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Public Financial Management Strengthening Project (PFMSP)

Report on Third-Party Verification of Medical Equipment and Inventory Management of Bir Hospital of the Ministry of Health and Population (MOHP)

August 13, 2021

Version: FINAL

PFMSP Year 5 Workplan Activity B.2.1.4 Conduct third party verification or appraisal of equipment, inventory at MOHP and selected hospitals and academies to establish a base-line database of medical equipment

**Submitted To: Government of Nepal, Ministry of Health and Population
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Authored document was produced for review by the Government of Nepal, Ministry of Health and Population. It is prepared by WSP/Louis Berger Group.

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Acknowledgement

At the request of Ministry of Health and Population (MoHP), USAID Public Financial Management Strengthening Project (PFMSP) contracted out Health Education Agriculture and Logistics (HEAL) Group to carry out the verification of medical equipment with the collaborative efforts of Quality Standard & Regulation Division (QSRD) of MoHP, Bharatpur Hospital and Bir Hospital of Kathmandu in 2021.

The HEAL Group is extremely thankful to MoHP and PFMSP for entrusting us to carryout third party verification of medical equipment in selected academics and hospital for MoHP.

WE Offer special thanks to Dr. Roshan Pokhrel, Secretary of Ministry of Health and Population for providing valuable suggestion to enhance inventory system, and annual maintenance plan/cumulative maintenance plan. In particular, we thank Dr. Madan Kumar Upadhyaya, Chief/QSRD/MoHP, Dr. Bikash Devkota, Secretary of Health/Lumbini Province, and Mr. Sanu Babu Adhikari/Under Secretary/MoHP for their valuable guidance throughout the /verification process.

HEAL Group would further like to appreciate the contribution of Dr. Jageshwar Gautam, Chief Administrative Officer of Bir Hospital and his team for extending their support during the verification process. We also would like to thank Dr. Nabin Pokhrel/Deputy Director, Dr. Ashesh Dhungana/Deputy Director and Ms. Goma Devi Niraula/Matron of Bir Hospital for facilitating the verification process.

Finally, special gratitude goes to all Head of the Departments of Bir Hospital and the Data Collection Team for their support and effort to materialize the hospital equipment verification.

Our sincere thanks go to PFMSP for providing expert opinions and guidance. We hope this verification of Medical Equipment would pave the way for future planning and programming.

Acronyms and Abbreviations

Acronym	Definitions
AMC	Annual Maintenance Contract
CMC	Comprehensive Maintenance Contract
HCTP	Health Care Technology Policy
HEAL	Health, Education, Agriculture and Logistics
HOD	Head of Departments
HR	Human Resource
MEM	Medical Equipment Management
MoHP	Ministry of Health and Population
NHP	National Health Policy
NHSP	Nepal Health Sector Strategy
PFMSP	Public Financial Management Strengthening Project
PHSA	Public Health Service Act
QSRD	Quality Standard and Regulatory Division
SOP	Standard Operating Procedure
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

Nepal has made significant progress in health outcomes relative to its income level. Yet, inability to ensure consistent access to quality health services by the people, accountable human resources to public health and services, disproportionate return from investment in the health services and unavailability and optimum use of necessary modern equipment as well as specialized doctors in public health institutions are the main challenges in promoting and availing quality health services in Nepal.

Medical Equipment Management (MEM) takes place within the context of human, material, structural, organizational, and financial resources. It is a process which helps hospitals to develop, monitor, and manage their equipment to promote the safe, effective, and economical use and maintenance of equipment. The healthcare system has become dependent on new technologies developed to facilitate patient care. A good management practice includes planning, acquisition, incoming inspection, inventory, installation, commissioning and acceptance, training of users and operators, monitoring of use and performance, maintenance, and replacement or disposal of equipment.

Since long, hospital equipment management issues are in the limelight. Time and again the issues are highlighted by the media. MoHP has identified the weaknesses in its inventory management system, including non-compliance among federal level hospitals and health academies that have not regularly updated lists of existing medical equipment. Given these prevailing issues, MoHP, therefore, initiated to conduct a third-party verification of existing equipment at hospitals and academies under MoHP purview and to recommend setting up of a comprehensive inventory management system to address these problems.

The urgency to rectify the weakness has also been heightened due to the ongoing COVID-19 pandemic in Nepal. Concerns regarding limited equipment, instruments for diagnosis and treatment in recent COVID -19 pandemic crisis further substantiated the need of verification of medical equipment in hospitals as well as its proper use.

MoHP took the leadership in collaboration/ support of USAID Public Financial Strengthening Project (PFMSP) for the verification of the medical equipment and inventory management of selected hospitals that would help ensure the proper utilization of medical equipment with effective inventory management. The objectives of the third-party verification of medical equipment in academics and hospitals for MoHP are to:

- Conduct verification of all existing medical equipment as well as the review the inventory management and the system.
- Identify the number of required and available equipment's needed to provide health services as per the nature of health services to be provided.
- Suggest the strategies to be taken forward to utilize medical equipment properly, also keeping in mind the effective inventory management.

MOHP and PFMSP assigned the HEAL Group to carry out this task. The Standard Tool checklist developed by MoHP with the support from PFMSP was used to collect data on medical equipment at both the sampled hospitals in Bharatpur and Bir Hospital.

After the orientation program with the MOHP and the concerned officials from the hospitals, the HEAL Data Collection Team began collecting data and other relevant information from June 27, 2021, hospital which continued for a month. Retrospective review of inventory records, physical verification of hospital equipment and interviews/ and interaction with Department Heads and Store Managers were undertaken by the HEAL Team.

Based on the review carried out presented below are some of the key observations:

- Out of 1,704 equipment verified, more than three-fourth of the equipment were found to be purchased by the hospital. Around one-tenth of the total equipment were received as donation and less than one percent of equipment is received from government supply. Higher percentage of hospital's own purchase indicates independence on purchasing as per their need. Most importantly, nearly 13% of equipment's source of supply is not known. This somewhat necessitates significant improvement in proper recording and inventory management.
- 69% of equipment were functioning and used in patient care services. Out of the total equipment, 10% were either unbundled or not in use
- Of total 1,704 verified equipment, it was found that 8% of the equipment were maintained at least one time over their life span. The average number of maintenances of all equipment from all sources was 3.0. There were no maintenance records found for equipment received from government supply.
- Out of 1,329 hospital purchased equipment across all services (departments), equipment with at least one-time maintenances over the life span is 115. The average number of equipment that were maintained at least once during the lifetime was 3.3.
- Out of 1,704 equipment in all departments, 32% of them were less than 5 years old. Similarly, 4% percent of equipment were aged between 5 to 10 years. And 5% were more than ten years old. At the time of verification, 61.1% of all medical equipment's purchase date were not available.
- Only 33.1% of equipment have associated cost information available. More than two-third (66.9%) of all equipment have no cost information available. The average maintenance cost for all services (departments) were recorded to be Rs. 1,869,302.00. Orthopedics Department of Bir hospital recorded the highest cumulative maintenance cost of Rs. 411,874,823.90, followed by Psychiatry department recorded at Rs. 253,338,239.40. However, no maintenance cost could be verified for the Laboratory Services.
- Of 1,704 verified equipment, only 3.3% equipment across all departments had availability of documents regarding installation/agreement report while only 2.3% of all equipment had information on the warranty period of the equipment.
- Less than 1% of equipment across all departments had annual maintenance contract, and only 2.7% had comprehensive maintenance contract. The equipment with a scheduled maintenance was also recorded to be 1.7%.
- About 88% of equipment had sufficient infrastructure available to house the equipment. With 38% of equipment (N= 620) with user manual/catalog available, the logbook was maintained for 6% of equipment. On an average, 16.4 services were provided per day by the equipment across all departments. No record of number of services per day were retrieved from Pathology and Surgical Department during the time of verification.
- 87.3% of the equipment verified have human resource available for the operation of equipment; however, personnel operating the equipment have had user training for only 20% of equipment.

High percentage of medical equipment devices in Bir Hospital seems being operated without evidence of adequate user training to personnel operation the equipment.

Recommendations

- It is important to note that records of purchase/receipt, warranty period, AMC/CMC, availability of catalog and user manual were not available for most of the equipment at the verification. Hospital

Management should review the stock work to make it user friendly, and initiate inventory practices. Procurement section and Store Section to lead in this process.

- Information flow between store and departments, hospital management and donor as well as hospital and government for better supply chain management of equipment.
- Hospital Management is suggested to perform equipment audit once a year.
- Keeping in lieu of unbundled equipment, immediate action to be taken to make operational. Out of order and equipment not in use are to be verified. If they are repairable, are to be repaired accordingly. In case of irreparable ones, Hospital Management Committee should initiate disposing.
- If the equipment is out of order due to unavailability of accessories and or associated parts, and if with valid warranty period, Hospital Management should follow up with the supplier for accessories.
- Keeping unbundled equipment for longer period of time gradually decreases life span of such equipment. It is suggested that Hospital Management manage resources to make such equipment operational.
- Proper recording system should be enhanced. Effective maintenance management of medical equipment is one of the major issues for quality of care, for providing cost-effective health services and for saving scarce resources. Hospital management is thus suggested in the decision-making in support of selection, purchase, repair, and maintenance of medical equipment, especially for capital equipment.
- While purchasing equipment, especially for capital equipment, to include AMC/CMC in the bidding document.
- Equipment that requires maintenance frequently, and maintenance cost is id high, Hospital Management should weigh on pros and cons of keeping such equipment or seek for new procurement,
- The healthcare system has become dependent on new technologies developed to facilitate patient care. Old and obsolete equipment are needed to be decommissioned and start for planning new acquisitions. In case of acquisition of new equipment with advanced technology, it is essential to assess the availability of physical infrastructure to house such equipment and train personnel responsible to operate such equipment.

1. INTRODUCTION

1.1 Introduction

Medical Equipment Management (MEM) takes place within the context of human, material, structural, organizational, and financial resources. It is a process which helps hospitals to develop, monitor, and manage their equipment to promote the safe, effective, and economical use and maintenance of equipment¹. The hospital equipment management is a management cycle that starts from planning, procurement, acquisition, installation, commission, decommissioning and finally disposal of hospital equipment². In developing countries absence of maintenance and repairs of hospital equipment, improper procurement plan, improper calibration, and poor validation of the equipment are the major challenges in hospital equipment management³.

Hospital equipment inventory is an essential part of an effective health-care technology management⁴. The (mis-) management of physical assets impacts the quality, efficiency, and sustainability of health services at all levels. It could be some issue with sophisticated life-support equipment in a tertiary hospital setting, or with simple equipment required at the primary healthcare level for effective diagnosis and safe treatment of patients. What is vital at all levels and at all times is a critical mass of affordable, appropriate, and properly functioning equipment used and applied correctly by competent personnel, with minimal risk to their patients and to themselves.

Nepal has made significant progress in health outcomes relative to its income level. Yet, inability to ensure consistent access to quality health services by the people, accountable human resources to public health and services, disproportionate return from investment in the health services and unavailability and optimum use of necessary modern equipment as well as specialized doctors in public health institutions are the main problems in promoting and availing quality health services in Nepal⁵.

1.2 Rationale

Public hospitals hold a vast array of medical equipment ranging from small inexpensive items to expensive complex. This verification examines the efficiency and effectiveness of the use, management, and maintenance of major medical equipment in hospitals and academics under Ministry of Health and Population (MoHP). The assignment included an assessment of the current status, life expectancy of medical equipment and the asset management practices in hospitals.

Since long, hospital equipment management issues have come into the limelight. Time and again the issues are highlighted by the media as well. MoHP has identified weaknesses in its inventory management system, including non-compliance among federal level hospitals and health academies that have not regularly updated lists of existing medical equipment. MoHP, therefore, initiated to conduct a third-party verification of existing equipment at hospitals and academies under MoHP purview and recommend set up of a comprehensive inventory management system.

1 <https://www.asianhnm.com/technology-equipment/medical-equipment-management>

2 Rajeev B, Ashish D (2007) Healthcare Knowledge Management: Issues, Advances, and Successes, Library of Congress Control Number: 2006923639: 10:0-387-335404.

3 Mercy Adusei Boatemaa, Hospital Equipment and its Management System: A Mini Review, 2017, <https://juniperpublishers.com/ctbeb/pdf/CTBEB.MS.ID.555684.pdf>

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http://apps.who.int/iris/bitstream/handle/10665/44561/9789241501392_eng.pdf;jsessionid=719B092427000867CE76A22AEBA4E71?sequence=1

5 https://un.org.np/sites/default/files/doc_publication/2018-08/who_nepal_ccs_2018-2022.pdf

The urgency to rectify the weakness has also been heightened due to the ongoing COVID-19 pandemic in Nepal. Concerns regarding limited equipment, instruments for diagnosis and treatment in recent COVID -19 pandemic crisis further substantiated the need of verification of medical equipment in hospitals.

The Office of Auditor General in its Annual Report has highlighted mandatory requirement for public entities in maintaining up-to-date record of every non-expendable item, conserve, timely repair & and maintenance, and decommissioning of un-repairable as per Financial Procedure Regulations (2064) and Fiscal Accountability Act (2076)⁶.

MoHP decided to conduct a third-party verification of medical equipment and inventory management of selected hospitals/academics with support from USAID/PFMSP. Health, Education, Agriculture and Logistic (HEAL) Group was assigned on behalf of PFMSP and MoHP to carry out the third-party verification of medical equipment in academics/hospitals with no conflict of interest.

1.3 Objectives

With support from the MoHP, the verification of the medical equipment and inventory management of selected hospitals would help ensure the proper utilization of medical equipment with effective inventory management. The specific objectives of the third-party verification of medical equipment in academics and hospitals for MoHP are:

- Conduct medical equipment verification as well as inventory management.
- Identify the number of required and available equipment's needed to provide health services as per the nature of work.
- Suggest the strategies to be taken forward to utilize medical equipment properly, also keeping in mind the effective inventory management

1.4 Hospital Equipment Management in Nepal

A systematic way to manage medical equipment is to study and optimize all phases in the useful life of that equipment. Medical equipment plays an important role in the healthcare delivery. MEM takes place within the context of human, material, structural, organizational, and financial resources. It is a process which helps hospitals to develop, monitor, and manage their equipment to promote the safe, effective, and economical use and maintenance of equipment through a life cycle approach is prescribed. It typically consists of nine stages; Planning, Procurement, Delivery and incoming inspection, Inventory and documentation, Installation and commissioning, User training, Monitoring of performance, Maintenance and Replacement or disposal⁷.

Nepal Health Infrastructure Development Standards integrates planning for important building blocks of the health system - health infrastructure, human resources, and equipment. An efficient and effective system is crucial to improve and ensure quality health services at the point of service delivery. Human resources, Infrastructure, Procurement and Supply chain are highlighted as essential, interconnected components that need to function in tandem for smooth service delivery. These systems are altogether geared towards ensuring optimal deployment and quality of health personnel, setting up minimum infrastructure and the timely procurement, uninterrupted supply of drugs and equipment and logistics⁸,

⁶Office of Auditor General, Annual Report, 2020/21

⁷ <https://www.asianhnm.com/technology-equipment/medical-equipment-management>

⁸ https://www.nhssp.org.np/Resources/HI/Hi_Dev_Standards_2074BS_Unofficial_Translation_Volume4.pdf

In Nepal, system and procedures are in place for the management of medical equipment from need identification, preparation of annual procurement plan, procurement, receipt, recording, quality assurance, commissioning, repair/maintenance, and decommissioning. All public sector institutions get supplies basically from three sources; government, own procurement, and donations. For the procurement, all public sector institutions are required to abide the Public Procurement Act 2063, Public Procurement Regulations 2064. All institutions are required to prepare annual procurement plan basing on need identification. Depending upon the price, volume procurement is done either direct, through quotation or competitive bidding. Public Procurement Monitoring Office (PPMO) has developed standard bidding document and all procurements are to be made accordingly. Annual Maintenance Contract (AMC) and Comprehensive Maintenance Contract (CMC) can be inbuilt in the bidding document. The provision of pre and post shipment inspection is in place for quality assurance. After quality inspection, the received equipments entered in the main stock register. After entering the inventory in store records, the equipment are installed and commissioned as per the contract and the suppliers are required to perform periodic maintenances as per AMC and CMC for specified period of time. The suppliers are required to provide training to users on the operation of the equipment. When the equipment become unrepeatable, then every institution should proceed decommissioning of such equipment as per Government's Financial Procedure Rules. For decommissioning of unrepeatable medical equipment, MoHP has also published a guideline which was endorsed by PPMO and Auditor Generals' Office as well⁹.

High-quality health services involve the right care, at the right time, responding to the service users' needs and preferences, while minimizing harm and resource waste¹⁰. The condition of medical equipment used has an impact, no matter how small, on the patient mortality rate. Globally, it is considered that almost 10% of the world population's mortality rate is due to medical equipment failure.

Despite of system being in place hospital equipment management is still of less priority in many hospitals. The data from one of the previous projects of MoHP showed that on an average 30-33% of the equipment is out-of-order. Almost 4% of the equipment was not commissioned in the facility. Moreover, 2 to 3% of the equipment were not verified in the health facility. The underlying reasons for the above data were found to be due to lack of human resource to operate that equipment, lack of proper training for users as well as the technicians and lack of a proper inventory management¹⁰.

1.5 Regulatory and Guiding Policies

The quality equipment management includes production, procurement, transportation, use, and even maintenance of the equipment. There are many relevant guidelines in this regard like Public Procurement Act/Regulation, Equipment Handling Standard Operating Procedure (SOP) s, User Manual, Maintenance Guidelines, and Equipment Auction Guidelines.

The Health Care Technology Policy (HCTP)¹¹, 2006 was the guiding document for utilization and operation of medical equipment. An appropriate equipment and facility management system is essential for increasing returns from such investments. HCTP aims to improve life cycles of medical equipment from planning, procurement, and implementation.

The National Health Policy (NHP), 2019¹² outlines the policy of medical and managerial audit of health institutions is carried out to strengthen the quality of services and institutional capacity. NHP has well

⁹<http://dohslmd.gov.np/web/en/postdetail/final-auctioning-and-writeoff-guideline-2067>

¹⁰https://www.who.int/healthinfo/global_burden_disease/GlobalHealthRisks_report_full.pdf

¹¹ <http://mohp.gov.np/downloads/Health-Care-Technology-Policy.pdf>

¹⁰ Report on "Nationwide Maintenance Outsourcing Program", MD, DoHS

¹²National Health Policy, 2019

spelled out about the equipment and inventory management to deliver quality health services. The strategy 6.10 mentions ensuring establishing mechanism to determine price and quality of drugs, equipment, and technological health materials and to regulate them. It also addresses the need to develop the guidelines and standards to receive and utilize medicines, equipment, medical supplies as per the need from international, national, and local government, non-government, and private entities. It also ensures making procurement, transportation, storage, and distribution system more effective and systematic by preparing specifications of drugs and medical supplies.

The Fifteenth Plan (2019/20 – 2023/24) reiterates ensuring quality health service by using medicine and treatment methods, physicians, and the latest technology in service delivery, and enhancing the availability and skills of human resources. For this reforming the quality of health services will be provided by health institutions at all levels by effectively implementing Nepal Health Infrastructure Development Standards and Minimum Service Standards (MSS).

Nepal Health Sector Strategy (NHSP), 2015-20¹³ has incorporated to rebuild and strengthen the health systems: HRH, Infrastructure, Procurement and Supply chain management as its output. It calls for necessary institutional arrangements, including building capacities at different levels, to leverage technologies adequately, better manage (asset management) existing technologies and improve repair and maintenance functions¹⁴.

The Public Health Service Act (PHSA), 2018¹⁵ spells that each health institution shall provide services subject to the Minimum Standards as determined by the Ministry. Key thrust of PHSA is the responsibility of the health institution to maintain the quality of healthcare services. The quality health service is not possible without quality equipment management.

¹³ Fifteenth Plan, 2019/20 – 2023/24, National Planning Commission, March 2020

¹⁴ Nepal Health Sector Strategy, 2015-2020, Government of Nepal, ministry of Health and Population, 2015

¹⁵ The Public Health Service Act, 2075 (2018)

2. METHODOLOGY

2.1 Sampling

For the purpose of verification of medical equipment, Quality Standard and Regulatory Division (QSRD) of MoHP selected two major hospitals based on the geographical setup and flow of patient. While Bharatpur Hospital is based outside Kathmandu valley, Bir Hospital is one of the leading hospitals of the capital. Both of these hospitals have commendable patient flow with numerous medical equipment used for healthcare services delivery. Furthermore, the Physical Assets Management Sub-division of the Management Division (MoHP) had earlier carried out a study per the equipment management perspective at Bharatpur Hospital.

2.2 Tool Used

The Standard tool developed by Ministry of Health and Population (MoHP) was used to collect data on medical equipment at both the sampled hospitals: Bharatpur Hospital and Bir Hospital (Annex 1). A separate questionnaire was also developed for the Head of Departments (HODs) of the respective hospitals to gain a broader perspective and information regarding the program.

2.3 Orientation

2.3.1 Orientation to Head of Departments

With the initiation of MoHP, Quality Standard Regulation Division (QSRD) and HEAL Group coordinated with the sampled Hospital's administration for necessary arrangements to carry out the orientation program at the respective hospitals. A team comprising of representatives from MoHP, Lumbini Province Health Secretary, and HEAL Group conducted the orientation program in Bir Hospital. Despite the nationwide lockdown due to COVID – 19 pandemic, the team successfully conducted orientation program at Bir Hospital on June 25, 2021.

The orientation program witnessed the presence of various dignitaries from QSRD, MoHP, The Hospital Chief Executive Officer, Head of Departments (HODs) as well as other guests. Chief QSRD/MoHP, Under Secretary/MoHP, Deputy Directors also facilitated the orientation program.

During the orientation, all dignitaries highlighted on affordable, appropriate, and properly functioning equipment applied correctly by competent personnel is crucial for delivering quality health services. Health Secretary of Lumbini Province explained the objectives of the hospital equipment verification. He shared that MoHP have had in mind of carrying out a verification of medical equipment in larger hospitals. This would be of great help for planning, programming, procurement, and deployment of appropriate human resources. He added that the outcome of the project would be most beneficial to the facility itself followed by the policy making procedure in the future.

It was also highlighted that hospital equipment management issues have been in the limelight since a long time. Time and again the issues are highlighted by the newspaper as well. They emphasized and instructed the third-party verification team to bring the actual scenario as it is. The need to do a lot in equipment management in all public hospital was also realized during the discussion. It was further stated that the hospital management side everything might be well set regarding the equipment management, but third-party independent audit could bring the real picture. Furthermore, the COVID-19 pandemic made the management realize the need of medical equipment in case of emergency as there were discrepancies in stock register and actual availability. The Technical Lead from HEAL Group also facilitated the orientation program.

The meeting also concluded that this verification will not only help in identifying the issues of availability of equipment as well as human resource required to operate those equipment, but also on the procurement management, and current status of use. The independent report will certainly highlight these issues that would be helpful in future planning and programming. In the Plenary Session participants raised few queries. Summary of which are as following:

- a. The measures for User Trainings to be undertaken and the lack of knowledge to operate certain equipment.
- b. The absence of human resources for the maintenance of the concerned medical equipment which results in a greater number of non-functioning equipment and in some cases the unbundled supplies too.
- c. The lack of overall management knowledge of medical equipment.
- d. Provision of service contract while contracting for the medical equipment.

2.3.2 Orientation to the Data Collection Team

An orientation and proper explanation on the use of the data collection tools is an important part of this assessment. Hence, the detailed information and importance of those tools were explained to the data collectors. The session was facilitated by the Chief QSRD/MoHP, Health Secretary, Lumbini Province, Under Secretary/MoHP, third-party audit/verification Part-Time Technical Lead and Bio-Medical Engineer thoroughly facilitated the orientation program.

A separate orientation only for the data collectors was conducted to familiarize them to the main motive of the program including how to proceed and prepare for data collection. This session provided them with the pointers on what was expected from them during the process until the completion of data collection. The checklist developed by MoHP was introduced to the Data collectors with a detail explanation of each variable included that further enhanced their understanding of how to use the Data collection tool. The Biomedical Engineer then described each variable in detail. She also pressed on the data collectors not to leave any room blank. The process of data collection was also explained to the participants, and they seemed to not have any problem with the discussed information. The participants were reiterated not to leave any field blank and not to fill the sheets with cooked up information.

Lumbini Province Health Secretary ran a practical session requesting the participants to fill up some dummy data on the data collection tool as an exercise to ensure the understanding of the data collectors regarding the tool. All the participants practiced and filled up the forms with some hypothetical data. The session was fruitful to observe any errors or confusions on the use of the tool. Necessary feedbacks and suggestions were provided right away to clear out any confusion as well as to correct the errors from the data collector's point of view.

2.4 Data Collection

Data Verification Team Members were hired prior to orientation program. As far as possible, Data Verification Team Members were selected on the basis of how well accustomed the data collectors would be with the hospital environment, their knowledge of the medical equipment as well as their ability to efficiently collect the data. After the orientation program, the data collection team began collecting data and other relevant information from June 27, 2021, continued for month. The data collection team applied the following methodologies for the verification:

2.4.1 Retrospective Review of Inventory Records for Medical Equipment

The main Financial Administration Rules and Regulations of the Government of Nepal require every government institution to enter every item received in the main stock register. Main stock register also provides information on where the items are sent. Likewise, at the end of any fiscal year, all government institutions are mandatorily required to prepare annual physical inventory of goods with quantity, conditions of non- expendable goods whether usable, unusable, or repairable. The information collected served as the main entry point for the verification. The data collection at Bharatpur hospital started with the verification team sitting with the Store Manager and reviewing the noted inventory. However, for Bir hospital, the scenario was a little different. As a proper inventory was not managed at the departments of Bir hospital, the data collection began with the physical verification of the medical equipment from each existing department.

2.4.2 Physical Verification of Hospital Equipment

With the standard checklist developed and endorsed by the MoHP, the team then visited every department of the hospital for the physical verification of the medical equipment. Using the checklist, the verification team at both the health facilities collected the data of medical equipment and inventory management for:

- Number of required and available equipment
- Source and date of equipment commissioning
- Cost and status of equipment
- Installation reports, agreement document and/or warranty period of the equipment
- Relation of use and maintenance of equipment
- Relation of use and average services provided per day
- Availability of catalogue/user manual, logbooks, etc.
- Environment, Human Resource (HR) availability, user trainings for optimal use of equipment

The physical verification of hospital equipment also demanded the data collecting team to search for the equipment that were stored away either for non-repairable or auctioning processes or for disposal process.

2.4.3 Interviews and Interaction with Department Heads and Store Managers

Often time, most of the government hospitals lack the provision of a qualified HR to oversee and ensure the optimum functioning of the equipment as well as to conduct preventive and corrective maintenance according to the need. Up to date record keeping of the available medical equipment including maintenance of records would foster their future procurement plan of the hospital.

The verification team carried out interaction and interview with Department Heads and Store Managers. A Structured questionnaire was designed and used to capture the perspective of Head of Departments and Store Managers on availability of human resources to operate the medical equipment, repair & maintenance, and effective utilization of limited space. The interview tried to capture the availability of following information:

- a. Installation agreement document with date of installation
- b. Warranty agreement
- c. Annual Maintenance Contract (AMC)/Comprehensive Maintenance Contract (CMC) documents
- d. Record of number of services provided through the equipment
- e. Facilitation for the maintenance cost for the medical equipment
- f. Requirement of any new equipment to be included in its services
- g. Benefit of adding the equipment to the patients and the department
- h. Availability of enough space to setup the new equipment or service
- i. Required Human Resource to effectively operate the existing or the demanded
- j. User training of the existing staffs meet up the HR requirement
- k. User training for better efficiency of the existing equipment
- l. a fluid

2.5 Verification Process

2.5.1 Coordination

A fair amount of preparatory activities were carried out ahead of verification. HEAL Group coordinated with MoHP/Quality Standards and Regulations Division (QSRD) for the necessary approval. Following the approval, MoHP facilitated with Bir Hospital for the orientation program of the Department Heads, Administrative Staff, Financial Staff, Procurement Staff and Store Manager.

This was the first step to ascertain formal association of third party with hospitals and build conducive environment during the whole process. This was crucial to align the objectives of verification with hospital administration and departments have time to prepare. Department Heads then facilitated with other staffs for third party verification.

2.5.2 Verification Execution

The verification process consisted of various activities including interviews with concerned personnel, on-site medical equipment verification, assessing process and system controls, and regular communication with other relevant parties within the hospital. All the above-mentioned methodologies were practiced in order to obtain the qualitative data as demanded by the tool and the aim of the program. This phase of verification ended with an exit meeting with HODs.

2.5.3 Reporting

The report outlines the results of the third party's independent verification of medical equipment in Bir Hospital, providing accurate status of medical equipment along with recommendations on any corrective actions that need to be taken. This enables the hospital management to effectively track quality and performance over time and identify areas for improvement.

2.6 Quality Assurance

A practical session for the data collectors during the beginning of the data collection process of filling up some dummy data on the data collection tool as an exercise helped to ensure the proper and complete understanding of the tool used by the data collectors. As mentioned earlier, those dummy data were cross checked, and the necessary feedbacks and corrections were made on the same sitting.

Already tested tool was used for data collection in Bir Hospital. The Data Verification Team Members were urged to fetch the information regarding the need of hospital equipment from all the existing departments and especially from newly created department.

For data quality assurance, the Bio-Medical Engineer and Coordinator checked completed checklist from each department questionnaires. The raw data collected were further reviewed by the senior personnel for inconsistencies and blank spaces. Necessary administrative data were accumulated in coordination to the respective office departments. The data then was entered in Microsoft Excel and checked once again for recording errors.

2.7 Monitoring

Bio-Medical Engineer (BME) from HEAL Group provided necessary guidance to the team and reviewed collected data every day. This helped Data Verification Team Members to enhance their capacity in data collection and focus on what to be collected as per the checklist.

The BME routinely monitored data collection process in Bir Hospital. HEAL Group Team frequently visited the sites during data collection process for quality and completeness.

The coordinator routinely monitored the data collection throughout verification process. Time and again, MoHP also made follow up visits and interactions to facilitate the addressing of issues, problems that came across.

2.8 Data Review

The central team thoroughly reviewed the collected data. Various inconsistencies were found during the review process. The inconsistencies were directed to the Data Verification Team Members for rectification. Accordingly, the Data Verification Team Members revisited the collected data and reverted back with the necessary and complete information.

2.9 Data Management and Analysis

The verification team collected the data on printed datasheets, which were later electronically transcribed as well as directly entered on the Excel Sheets provided to them. To resolve inconsistencies in the data, the team first reviewed the data. During review process, cleaned the data and entered for analysis. Data is analyzed by using SPSS,

2.10 Limitations of Audit/Verification

- The verification of medical equipment included purposively selected hospitals. The sampled hospitals may not represent the situation of all hospitals in the country overall.
- The various documents that were required during the verification process were not filed properly and unavailable. (e.g. Installation report; Annual Maintenance Contract/Comprehensive Maintenance Contract; Warranty agreement, etc.) (Findings)
- It was observed that the unavailability of HR at the health facility to efficiently operate certain equipment and the unforeseen transfer of the available HR directly affects the services provided by the facility to the patients.

3. OBSERVATIONS AND DISCUSSION

A total of 1,704 equipment was verified in Bir Hospital, of which almost 78% of the equipment verified were purchased by hospital itself. Very few equipments were government supplied and received as donation. The findings of the verification as follows:

3.1 Total Number of Equipment with Source of Receipt

Table 1 below shows the total number of equipment with source of receipt, i.e., equipment purchased by hospital, received as donation and government supply.

Table 1: Equipment with Source of Receipt

Services / Department	Number of Equipment Available	Sources of Equipment			Source Not Available (%)
		Purchased by the Facility (%)	Donation (%)	Government Supply (%)	
Anesthesia	166	9	0	0	0
Dental	112	6	0	0	1
Dermatology	10	1	0	0	0
Emergency	55	3	1	0	0
ENT	61	2	0	0	1
General Medicine	613	26	5	0	5
Laboratory	163	7	1	0	1
Oncology	36	2	0	0	0
Physiotherapy	30	2	0	0	0
Radiology	26	1	0	0	0
Store	123	5	0	0	2
Supporting Service	74	4	0	0	1
Surgery	235	12	1	0	1
Total	1,704	78	9	0	13
	N	1,329	153	7	215

Observations:

- 78% of the equipment are purchased by hospital.
- Nine percentage of the total equipment are received as donation
- Less than one percent (0.42%) (N=7) of equipment is received from government supply.
- Most importantly nearly 13% (N=217) of equipment's source of supply is not known. This somewhat necessitates significant improvement in proper recording of equipment received.

3.2 Current Status of all Equipment by Services (Department)

Table 2 below provides the information on current status of equipment by services (department). Under these criteria five categories were assessed; **Functioning**, **Out of Order**, **Not in Use**, **Unbundled** and **For Auction** for all departments.

Table 2: Current Status of Equipment by Services (Department)

Services/Department	Number of Equipment Available	Functioning (%)	Out of Order (%)	Not in Use (%)	Unbundled (%)	For Auction (%)	NA (%)
Anesthesia	166	6	2	0	0	0	2
Dental	112	5	1	0	0	0	0
Dermatology	10	0	0	0	0	0	0
Emergency	55	3	0	0	0	0	0
ENT	61	3	0	0	0	0	0
General Medicine	613	29	5	0	0	0	1
Laboratory	163	7	1	1	0	0	0

Oncology	36	1	1	0	0	0	0
Physiotherapy	30	1	0	0	0	0	0
Radiology	26	1	0	0	0	0	0
Store	123	0	0	0	7	7	0
Supporting Service	74	3	1	0	0	0	0
Surgery	235	10	3	0	0	0	0
Total	1,704	69 (N=1,183)	15 (N=250)	2 (N=29)	8 (N=141)	3 (N=45)	3 (N=56)

Observations:

- 69% of equipment are functioning and are used in patient care services.
- Out of the total equipment, 10%, (8% unbundled and 2% are not in use) are not in use during time of data collection.
- 15% equipment are **out of order**.

3.3 Source of Equipment by Functioning Status

Table 3 below provides the Source of Equipment by its' Functioning Status. Three sources of receipt (Institution Purchase, received as Donation and Government (Center) Supply) were verified with the Current Status of Equipment (Functioning, Out of Order, Not in Use, Unbundled and for Auction).

Table 3: Source of Equipment by Functioning Status

Source of Equipment	Number of Equipment Available	Functioning (%)	Out of Order (%)	Not in Use (%)	Unbundled (%)	For Auction (%)	Information Not Available (%)
Hospital Purchase	1,329	71	15	1	7	2	3
Received as Donation	153	72	19	3	1	5	1
Government Supply	7	57	29	0	0	14	0
Source Not Available	215	57	10	3	19	7	5

Observations:

- Out of 1,329 hospital purchased equipment 71% are functional.
- 72% of equipment **received as donation** are functional.
- 57% of equipment from government supply are also functional.
- 19% of donated equipment are out of order, 3% of them are not in use and 5% are totally unusable and need auctioning.
- 29% of Government supplied equipment are out of order whereas a massive 14% are totally unrepairable and needs auctioning.

3.4 Hospital Purchase - Current Status of all Equipment by Services (Department)

Table 4 below provides the current status of all equipment purchased by Hospital in all services (departments). Total equipment purchased by hospital in all services (department) was verified for functioning, out of order, not in use, and unbundled.

Table 4: Current Status of Hospital Purchased Equipment by Services/Department

Service / Department	Number of Equipment Available	Functioning (%)	Out of Order (%)	Not in Use (%)	Unbundled (%)	For Auction (%)	Information Not Available (%)
Anesthesia	166	60	19	1	0	3	17
Dental	112	72	16	2	0	10	0
Dermatology	10	70	30	0	0	0	0
Emergency	55	93	5	0	0	0	2
ENT	61	74	11	0	0	11	3
General Medicine	613	81	13	1	1	2	3
Laboratory	163	75	10	9	0	3	2
Oncology	36	53	36	3	6	3	0
Physiotherapy	30	60	27	3	7	3	0
Radiology	26	73	23	0	0	4	0
Store	123	0	0	0	100	0	0
Supporting Service	74	74	20	0	1	4	0
Surgery	235	73	21	0	3	0	2
Total	1,704	69	15	2	8	3	3

Observations:

- More than 80% of functional equipment are in the Emergency and General Medicine department.
- Higher percentage of out of order equipment is in Dermatology, Oncology and Physiotherapy Departments.
- Equipments that need auctioning are in higher percentage in Dental and ENT departments. These are unnecessarily occupying space and need auctioning.

3.5 Source of Equipment by Times of Maintenance

Table 5 compares the source of equipment (purchase, received as donation and government supply) with maintenance (total number of maintenance and average number of maintenance).

Table 5: Source of Equipment by Times of Maintenance

Source of Equipment	Number of Equipment Available	No of Equipment with at least One Maintenance (>0)	Total Number of Maintenance of all Equipment by Source	Average Number of Maintenance
Hospital Purchase	1,329	115	386	3.3
Donation	153	8	11	1.4
Government Supply	7	0	0	0
Source Not Available	215	9	33	3.7
Total	1,704	132	430	3.0

Observations:

- Of total 1,704 equipment verified, approximately only 8% of the equipment were maintained at least once in their lifetime whereas the remaining 92% of the equipment were not maintained even once during their lifetime.

- Total cumulative number of maintenances of all equipment that is maintained at least one time is more than 430.
- The average number of maintenances of all equipment from all sources is 3.

3.6 Hospital Purchased Equipment - Times of Maintenance Status by Services (Department)

Table 6 gives the times of maintenance of hospital purchased equipment by services; total number of maintenance and average number of maintenance).

Table 6: Hospital Purchased Equipment - Times of Maintenance Status by Services

Services/Department	Number of Equipment Available	No of Equipment with at least One Maintenance (>0)	Total Number of Maintenance of Equipment (>0)	Average Number of Maintenance
Anesthesia	166	9	13	1.4
Dental	112	3	3	1
Dermatology	10	0	0	0
Emergency	55	1	7	7
ENT	61	17	43	2.5
General Medicine	613	68	161	2.4
Laboratory	163	0	0	0
Oncology	36	1	6	6
Physiotherapy	30	3	3	1
Radiology	26	0	0	0
Store	123	0	0	0
Supporting Service	74	13	145	11.2
Surgery	235	17	49	2.9
Total	1,704	132	430	2.7

Observations:

- Equipment with at least one-time maintenances over the life span is 132.
- The cumulative maintenance of equipment that are maintained at least one time is more than 430.
- The average number of maintenances of the equipment that are maintained at least once equipment is more than 2.7.
- The verification found no maintenance record of equipment of Dermatology, Laboratory, Radiology and Store departments at all.

3.7 Age of Equipment

Table 7 below gives the average age of medical equipment in all services (department). Ages of equipment are categorized as less than 5, between 5-10, and more than 10 years old.

Table 7: Age of Equipment

Services / Department	Number of Equipment Available	Less than 5 Years Old (%)	Between 5 to 10 Years Old (%)	More than 10 Years Old (%)	Purchase Date not Available (%)
Anesthesia	166	28	12	13	47
Dental	112	16	3	0	81
Dermatology	10	20	0	0	80
Emergency	55	51	2	0	47
ENT	61	13	7	11	69
General Medicine	613	40	2	5	53
Laboratory	163	16	4	5	75

Oncology	36	11	3	0	86
Physiotherapy	30	17	0	0	80
Radiology	26	27	8	27	38
Store	123	67	0	0	33
Supporting Service	74	27	1	0	72
Surgery	235	25	7	8	60
Total	1,704	32	4	5	58
N		551	67	90	994

Observations:

- A total of 1,704 equipment in all departments are verified. 32% of all equipment across all services (departments) are under 5 years old.
- Similarly, 4% of equipment are aged between 5 to 10 years.
- 5% of all equipment are more than ten years old.
- At the time of verification 58% of all medical equipment's purchase date is not available.

3.8. Cost of Equipment

Table 8 below gives cost information of equipment with total and average cost of all equipment across all departments that have information available.

Table 8: Cost of Equipment

Services/Department	Number of Equipment Available	Equipment with Cost Information not Available (%)	Equipment with Cost Information Available (%)	Total Cost of all Equipment by Department (in Rs.)	Average Cost of Equipment by Department (in Rs.)
Anesthesia	166	49.4	50.6	2958255	35219
Dental	112	83	17	620456.5	32587
Dermatology	10	20	80	1354872	169359
Emergency	55	52.7	47.3	122348.5	4703
ENT	61	70.5	29.5	397725.5	22102
General Medicine	613	57.6	42.4	1572987	6052
Laboratory	163	76.7	23.3	3534250	93058
Oncology	36	83.3	16.7	4264877	709394
Physiotherapy	30	66.7	33.3	450798.8	45125
Radiology	26	42.3	57.7	16891472	1125948
Store	123	73.2	26.8	299510.9	9086
Supporting Service	74	74.3	25.7	421705.1	22174
Surgery	235	68.1	31.9	539073.3	7191
Total	1,704	64.1 (1093)	35.9 (661)	1909493	175538

Observations:

- Table above gives the percentage of equipment across all services (departments) with cost information. 1,704 equipment were verified of which 36% (N=661) of have associated cost information available. More than two-third (64%) of all equipment have no cost information available.
- Total cumulative cost of all equipment of all services (departments) is Rs. 175538 with an average maintenance cost by services (departments) Rs. 1909493
- No maintenance cost could be verified for lab Services.
- Only about one-third of total equipment has cost information available, enhancement of inventory management including recording is required for planning.

3.9 Date Purchased/Received vs. Date of Installation

Table 9 gives date information of equipment with date of purchase, date of installation or commissioning, and difference in duration of received/purchased and installation.

Table 9: Date Purchased/Received vs. Date of Installation-

Department	Number of Equipment Available with Installation Date	Both Received/Purchased Date and Installation Date Available		Either Purchased/Received Date or Installation Date Available	
		N	%	N	%
Anesthesia	166	88	53	78	47
Dental	112	21	19	91	81
Dermatology	10	2	20	8	80
Emergency	55	29	53	26	47
ENT	61	19	31	42	69
General Medicine	613	287	47	326	53
Laboratory	163	40	25	123	75
Oncology	36	5	14	31	86
Physiotherapy	30	6	20	24	80
Radiology	26	16	62	10	38
Store	123	83	67	40	33
Supporting Service	74	21	28	53	72
Surgery	235	93	40	142	60
Total	1,704	710	42	994	58

Observations:

- Only 42% % (N=710) of equipment across all departments has both purchased/received and installation/commissioned date.
- 58% of verified equipment do not have either purchased date or installation date.
- This is significant as it indicated no proper recording and documentation of date of purchase/received, and date of installation at all. Hospital Management needs to establish a system for inventory management with all associated variables such as source of received, date of purchase, date of commissioning/installation and so on. .

3.10 Availability of Installation Report and Warranty Period

Table 10 gives availability of installation report, agreement, and availability of warranty period of equipment across all departments.

Table 10: Installation Report and Warranty Period

Services/Department	Number of Equipment Available	Availability of Installation Report and Agreement (N &%)		Availability of Warranty Period (N &%)	
Anesthesia	166	2	1.2	4	2.4
Dental	112	0	0	0	0
Dermatology	10	0	0	0	0
Emergency	55	2	3.6	0	0
ENT	61	0	0	0	0
General Medicine	613	46	7.5	34	5.5
Laboratory	163	0	0	0	0
Oncology	36	0	0	0	0
Physiotherapy	30	0	0	0	0

Radiology	26	1	3.8	0	0
Store	123	0	0	0	0
Supporting Service	74	2	2.7	0	0
Surgery	235	4	1.7	2	.9
Total	1,704	57	3.3	40	2.3

Observations:

- Of 1,704 equipment verified, only 3.3% (N=57) equipment across all departments has availability of document on installation/agreement report while 2.3% (N=40) of all equipment has information on warranty period.

3.11 Maintenance of Equipment

Table 11 gives maintenance information of all equipment across all departments.

Table 11: Maintenance

Services/Department	Number of Equipment Available	Total Number of Maintenance	Equipment with at least 1 Time Maintenance	Average Number of Maintenance (among the equipment with at least one time maintenance)
Anesthesia	166	13	9	1.4
Dental	112	3	3	1
Dermatology	10	0	0	0
Emergency	55	7	1	7
ENT	61	43	17	2.5
General Medicine	613	161	63	2.6
Laboratory	163	0	0	-
Oncology	36	6	1	6
Physiotherapy	30	3	3	1
Radiology	26	0	0	-
Store	123	0	0	-
Supporting Service	74	145	13	11.2
Surgery	235	49	16	3.1
Total	1,704	430	126	3.4

Observations:

- Maintenance of only about 126 (7%) is done at least once during their life span
- 92.2% of all verified equipment (93%) have no records of maintenance.
- The average number of maintenance equipment that is maintained at least one time is 3.4.

3.12 Annual Contract, Comprehensive Contract and Maintenance Schedule

Table 12 gives the information on equipments by departments that have Annual Maintenance Contract, Comprehensive Maintenance Contract and Maintenance Schedule.

Table 12: Equipment Service Contract by Department

Services / Department	Number of Equipment Available	Equipment with Annual Contract (N &%)		Equipment with Comprehensive Contract (N &%)		Equipment having Maintenance Schedule (N &%)	
Anesthesia	166	1	1	11	6.6	1	0.6
Dental	112	0	0	7	6.3	0	0.0
Dermatology	10	0	0	1	10.0	0	0.0
Emergency	55	0	0	0	0.0	0	0.0
ENT	61	0	0	0	0.0	0	0.0
General Medicine	613	1	0	15	2.4	10	1.6
Laboratory	163	0	0	0	0.0	0	0.0
Oncology	36	0	0	0	0.0	0	0.0
Physiotherapy	30	0	0	0	0.0	0	0.0
Radiology	26	1	4	9	34.6	13	50.0
Store	123	0	0	0	0.0	0	0.0
Supporting Service	74	5	7	0	0.0	5	6.8
Surgery	235	0	0	3	1.3	0	0.0
Total	1,704	8	0.5	46	2.7	29	1.7

Observations:

- Less than one percent (0.5%) of equipment across all departments has annual maintenance contact, and only 2.7% has comprehensive maintenance.
- Scheduled maintenance of equipments is also 1.7% (N=29),
- Hospital Management needs to revisit on this scenario and work on whether suppliers are abiding AMC/CMC clauses of the contract, if AMC/CMC are not spelled out in the contract, should start including those.
- Hospital Management should also prepare maintenance schedules of the equipment particularly of capital equipments.

3.13 Availability of Infrastructure and Catalog/User Manual

Table 13 gives the information on availability of physical infrastructure to house the medical equipment, availability of catalog or user manual, logbook and average number of services provided by the equipments across the services/department.

Table 13: Availability of Infrastructure and Catalog/User Manual

Services/Department	Number of Equipment Available	Physical Infrastructure to Keep Equipment (N &%)		Catalog/User Manual (N &%)		Logbook Maintained (N &%)		Average Number of Services per Day
		N	%	N	%	N	%	
Anesthesia	166	162	98	146	88	18	11	17
Dental	112	104	93	11	10	3	3	14
Dermatology	10	10	100	2	20	8	80	0
Emergency	55	55	100	49	89	3	5	3
ENT	61	54	89	5	8	0	0	2
General Medicine	613	576	94	211	34	20	3	12
Laboratory	163	159	98	0	0	2	1	0
Oncology	36	26	72	26	72	9	25	3
Physiotherapy	30	30	100	25	83	2	7	3
Radiology	26	26	100	24	92	10	38	2
Store	123	0	0	0	0	0	0	0
Supporting Service	74	74	100	17	23	25	34	5
Surgery	235	223	95	129	55	2	1	0
Total	1,704	1,499	88	620	38.0	101	6.0	16

Observations:

- 88% of equipment (N=1,499) has infrastructure to keep equipment
- 38% of equipments (N= 620) has user manual/catalog available
- Logbook is maintained for 6% of equipments (N=101)
- About 16 services per day are provided by equipments across all departments.

3.14 Availability of Human Resource

Table 14 gives information on human resource availability to operate medical equipment and whether they have received user training or not.

Table 14: Availability of Human Resource

Services / Department	Number of Equipment Available	HR Availability (N &%)		Received User Training (N &%)	
		N	%	N	%
Anesthesia	166	162	98	4	2
Dental	112	106	95	39	35
Dermatology	10	10	100	0	0
Emergency	55	55	100	35	64
ENT	61	59	97	0	0
General Medicine	613	582	95	124	20
Laboratory	163	157	96	55	34
Oncology	36	22	61	2	6
Physiotherapy	30	29	97	0	0
Radiology	26	26	100	23	88
Store	123	0	0	0	0
Supporting Service	74	56	76	19	26
Surgery	235	227	97	33	14
Total	1,704	1,491	87	334	20.0

Observations:

- 87% of equipment has human resource to operate it.
- 20% of equipment (N=334), personnel operating those equipment has received user training.

4. FINDINGS FROM INTERACTION WITH HEAD OF DEPARTMENTS

4.1 Documents Availability with Departments of Bir Hospital

HODs, at the time of interaction/interview were also asked on the availability of different document associated with the medical equipments in the department. The summary of which as follows:

S/N	Description	Available with Department with Contact Person]	
		Number	Name
1	Installation Report	3	General OT - Medical store/Procurement ENT - Medical store Surgical Building – Medical store Hemodialysis - Shankar Bista
2	Warranty Agreement	1	Surgical Building – Medical store
3.	Record of number of services provided by the equipment	3	-General OT - Store- 9849743198; Olympus- 9802007894 - Radiology and Imaging - CT in-charge: Milie Kai. X-Ray/MRI: Neera Shrestha - Hemodialysis - Shankar Bista Medical OPD/Chest - Yubraj/Jiwan Kumar
4.	Separation of maintenance cost	1	Radiology and Imaging - 10% of total income of MRI is separated in CMC of MRI muchulka.
5	Physical infrastructure requirement for new equipment	8	Radiology and Imaging, ENT Head and Neck surgery, ICU-1, Dermatology, ICU-2, Gastro COVID Ward, Surgical building (1st floor), Liver unit

4.2 Different Needs of Departments

On different needs of the department, HODs suggested the following need:

S/N	Description	Need		No Need	
		Number	Name	Number	Name
1	Physical infrastructure requirement for new equipment	9	Medicine, Gynae/Obs, Physiotherapy, Surgery, Anesthesiology, Orthopedics, Engineering/Maintenance, Ophthalmology, Radiology,	6	Dental, ENT, Pediatrics, Neurosurgery, Emergency, Laboratory
2	HR requirement for the new equipment's operation	10	Dental, Orthopedics, Medicine, Gynae/Obs, Physiotherapy, Surgery, Anesthesiology, Laboratory, Radiology,	5	Ophthalmology, Neurosurgery, Emergency, ENT, Pediatrics,

			Engineering/Maintenance,		
3.	User training Requirement for equipment operation	12	Dental, Orthopedics, Medicine, ENT, Gynae/Obs, Pediatrics, Surgery, Anesthesiology, Laboratory, Emergency, Radiology, Engineering/Maintenance,	3	Pediatrics, Physiotherapy, Ophthalmology

4.3 Requirement of New and Additional Equipment

HoDs were asked whether the department require additional new equipment for patient care. Table below gives summary of new equipment requirement and benefits of having them.

S/N	Department	Need of New Equipments	Benefits
1	General OT	Autoclave machine; UPS Heave; OT Light; Emergency light; OT Table; Suction machine heavy; Portable OT light; Syringe pump; Infusion pump	Can provide quality care to the patient. Can increase the number of surgeries. Effective and Efficient service. Save time. Can perform the procedure smoothly and safely.
2	Emergency ER (Obs + Minor OT)	Wall suction; DC Shock; Patient bed; Refrigerator; CCTV; AC	Patient can get better and fast services and easy work environment for staff.
3	Radiology and Imaging	3T MRI-1; 512 slice CT; Digital X-Ray; Mammogram; Fluoroscopy; USG machine-4	Department will upgrade with many services. Patient gets immediate services.
4	ENT Head and Neck surgery	Surgical microscope; Stroboscope; Advanced ENT Treatment Unit	Enhance and upgrade current services. Introduce more advanced surgeries.
5	ICU-1	Portable USG and Echo	Patient gets on time and proper services.
6	Dermatology	Derma OT light and derma OT chair	Patient gets appropriate service on time.
7	Anesthesiology and Intensive care	ICU Ventilator; Anesthesia workstation. USG machine, etc. as per the list attached.	These could help in running of surgical ICU and operation theatres in the new surgical block of Bir hospital
8	ICU-2	Ventilator-3; ABG Machine-1; Portable fetus monitor-1; ECG machine-1; Ambuscope-1	Smoothly running the ICU ward. Patient can get the treatment.
9	Special OT	Flexible intubation bronchoscope for intubation. Portable ultrasound machine with intracranial Doppler,	The patient will receive quality service. The department will be able to run smoothly while providing

S/N	Department	Need of New Equipments	Benefits
		probe, cusa, plasma sterilization, endoasm, intra operative radiotherapy, C-arm/O-arm.	effective service to more patients.
10	CSSD	1 autoclave machine; 1 dishwasher	Instruments will be cleaner and properly washed. Autoclave machine will be given more time service than nowadays without maintenance.
11	Kidney transplant unit	Syringe pump (Helicaptor)	Patient takes quality service.
12	Dental	Dental chair (electrical) with compressor and suction. Dental lab setup. IOPA X-ray machine printer. Dental microscope.	We want to replace old non-functioning dental chair with new one. To provide fixed prostodontic service to the patient. To print IOPA X-ray. To provide endodontic service to patients.
13	Gastro COVID Ward	Syringe pump; Defibrillator; Infusion pump; Infusion pump stand; Portable X-ray; Portable monitor.	Such as time management. Quick treatment procedure. Reduce mobilization of patients.
14	ENT ward	Wall suction. Wall monitor.	Patient care will be so easy and qualitative care will be provided. Patient outcome will be improved.

4.4 Future Recommendation from Department Heads

HoDs were also requested suggestions for better medical equipment management in the hospital. Some of the key suggestions are HR Training, routine monitoring from Bio-Medical Engineer. The detail suggestions are summarized in the Table below:

S/N	Department	Suggestions for MOHP
1	General OT	Motivational training to staff. Observational visit to specific OT. Hazard allowance (e.g. C-arm exposure, chemical exposure, exposure to x-ray, and sero-positive case to OT staff. Requirement of AMC/CMC. Extra space for storage of equipment and instrument.
2	Female medical ward	Syringe pump, oxygen concentrator. Congested ward environment.
3	Emergency ER (Obs + Minor OT)	Congested area, bed, and insufficient bed. Poor visitor control.
4	Radiology and Imaging	Warranty, Installation and Maintenance documents are placed in store. Diagnostic services must be increased in early diagnosis and treatment of patients. Regular maintenance of equipment is needed. About 10% of department income must be separated for maintenance of equipment of that department.
6	ENT Head and Neck surgery	Human resource trainings (advanced academic, fellowships, e.g. Cochlear implant surgery). New advanced equipments and accessories. Periodical

S/N	Department	Suggestions for MOHP
		replacement of old equipments, instruments and accessories.
8	ICU-1	Regular round of Biomedical Engineer at least once a week or less. Wall suction is out of order with very minimum pressure, so they need to be replaced. Wall oxygen socket are broken and not replaced. Out of order equipment are occupying space, they need to be taken out.
11	Dermatology	Regular round of Biomedical Engineer at least once a week or less. Wall suction is out of order with very minimum pressure, so they need to be replaced. Wall oxygen socket are broken and not replaced. Out of order equipment are taking space, they need to be taken out.
12	Anesthesiology and Intensive care	mechanism for maintenance of equipment should be smooth, timely and easy for proper patient care. Recruitment of consultant anesthesiologist under government for the new surgical block. Special training for new equipment like perioperative echocardiography, bronchoscopy. Office secretary for smooth running of academic/administrative programs of department.
13	ICU-2	Well trained staffs. Monthly check the equipment by biomedical engineer and tag them when to be checked date.
14	Special OT	Provide specified equipment to the department. Provide training regarding the operation of special equipment to the staff. Provide relevant training on service and operation procedure (observation training, etc. to all the staff)
15	CSSD	Monitoring or weekly round is needed to check the equipment condition and to give the knowledge. New changes.
16	Kidney transplant unit	Monthly meeting of daily round to check the instruments according to the departments need.
17	Dental	We need space to accommodate minimum 15 dental chairs.
18	Gastro COVID Ward	Continuous professional development. Human resource must be added. In service training to be continued.
21	Male surgical cabin + VIP & VVIP Cabin	Orientation about uses and regular maintenance by Biomedical Engineer.
22	Hemodialysis	Portable USG machine. Lack of HR. Dialyzer reprocessing system should be started if HR available. All dialysis machines should be one door.
23	Nephrology ward and OPD	Fulfill the HR and supporting staff. Lack of trained staff. Lack of AMC/CMC, etc.
25	Physiotherapy	Proper rehabilitation service can be provided if space can be managed with rooms with mirror and closed room for laser therapy required,
26	Medical OPD/Chest.	Need more equipment and staff. Training needed for new equipment.
27	Liver unit	Purchase of new machine and regular maintenance of machine to keep up to date of regular services.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

There are a number of specific standards, guidelines and tools developed to address the need to improve and strengthen the government hospitals of Nepal. Some of them provide the infrastructure standards while others focus on specific technical competencies of the service providers. Minimum Service Standards for District Hospital has been developed to bring together all the previous standards, guidelines, tools, and other documents that are related to the quality of hospital services.

Medical Equipment Management (MEM) takes place within the context of human, material, structural, organizational, and financial resources. It is a process which helps hospitals to develop, monitor, and manage their equipment to promote the safe, effective, and economical use and maintenance of equipment. The hospital equipment management is a management cycle that starts from planning, procurement, acquisition, installation, commission, decommissioning and finally disposal of hospital equipment.

Despite of system is in place hospital equipment management is still in less priority in many hospitals in Nepal. In one of the previous studies by MoHP it was found that on an average 30-33% of the equipment is out-of-order. Almost 4% of the equipment was not commissioned in the facility. Moreover, 2-3% of the equipment was not verified in the health facility. The underlying reasons for the above data to exist were found to be lack of human resource to operate that equipment, lack of proper training for users as well as the technicians and lack of a proper inventory management.

5.2 Recommendations

- It is important to note that records of purchase/receipt, warranty period, AMC/CMC, availability of catalog and user manual were not available for most of the equipment at the verification. Hospital Management should review the stock work to make it user friendly, and initiate inventory practices. Procurement section and Store Section to lead in this process.
- Information flow between store and departments, hospital management and donor as well as hospital and government for better supply chain management of equipment.
- Hospital Management is suggested to perform equipment audit once a year.
- Keeping in lieu of unbundled equipment, immediate action to be taken to make operational. Out of order and equipment not in use are to be verified. If they are repairable, are to be repaired accordingly. In case of irreparable ones, Hospital Management Committee should initiate disposing.
- If the equipment is out of order due to unavailability of accessories and or associated parts, and if with valid warranty period, Hospital Management should follow up with the supplier for accessories.
- Keeping unbundled equipment for longer period of time gradually decreases life span of such equipment. It is suggested that Hospital Management mange resources to make such equipment operational.
- Only about 8% of all equipment has information on maintenance record. Proper recording system should be enhanced. Effective maintenance management of medical equipment is one of the major issues for quality of care, for providing cost-effective health services and for saving scarce resources. Hospital management is thus suggested in the decision-making in support of selection, purchase, repair, and maintenance of medical equipment, especially for capital equipment.
- While purchasing equipment, especially for capital equipment, to include AMC/CMC in the bidding document.

- Equipment that requires maintenance frequently, and maintenance cost is id high, Hospital Management should weigh on pros and cons of keeping such equipment or seek for new procurement,
- The healthcare system has become dependent on new technologies developed to facilitate patient care. Old and obsolete equipment are needed to be decommissioned and start for planning new acquisitions. In case of acquisition of new equipment with advanced technology, it is essential to assess the availability of physical infrastructure to house such equipment and train personnel responsible to operate such equipment.

ANNEX I: Study Tools

Tools will be made available upon request.

ANNEX II – LIST OF PARTICIPANTS

HoD Orientation

SN	Name	Designation	Organization
1	Dr. Prakash Bahadur Thapa	ENT Bir hospital	Bir Hospital
2	Dr. Shaili Pradhan	HOD	Bir Hospital
3	Dr. Saroj Sharma	HOD	Bir Hospital
4	Lok Bahadur Bohara	Under Secretary, Account	Bir Hospital
5	Dr. Pratibha Bisth	HOD Pathology	Bir Hospital
6	Dr. Rajani Hada	HOD Nephrology	Bir Hospital
7	Dr. Bibek Acharya	HOD oncology	Bir Hospital
8	Er. Amit K Chaudhary	Biomedical Eng.	Heal Group
9	Dr. Bhupendra Basnet	Sr. Consultant Gastro	Bir Hospital
10	Prof. Dr. Kiran Shrestha	Chief consultant	Bir Hospital
11	Yubraj Timalisina	Sr. AHW	Bir Hospital
12	Dr. Robin Bahadur Basnet	HOD Urology	Bir Hospital
13	Dr. Sunil Koirala	Sr. Neurologist	Bir Hospital
14	Baikuntha Prasad Luitel	Store In charge	Bir Hospital
15	Dr. B.B. Basnet	HODENT	Bir Hospital
16	Udhab Lal Singh	Report & Ninut Officer	Bir Hospital
17	Suni Shrestha	Logistic Officer	Bir Hospital
18	Nirmal Acharya	Lab Tech	Bir Hospital
19	Dr. Ritu Pradhan	HOD, Anesthesiology	Bir Hospital
20	Assoc. Prof. Dr. Anupama Karki	HOD, Derma	Bir Hospital
21	Bhagabati Thapaliya	N/O Procurement	Bir Hospital
22	Sagar Mishra	Under Secretary	Bir Hospital
23	Dr. Jeetendra Kaji Shrestha	Sr. Consultant	Bir Hospital
24	Dr. Saral Sharma	Medical Officer	Heal Group
25	Dr. Prabha Chapagain	Consultant physician	Bir Hospital
26	Er. Bhuwan Baral	Biomedical Eng.	Bir Hospital
27	Dr. Ajit Kharel	HOD, Gastro	Bir Hospital
28	Agnidhar Basnet	SAHW	Bir Hospital

Data Collection Team

- 1) M. Sangeeta Bhusal
- 2) Er. Amit Chaudhary
- 3) Dr. Manish Thapa
- 4) Dr. Saral Sharma
- 5) Ms. Bharati Shrestha
- 6) Ms. Kavita Gajurel
- 7) Ms. Ramila Chaulagai
- 8) Ms. Ramila Joshi
- 9) BE Sonu Shrestha

Facilitator/Resource Persons

SN	Name	Designation	Organization
1	Pro. Dr. Jageshwor Gautam	CAO	Bir Hospital
2	Dr. Ashesh Dhungana	Deputy Director	Bir Hospital
3	Dr. Nabin Pokharel	Deputy Director	Bir Hospital
4	Dr. Bikash Devkota	Secretary	Lumbini Province
5	Prof. Goma Devi Niraula	Chief Nursing Administrator	Bir Hospital
6	Sanubabu Adhikari	Under Secretary	MOHP
7.	Er. Sonu Shrestha	BME	HEAL
8	Dr. Padam Bdr. Chand	Lead	HEAL

ANNEX III – Photographs



Picture 1: Bir Hospital Deputy Director Dr. Ashesh Dhungana addressing the meeting



Picture 2: Dr. Bikash Devkota talking with Chief Administrative Officer - Dr. Jageshor Gautam



Picture 2 MoHP Under Secretary Sanu Babu Adhikari addressing orientation meeting.



Picture3: Data Collection Team of Bir Hospital



Picture 4: Data Collection team having review meeting



Picture5: Data collection team working on the equipment verification