

TERMS of REFERENCE

Implementation of a CMMS in two hospitals of the Ministry of Health of the Republic of Serbia

RS-AFSSHP-8830YF-CS-CQS-21-2.3.5

Background

The Republic of Serbia has received a loan from the International Bank for Reconstruction and Development (IBRD) in the amount of EUR 29.1 million equivalent toward the cost of the *Second Serbia Health Project (SSHP)*, Loan No. 8338-YF and EUR 25 million equivalent toward the cost of the *Additional Financing for the Second Serbia Health Project (AF-SSHP)*, Loan No. 8830-YF.

The Project Development Objective (PDO) is to contribute to improving the efficiency and quality of the public health system through the strengthening of: (i) health financing, purchasing, and maintenance systems; (ii) quality improvement systems and management of selected priority non-communicable diseases.

The project includes four components with subcomponents:

1: Improvement of Health Financing

- 1.1 Support Hospital Financing Reforms
- 1.2 Strengthen Primary Health Care Financing

2: Improve Access to Quality Health Care

- 2.1. Improve Access to Medicines
- 2.2. Strengthen Health Technology Assessment Capacity
- 2.3. Improve Medical Equipment Maintenance Systems

3: Strengthening Quality of Service Delivery

- 3.1. Strengthen Quality Improvement Systems
- 3.2. Improve Cancer Management

4: Monitoring, Evaluation, and Project Management - this component will support project management, monitoring and evaluation, as well as audits of the project's financial statements. It will also finance the project's operating costs, including translation, interpretation, equipment, supervision costs and PCU staffing costs.

Key Issues

A critical concern for the project is protecting the substantial investments that have already been made, including for medical equipment¹. A strategic approach to maintenance of medical equipment, aimed at developing a cost-effective system, represents one of the priorities for the delivery of good quality health services in Serbia. The total replacement value of the equipment installed in Serbian health facilities is estimated at about US\$800-900 million. An internationally accepted figure for the annual cost of a good maintenance program is 6-8 percent of the equipment capital value, which would correspond to an expenditure of US\$56-63 million per year - much higher than the budget currently allocated for maintenance. This explains in part the large number of unrepaired devices in hospitals. Hospitals also encounter difficulties procuring

¹ Medical Equipment is understood in this context as any medical device that may be an instrument, apparatus, implement, machine, appliance, material or other similar or related article, intended by the manufacturer to be used, alone or in combination for a medical purpose that is : (i) durable and reusable for multiple patients for at least three years, (ii) serialized (i.e., assigned a serial number) by its manufacturer, and (iii) has unit acquisition cost above a minimum defined by the Ministry of Health.

spare parts for high-tech equipment, contributing to equipment “downtimes” of several months. Despite fiscal constraints, the problem cannot be ignored, as it reduces patient access to lifesaving technology and contributes to a progressive depletion of the medical technology assets in the national health system.

Properly functioning medical devices are crucial for diagnostics and treatment of illnesses. If formerly the medical equipment was mechanical and straight-forward to use and maintain, modern high-tech equipment is expensive, unique in most cases requires specific knowledge of the service personnel and considerable financial resources for maintenance. Formerly, one hospital electrician was able to fix most of the problems related to the daily used equipment. Nowadays, special equipment requires specific skills and even particular certification in order to preserve the purchaser’s warranty entitlements. Consequently, maintenance services focusing min downtime and max optional time of all equipment of a health facility during their specific life cycle requires a systematic approach at national level.

Due to the lack of national guidelines or strategy, there are no uniform approaches and almost no awareness about maintenance within healthcare facilities staff. The development of maintenance structures and staffing is left to the health facilities.

The current fixed line budget allocation in the health facilities does not allow hospital managements to go beyond budget lines. However, high-tech equipment requires a certain degree of flexibility in resource allocation. Preventive and Corrective Maintenance (i.e. repair services) for medical equipment are taken from hospital income and therefore, **budget allocation for preventive and corrective maintenance is very low.**

Healthcare facility and technology management should be enabled and incentivized to look and develop global budget systems where the management seeks sustainable solutions in maximizing the high investment costs and developing strategies to reduce high/unaffordable down-time costs through establishing the procedures for preventive and corrective maintenance.

Unless the costs for installation, maintenance, consumables, training, energy consumption and waste disposal are calculated appropriately, the downtime for high-tech equipment will be increasing with the complexity of such equipment.

A Computerized Maintenance Management System (CMMS) to manage the Healthcare technology of the Hospitals in Serbia.

A computerized maintenance management system (CMMS) is a tool that can improve overall medical equipment management at the facility level. The information included in a CMMS varies depending on the individual situation but always includes the medical equipment inventory and typically includes information such as service history, preventive maintenance procedures, equipment and performance indicators, and costing information².

The implementation of a CMMS may be considered one of the first necessary steps for the implementation of a global strategy for the maintenance of medical equipment in health facilities.

² Computerized maintenance management system - WHO Medical device technical series, 2011

A Medical Equipment Inventory system and registration of maintenance work orders

In general, healthcare facilities do not keep a technical inventory system for medical equipment. There are only accounting inventories to measure depreciation, often in paper and only in some exceptions in form of excel sheets. Every technician has a log book in which the maintenance activities are to be registered. These activities are mainly limited to corrective maintenance, i.e. in the event when one item needs to be repaired.

For every device, there is, in several cases, a separate paper registration book, stored in the accountant's office. This prevents the heads of departments, heads of institutions, and other staff to have easy access to the information.

Together with the identified potential for better health technology management, the need for a modern and integrated information system on medical equipment became clear.

Electronic medical equipment inventories are necessary tools at national level to monitor the overall performance of equipment units and prepare informed decision in view of effective and efficient investment measures. For health facilities, an inventory and maintenance software serve as a tool for the elaboration and update of inventory of medical equipment, planning and record of maintenance management and training, and for management of resources such as spare parts or consumables but also technical services, for example, to plan bulk procurement of spare parts or explore the economies of scales in organizing the repair services by manufacturers after the expiration of the warranty period.

The implementation of an **inventory system will enable monitoring status and cost of operation for each equipment unit**, with at least the following capabilities:

- planning and monitoring of inspection and preventive maintenance, as well as scheduling and tracking repairs;
- monitoring equipment performance indicators, clinical engineering staff performance indicators, down time, cost of maintenance, compliance with the inspection and preventive maintenance, records on user and maintenance training, etc.

Objectives of the Consultancy

To develop a CMMS for two hospitals of the Ministry of Health of the Republic of Serbia (the Vojvodina Oncology Institute and the Institute for Pulmonary Diseases of Vojvodina in Sremska Kamenica) that may later on be also implemented in other hospitals by the Ministry of Health

Specific Objectives

1. To design /build or adapt from an existing market one, computer-based inventory system (CMMS)
2. To install the designed / adapted CMMS in two pilot hospitals.
3. To monitor the implementation of the CMMS during 4 months.
4. To train the Medical Equipment Maintenance Unit (MEMU) staff as well as the biomedical engineers, biomed technicians from the pilot hospitals in the use of the CMMS.

Scope of Services

The contractor will develop the CMMS or adapt it based on an already existing platform / system in hospitals.

The system should not require additional local hardware and it should require only moderate efforts and limited investment in order to allow the system to be run and configured to operate in Serbian language. Open architecture where data could be inter-operable with other health information systems based on open standards would be preferred.

The new CMMS should be used to support the Medical Equipment Maintenance Unit (MEMU) (officially *Group for Human Resources, Equipment and Investment in Health Institutions*) of the MoH and the Ministry of Health in introducing a standardized, countrywide electronic inventory system.

The CMMS should offer a user-friendly web-based platform for collecting and analyzing information about medical devices (equipment), including model specifications, age, cost and current status. Data entered at the facility level should be accessible for monitoring, management and planning purposes by authorized users at the facility, district, regional or national level.

The aim is to develop a feasible software that may be implemented by the Ministry of Health in any hospital of the national network that may allow a professional HTM.

The system should include the necessary provisions to integrate tutorials, a Health Technology Management Training Module.

The system must include elements of maintenance management and device types that should be categorized based on international standards to improve the data situation regarding medical devices in the country as well as international clinical equipment nomenclature such as the European Medical Device Nomenclature (EMDN).

The ownership of the CMMS shall be with the MoH, even after completion/ termination of the contract. The bidder will have to handover the CMMS with source code (if developed for this contract) or the licenses if it was procured to a third party: even after completion/termination of the contract.

Expected Minimum Features of the system

The main tasks of the information system have to be defined by a working group consisting of members of the Ministry of Health, the MEMU and other relevant stakeholders and for these tasks, clear technical specifications/requirements will be defined.

The following features are considered minimum requirements:

The system shall be able to calculate the minimum time taken for attending each call; time taken to complete each service request, uptime maintained for each healthcare facility and type of equipment and it should be flexible enough to generate query-based reports as per requirement in order to monitor the in-house maintenance service or external maintenance services.

The system shall have the following minimum modules:

- Inventory Module
- Spare parts management
- Biomedical Engineering Tools Management
- Digital Technical Manuals
- Maintenance Procedures Database
- Work Orders
- Alerts
- Risk Management Module
- Mapping with the location of each device within the hospital
- Reporting

Maintenance activities should be recorded with defined procedures with at least the following service status to monitor the performance of maintenance services:

- Notification service request
- Notification of "service call accepted"
- Notification of the medical equipment status (up/down)
- Notification of work order filed
- Notification of work order started
- Notification of work order completed
- Notification of work order on hold

The maintenance activities / corrective actions taken for each piece of equipment should all be recorded in the system.

Access Control

A dashboard with the main indicators from each pilot hospital shall be provided to MEMU from the MoH.

The system shall allow online access with all privileges to the MoH.

The system should automatically alert the responsible staff of the preventive maintenance activities to be performed, each week and each day.

The system should allow the assignment of activities to specific staff for the completion of the tasks.

The software final customization must be approved by the Ministry of Health before implementation in hospitals. Once the product specifications of medical devices are entered into the CMMS, the system should be able to track servicing requirements and notify the hospital managers in a timely manner when regular safety inspections or other maintenance actions are required.

The contractor will be working closely with Project Coordination Unit (PCU) on defining technical requirements of the software, which will be necessary for countrywide adaptation. Based on defined criteria, the contractor will developed / tune up / customize the computer- based inventory system proposed.

Activities

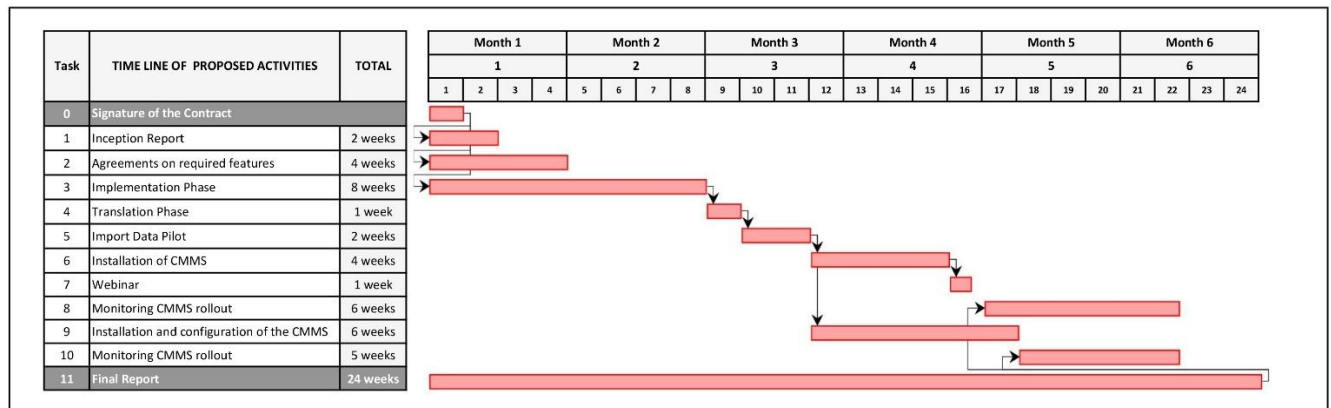


Figure 1: Timeline of proposed activities

Task 1: Presentation of the Project Implementation and features of the proposed system including a demo - 2 weeks from the signature of the contract

Task 2: Agreement on requested features to be customized on the basis of the minimum expected features defined above – 4 weeks from the signature of the contract

Task 3: Implementation of the agreed customizations – 8 weeks from the signature of the contract

Task 4: Translation of the user interface to Serbian – 1 week from the completion of task 3

Task 5: Import Serbian version of EMDN and coding of all equipment existing in the pilot hospitals – 2 weeks from the completion of task 4.

- Verification, testing of nomenclature

Task 6: Installation and configuration of the new CMMS in one-two training set-ups in 1 pilot hospital – 4 weeks from the completion of Task 5

- Import of existing data (xls lists) from pilot hospitals into the system.
- Evaluation of data quality and data integrity: Import of tables for manufacturers, services agents, and other requirements

Task 7: Webinar to launch the piloting - 1 week after the completion of task 6

- Theoretical and practical training sessions on HTM and use of the new CMMS
- Support the Data collection process at each Hospital
- Support data enter during training.

Task 8: Rollout of the CMMS and monitoring of the performance of the system in the Pilot 1 hospital. The rest of the time until 2 weeks before the submission of final report.

Task 9: Installation and configuration of the CMMS in a Pilot 2 hospital – 6 weeks after completion of task 5.

Task 10: Rollout of the CMMS and monitoring of the performance of the system in Pilot 1 and Pilot 2. The rest of the time until 2 weeks before the submission of final report.

Final Report: 24 weeks after the signature of the contract.

Duration of the Consultancy and Contracting Modality

6 months

The contract will be a lump sum contract.

Expected Outputs and Deliverables

The contractor will prepare an inception report after 1 month of commencement of services and will deliver timely monthly reports and one final report. The contractor is expected to maintain good communication with the PCU and partner organizations and attend partner meetings at regional level if needed.

As shown in the following table, specific milestones are to be reached at specific points during the contract term:

No	Phase	Activities and Deliverables	From	(Maximum) Time Allocation
1	Inception Report	Project Implementation Plan	Signature of the Contract	2 weeks
2		Agreement on required features	Signature of the Contract	4 weeks
3	Implementation Phase		Signature of the Contract	8 weeks
4	Translation Phase		Task 3	1 week
5	Import Data Pilot		Task 4	2 weeks
6	Installation of CMMS	In one pilot	Task 5	4 weeks
7	Webinar		Task 6	1 week
8	Monitoring CMMS rollout	In one pilot		Until the 2 weeks before the end of consultancy
9	Installation of CMMS	In second pilot		6 weeks
10	Monitoring CMMS rollout	In second pilot		Until the 2 weeks before the end of consultancy
11	Final Report		Signature of the Contract	24 weeks

Qualifications of Consultants

- Consulting firm with at least 5 years of experience in the health sector
- Consulting firm with at least 2 previous successful experiences in the implementation of CMMS systems in the past 5 years
- Team Leader with
 - University degree in biomedical engineering or similar field
 - Previous experience as team leader
 - At least 10 years of professional experience in the implementation of Health-related applications / platforms

- Previous experience leading, implementing or using CMMS will be considered as an advantage
- Previous experience working in developing countries will be considered as an advantage
- Previous experience with the World Bank funded projects and other internationally financed health related projects is strongly preferred
- Computer literate
- Good command of English, including oral and written reporting abilities
- Knowledge of Serbian language would be an advantage
- Health Technology Management (HTM) Specialist
 - University degree in biomedical engineering or similar field (Biomed technician / medical equipment technician)
 - At least 5 years of professional experience in management of Healthcare Technology
 - Previous experience in developing and using CMMS
 - Previous experience working in developing countries
 - Previous experience with the World Bank funded projects and other internationally financed health related projects is strongly preferred
 - Computer literate
 - Good command of English, including oral and written reporting abilities
 - Knowledge of Serbian Language would be an advantage
- Back office with at least 5 staff