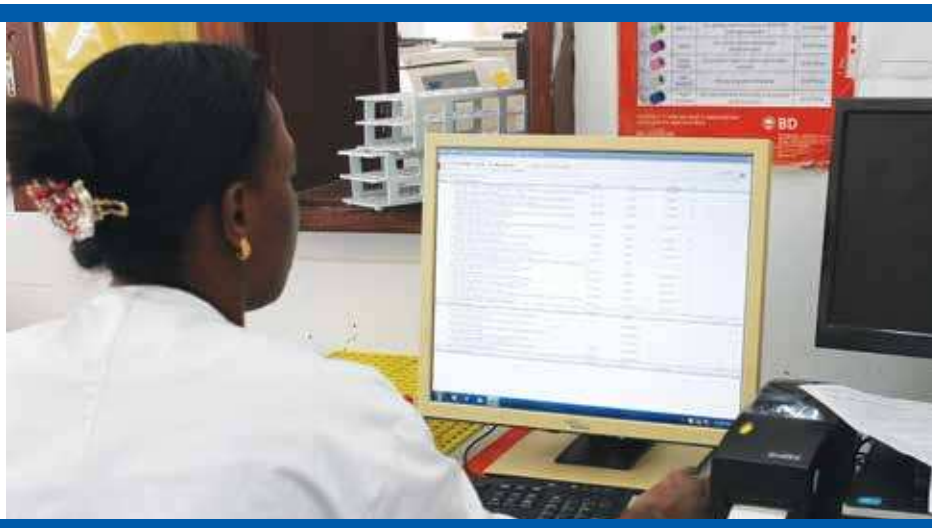
GOVERNMENT OF
THE UNITED REPUBLIC OF TANZANIA

Ministry of Health,
Community Development, Gender,
Elderly and Children

President Office – Regional
Administration and Local
Government

Guidelines and Standards for Integrated Health Facility Electronic Management Systems



Computerization of Health Facility Operations
Clinical, Administration & Financial

January, 2016

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FOREWORD

The Government of Tanzania's (GoT) mission is to facilitate the provision of quality and accessible health services efficiently. Despite the noticeable improvement towards this mission, the sector still faces several challenges. These include inadequate funding, rising health facility management costs, shortage of healthcare workers and inefficiencies in the use of available resources to adequately provide required health services. To overcome these challenges the government has implemented various reforms in the health sector.

Among the reforms, in the health sector, implemented by the government is the introduction of cost-sharing scheme an attempt to raise additional revenues from health facilities (HSSP III, 2009-2015). To achieve maximum benefit, the government needs to address at least two concerns emanating from this reform. The first concern is to ensure all genuine revenue is collected, recorded and reach relevant authority. To address this concern, the government should put in place implementable mechanisms for ensuring effective revenue collection. It is worth to note that the reform came to replace the old system where majority of health services were free for all and the new cost –sharing scheme came with some fee –waive components for some vulnerable groups. Thus, effective and efficient revenue collection under cost-sharing scheme requires review and re-engineering of Health facility business processes. The second concern is controlling expenditure and service delivery at the health facilities. All of these require re-engineering of Health facility business processes in order to increase net income and reduce the impact of shortage of funds in delivering accessible, efficient and quality health care services.

Parallel to re-engineering Health facility business processes, automation of well-defined Health facility business process is vital for improving management of scarce resources, reducing workload and increasing productivity. To achieve best results of controlling health resources, the automated system must be able to capture process and disseminate relevant information across all functional units within a health facility and possibly from health facilities to both ministries. This necessitates the need to have an integrated Health Facility electronic Management Systems (iHFeMS) that implements the re-engineered Health facility business processes in order to facilitate effective and efficient health resource (include drugs, financial and human capital) management. This is in line with the strategic objective 4 (SO4) of the national eHealth Strategy (2013-2018), which focuses on the use of information technology on financial and resource management.

If iHFeMS is well implemented it can improve the quality of Health Facility operations while enhancing revenue collection, management of medicines and other medical supplies. The iHFeMS can also enable patient tracking to increase productivity of inpatient allocation and provide effective administration and control. The iHFeMS supports integration between functions for smooth patient movement within various services. To ensure successful implementation and use of the iHFeMS, a national guideline is fundamental. The iHFeMS implementation guideline for Tanzania aims to provide guidance for development of iHFeMS and set an environment for successful implementation and use of the iHFeMS. It is a directional document that describes minimum requirements, standards and guidelines for successful implementation and use of the iHFeMS in Tanzania's private and public Health facilities. This document builds on the feasibility study, which was carried out to assess the feasibility of implementing Health facility management system in Tanzanian Health facility setting. It is a product of consistent work carried out by the ICT Department of the Ministry of Health,

Community Development, Gender, Elderly and Children with inputs from stakeholders through a participatory process.

The adoption of this guideline will improve the ongoing reforms in Tanzanian Health facility setting. In addition, this guideline will address some of the key challenges experienced by health facilities implementing Health facility management systems and other related electronic systems that include a lack of proper governance, diverse scope of functionalities, and lack of standards hampering data exchange and information sharing.

The iHFeMS implementation guideline is applauded as a useful guide to the next steps for Tanzania in its eHealth journey. The document is easy to understand and therefore will help to lead Tanzania towards providing quality healthcare by making management of Health facility more efficient and more effective.

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ACRONYMS

BPR	Business Processes Re-Engineering
DHIS2	District Health Information Software version 2
ELMIS	Electronic Logistic Management Information Systems
ERP	Enterprise Resource planning
GoT	Government of Tanzania
HL7	Health Level 7
HMIS	Health Management Information System
HQ	Headquarters
ICD	International Classification of Diseases
ICT	Information and Communication Technology
iHFeMS	Integrated Health Facility Electronic Management Systems
JSI	John Snow Inc.
LAN	Local Area Network
LMIS	Logistics Management Information System
MCSP	Maternal Child Survival Programme
M&E	Monitoring and Evaluation
NeHSC	National eHealth Steering Committee
PACS	Picture Archiving and Communication System
PO-RALG	Presidents' Office Regional Administration and Local Government
QRDA	Quality Reporting Document Architecture
SDMX-HD	Statistical Data and Metadata Exchange - Health Domain
SDP	Service Delivery Point
SDP	System Development Plan
SMS	Short Message System

SNOMED CT	Systematized Nomenclature of Medicine - Clinical Terms
SO	Strategic Objective
SOMD	System Operation Maintenance Document
SOP	Standard Operating Procedure
SRS	System Requirements Specification
TZ	Tanzania
USAID	United States Agency for International Development
WHO	World Health Organization

TECHNICAL GLOSSARY

Term	Definition
A functional requirement	A requirement that describes in details the programmatic or project needs and/or requested behavior of a system or component. It specifies what the finished system or component is expected to do and how a user will interact with it.
A non-functional requirement	A requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviors
Business process reengineering (BPR)	A business management strategy focusing on the analysis and design of workflows and business processes within an organization.
Electronic medical record (EMR)	An electronic record of health-related information on an individual that can be created, gathered, managed, and consulted by authorized clinicians and staff within one health care organization.
Health Facility	Refers to Dispensary, Health Center, Hospital, Clinic etc.
Health Level 7 (HL7)	A flexible standard by which various health care systems can communicate with each other; it is typically used for transmission of patient level data.
Integrated Health Facility Electronic Management System (iHFeMS)	A single system or collection of integrated systems that automate both clinical and administrative processes in the health facility settings.
International Classification of Diseases (ICD)	A statistical classification system used to assign diagnostic and procedural codes in order to produce coded data for statistical analysis, epidemiology, reimbursement and resource allocation.
Interoperability	Ability for a system to securely communicate and exchange data in an accurate, reliable, and meaningful way with another information system so that the clinical or operational purpose and meaning of the data are preserved and unaltered.
Management information system (MIS)	A computer-based system that provides managers with the tools to organize, evaluate and efficiently manage departments within an organization.
Quality Reporting Document Architecture (QRDA)	A standard for communicating health care quality data. It is developed on the Health Level 7 Clinical Document Architecture model.
Statistical Data and Metadata Exchange - Health Domain (SDMX-HD)	A data exchange format developed by WHO, to facilitate exchange of indicator definitions and data in aggregate data systems.
Systematized Nomenclature of Medicine - Clinical Terms (SNOMED CT)	A clinical terminology designed to capture and represent patient data for clinical purposes

ACKNOWLEDGEMENT

The realization of this document has been possible through tremendous effort and commitment of several individuals, organizations, and partners who contributed to the development of this guidelines and standards document.

This document has been developed in two phases. The first phase involved a participatory process that was spearheaded by independent consultants appointed by the Ministry of Health, Community Development, Gender, Elderly and Children. They conducted a feasibility study, a process that produced a draft on Guideline and Standards. To each of the contributors to the draft document, as well as to those who assisted and supported them, we send our profound appreciation. They held several meetings and numerous informal sessions but also conducted technical consultations.

The second phase of developing the Guidelines and Standards for iHFeMS development also involved a participatory process, which was carried out with extensive input from stakeholders through workshops, discussion groups, interviews, review of the several government documents from eGA, and other surveys. The Ministry of Health, Community Development, Gender, Elderly and Children wishes to thank all those who were involved in one way or another in this second phase of development, including USAID, MCSP/JSI and other development partners for their financial support.

Representative participation of the Council and Regional Health Management Teams, President's Office – Regional Administration and Local Government (PO-RALG), eGovernment Agency (eGA), President's Office Public Service Management (POPSM), faith based and the private sector significantly enhanced the ownership of this document.

Special thanks to the National eHealth Steering Committee (NeHSC) particularly Chairman Dr. Hassan Mshinda and Vice-Chairman Mr. Hiiti Sillo for their sincere encouragement and follow-up on eHealth issues, as well as stakeholders who participated in the workshops and contributed ideas that contributed to the successful completion of this document.

Staff of Ministry of Health, Community Development, Gender, Elderly and Children worked with vigor to make sure that the Ministry finalizes this important document, the Guideline and Standards for Integrated Health Facility Electronic Management System. All contributions and efforts are highly appreciated. Preparation of this document was constantly guided by NeHSC and included participation from the Government and Non-Government stakeholders, and I would like to thank them for this commitment, which I expect to continue in the subsequent implementation stage.

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EXECUTIVE SUMMARY

The Integrated Health Facility Electronic Management System (iHFeMS) document describes minimum requirements, standards and guidelines for successful implementation and use of the iHFeMS in Tanzania private and public Health facilities. It also describes the leadership and governance structure, centered on the National eHealth Steering Committee (NeHSC) that will help ensure the timely implementation of eHealth initiatives.

The iHFeMS guideline intends to address challenges eye-marked by the feasibility study which among other things examined the challenges faced by existing health facility management systems in the Tanzanian landscape. The study revealed that implementation of the existing systems suffered a number of challenges such as lack of proper governance, diverse scope of functionalities, and lack of standards hampering data exchange and information sharing.

The iHFeMS guideline document is an important component of the strategic objective number two (SO2) implementation of the National eHealth Strategy, which seeks to establish nationally, adopted standards, rules, and protocols to enable the implementation of affordable, cost-effective, and accessible technology that complies with these standards.

The document has been developed through a participatory process, carried out with inputs from stakeholders through focused group discussions, interviews, and with extensive review of the iHFeMS feasibility study report.

Vision of the iHFeMS Initiative

The Ministry of Health, Community Development, Gender, Elderly and Children envisions an integrated national health information system (HIS) that has, as its components, the iHFeMS that support provision of quality healthcare by making management of Health Facility more efficient and effective.

Requirements and Standards

The document stipulates the minimum requirements and standards the iHFeMS must meet to ensure that it creates the value and the utility to its stakeholders. The requirements include both the following:

Functional Requirements

Functional requirements capture the intended behavior of the iHFeMS expressed as services, tasks or functions the system is required to perform. At minimum the iHFeMS should cover the following functional requirements areas: Patient Care Management, Laboratory, Billing, Pharmacy and Inventory, Medical Record Management, Human Resource Management, Financial Management and Management Information System (dashboard).

Non-Functional Requirements

Non-functional requirements define the overall qualities or attributes of the iHFeMS that place restrictions or conditions on the development process, and specify external constraints that the system must meet such as usability, access security, availability, efficiency, integrity, reliability, and scalability.

Standards

It is required that the iHFeMS be able to share and exchange information with other system in the health sector. This can be achieved through creation, acceptance and implementation of clinical data standards such as Health Level 7 (HL7) and coding standard such as the International Classification of Diseases (ICD).

Computing Infrastructure Requirements

The computing infrastructure will support the hosting of applications and provide communication and system platforms for users to access and use the system. They include the data center (server room), network and Internet connectivity, workstations, and computer-training laboratory.

Human Resource Requirements

Successful iHFeMS implementation requires a mix of the right people with minimum competencies as key role players in the system implementation and operational processes. Taking into consideration the complexities of Health facility setting, involving precarious situations of serving lives, to ensuring that the iHFeMS is functional 24/7, there should be a good mix of the following cadres to support its operation: IT System Analysts, System/Network Administrator, ICT support technician and Data/ Medical Record Clerks.

Implementing iHFeMS

Coupled with the minimum requirements and standards that the iHFeMS must meet, in order to ensure successful implementation and use of the iHFeMS in a Health facility, the following activities grouped into three main phases should be adhered on to: planning, deployment, and maintenance and support.

Planning

The implementation of the iHFeMS requires careful planning to ensure that the implementation proceeds in comprehensive, cost-effective and timely ways. This involves a range of activities including establishment of the governance structure, budgeting, development of the implementation work plan, acquiring the iHFeMS software, readiness assessment and procurement of the required computing infrastructure.

Budgeting

Implementation of iHFeMS is a complex and challenging task. One obstacle to successful implementation can be the cost of converting to an electronic system when insufficient health care funding has been budgeted. It is essential that Health facility management and stakeholders involved in planning for iHFeMS implementation understand what funding is available and develop a timeframe for funding in conjunction with timetables for implementation.

Deployment

Deployment of the iHFeMS includes the following activities: installation of the computing infrastructure, installation and configuration of the iHFeMS software, iHFeMS software acceptance testing, and training. Most importantly the training should include the following: basic computer training, iHFeMS software end user training, network and system administrators training and ICT governance training for managers.

Maintenance and Support

Maintenance and support of the iHFeMS system operations is an essential ingredient in making iHFeMS adoption successful and thus achieve the intended organizational goals. For all users to efficiently and effectively use iHFeMS properly plan should be devised and operationalized which should include maintenance of the computing infrastructure and the iHFeMS system, continuous end user training and support, disaster preparedness and recovery plan, regular assessment of system usage, modifications and enhancements of the system and IT infrastructure.

Monitoring and Evaluation

As part of iHFeMS implementation, it is necessary to track and evaluate the implementation and functioning of the system, to understand how well the implementation activities have been met and the effect of the new system in the Health facility operations.

This document, *Guidelines and Standards for Integrated Health Facility Electronic Management System* is organized in four parts, A, B, C and D. In this, **Part A,** Background and Vision, we have explained the motivation of the work, described the challenges experienced by the healthcare systems, described the vision of the iHFeMS initiative, the purpose of the document, and the target audience. The rest of the document is organized as follows.

Part B presents the business process analysis and improvement.

Part C presents the requirements and standards for the iHFeMS. This part consists of Chapter 2 and Chapter 3.

Chapter 2 Outlines the minimum set of requirements that must be met by the iHFeMS for it to have value and utility to its stakeholders. These include both functional and non-functional requirements. Also Chapter 2 Describes the minimum set of standards that must be supported by the iHFeMS to ensure that iHFeMS is interoperable with other systems within the integrated national HIS and therefore can share and exchange information.

Chapter 3 Outlines the necessary set of computing infrastructure and human resource requirements that must be available to provide conducive environment for the iHFeMS implementation in the Health facility.

Part D provides a set of guidelines for successful implementation and use of the iHFeMS. This part consists of **Chapter 4**. This Chapter outlines a set of guidelines related to planning, installation, and maintenance and support phases of the iHFeMS implementation. Included in this Part is **Chapter 5**: Monitoring and Evaluation, **Chapter 6**: iHFeMS Implementation Closure and Signoff, and **Chapter 7**: Guidelines for Accessing Compliance of iHFeMS

Chapter
ONE

BACKGROUND AND VISION

1.1 Background

The Ministry recognizes the potential of information and communication technology (ICT) in transforming healthcare delivery by enabling information access and supporting healthcare operations, management, and decision-making. In response to this the National eHealth Strategy was formulated to guide such a transformation. One of the key areas targeted for transformation is the use of ICT to make health facilities more effective and efficient. This necessitates the need to have an integrated Health Facility Electronic Management System (iHFeMS) that implements the re-engineered Health facility business processes in order to make Health facility become effective and efficient.

The feasibility study revealed that efforts to computerize various clinical and administrative functions have been noticeable in some health facilities in Tanzania. While there is significant improvement in management of health resources, the degree of success on automation has been varying significantly, with some obtaining poor results. However, few challenges were observed as follows.

Inadequate governance:

The study revealed inadequate governance in implemented information systems for Health facility business processes. Acquisitions, deployment, operationalization of many existing systems were handed in ad-hoc way resulting in either insufficient utilization or poor performance.

Diverse scope of functionalities:

The study revealed diverse scope of functionalities being implemented by Health facility. Existing information systems cater for fragmented functionalities relative to a range of activities in a typical Health facility setting. There is neither criterion for establishing functionalities of high priority for automation nor established minimum set of requirements for the same. Thus, data sharing among these information systems is difficult.

Inadequate standards:

Standards are essential for ensuring interoperability. The feasibility study revealed that many information systems were implemented without focus on standards. Thus, facilitation of information exchange between two or more different systems is a challenging exercise.

One possible approach to addressing the above mentioned challenges that is well acknowledged is to establish a national-driven iHFeMS implementation framework that constitute (i) a minimum set of requirements that the iHFeMS must meet to provide the value and utility to the stakeholders, (ii) a minimum set of standards that the iHFeMS system must support to ensure interoperability and therefore information exchange and sharing between eHealth systems, and (iii) a set of guidelines that must be followed for successful implementation of the iHFeMS. In response to this, the Ministry has developed the requirements, standards and implementation guidelines for Integrated Health Facility Electronic Management System.

1.2 Vision of the iHFeMS Initiative

The Ministry of Health, Community Development, Gender, Elderly and Children (Ministry of Health, Community Development, Gender, Elderly and Children) envision an integrated national health information system (HIS) that has, as its components, the iHFeMS that support provision of quality healthcare by making management of Health facility more efficient and effective. Central to this vision is the need to have systems that can:

- Streamline the medical / administration work flow
- Provide seamless integration between functions for smooth patient movement within various services
- Improve availability of medicines and other medical supplies
- Enable patient tracking to increase productivity of inpatient allocation
- Ensure instant patient billing
- Provide real-time management and accounting report
- Provide effective administration and general control

1.3 Purpose of the document

This document provides requirements, standards and guidelines for effective implementation of iHFeMS. The requirements, standards and guidelines have been drawn from both the stakeholders and references to local and international documents including:

- Tanzanian National eHealth Strategy 2013-2018
- Health Sector Strategic Plan III and successor Health Sector Strategic Plan IV
- Comprehensive Health Facility Operation Plan
- Report of the Feasibility Study on the implementation of the Integrated Health Facility Electronic Management System
- WHO eHealth Development Toolkit
- National ICT Policy 2003
- Tanzania eGovernment Strategy 2013
- EGovernment related Standards and Guidelines
- Guide for Appropriate, Proper and Safe Use of ICT in the Government, second edition 2015

1.4 Audience

This document is intended for the following audiences:

- Public and private health facilities which are considering to procure, adapt, or install iHFeMS
- Health facilities which currently use electronic systems
- Public and Private Software development Institutions
- Healthcare managers and policy makers
- All other healthcare stakeholders

Chapter
TWO

HEALTH FACILITY BUSINESS PROCESS REENGINEERING

Health facility business process reengineering involves critical analysis and redesign of workflows and work practices of existing business processes within the Health facility setting in order to maximize the value of the computerization process.

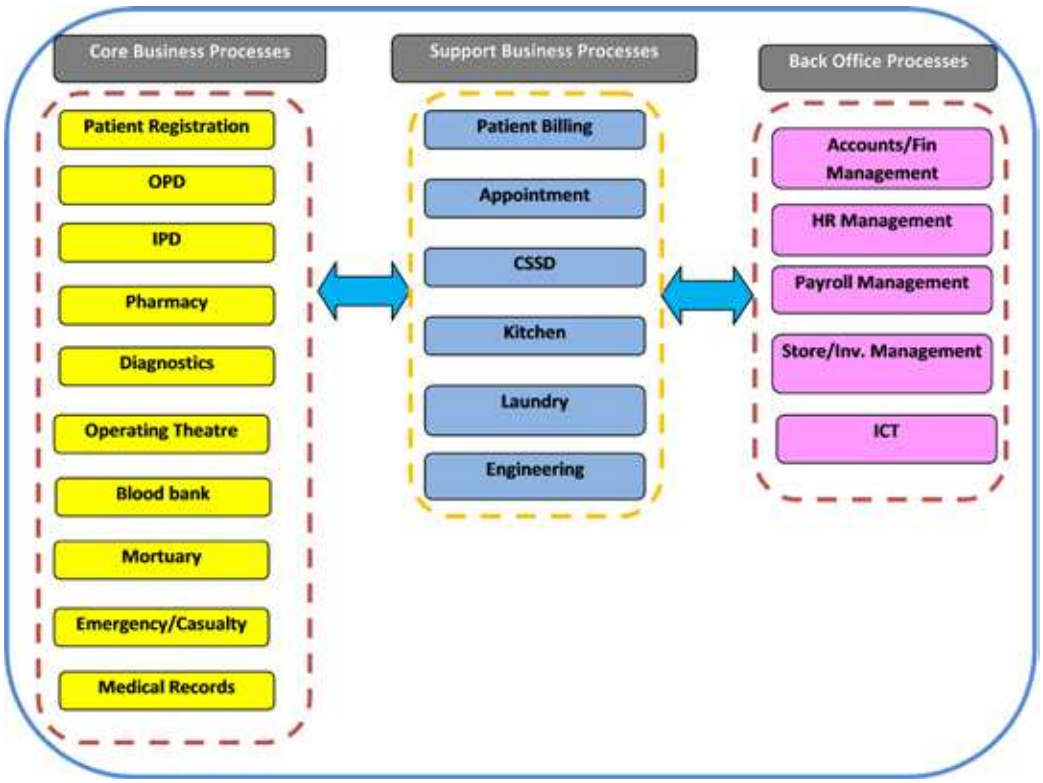

Figure 1: Health facility Business Process Framework

Figure 1: Presents an overview of the Health facility business processes framework, which includes business processes classified as core processes, support processes and back office processes. The framework presents a high level representation of how a typical Health facility operates. This section provides guidelines and procedures for process improvement, and process map (flow of activities) for each business process to be supported by iHFeMS.

Objective

To provide guidelines and procedures for business process analysis and improvement in order to help health facilities rethink and improve their business processes

Scope

All functional areas in the Health facility shall use the guidelines and procedures during acquisition of new iHFeMS or reviewing and enhancing an existing Health facility management system.

General Standard Guidelines

SG1. Health facilities shall perform business process analysis and improvement based on the national guidelines and standards

SG2. The business process analysis and improvement should be done alongside with iHFeMS system requirement specifications (SRS) gathering exercise.

SG3. The SRS shall be developed by the health facility owner and should comply with minimum requirements provided in chapter 3.

SG4. The SRS shall include both functional requirements and non-functional requirements and shall be approved by the Health facility steering committee

2. Patient Care Management

Patient care management processes is one of the core business processes of the Health facility in the framework (Figure 1). Major processes that need improvements within the patient care management in the Health facility include registration, admission, laboratory, radiology, discharge and appointment scheduling.

2.1 Patient Registration

Patient registration process involves activities such as capturing of accurate demographic details for new patients, updating of the information for follow up patients, creating correct clinical patient record depending on the nature of health problem and deciding on the required mechanism of payment of bills. Refer Figure 2.

Standard Guidelines for process improvement

SG1. Integrate patient registration and verification activities to be performed at the same center to avoid multiple patient queues.

SG2. Eliminate corridor/unregistered patients from being attended by clinicians by providing integration and information sharing between registration and consultation.

SG3. Adapt patient registration flow as shown in figure 2 below.

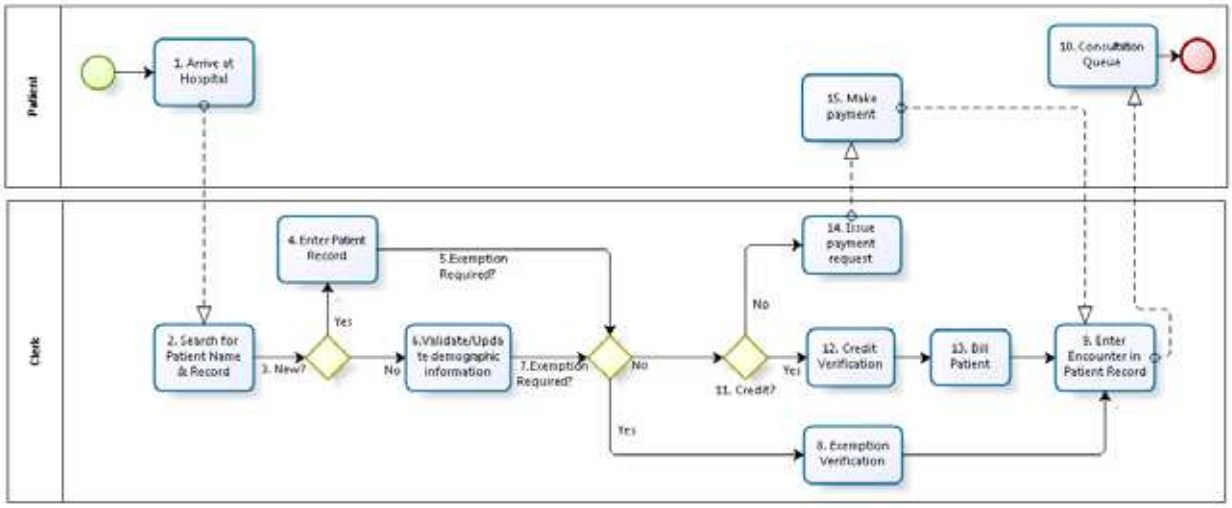

Figure 2: Patient Registration Process Map

Procedures

At minimum patient registration process should have the following procedures:-

P1. Patients arrive to the Health facility reception for verification. The clerk checks the patient registration (new or existing)

P2. Identify whether the patient has an existing record or is a first-time user.

P3. *Enter patient record*. Create a patient record in the system for new patients. Record demographic information with proof of identification.

P4. *Existing patient*. Search and retrieve patient record through identifying information collected. A search needs to be done first on all patients in order to avoid duplicates.

P5. *Validate/update demographic information.* Display patient information that can be edited for updates so the clerk can verify identification of patient.

P6. *Exemption required.* Identify whether the patient is entitled for exemption.

P7. *Exemption verification*. Verify to determine whether the patient is exempted or not.

P8. *Credit patient.* Check whether, the patient is a credit or a cash client.

P9. *Credit verification.* For credit patient, the clerk will verify and register the patient, and provide patient with a form to be filled at each step of service provision. Insured parties, the patient and doctor, will sign claim form the insurance card will be kept by the clerk and provided to the patient at the end of services.

P10. *Issue payment request.* For cash patient, the clerk will provide cost of all services and provide payment sheet to patient for settlement.

P11. *Bill patient.* For credit patient, clerk will prepare bill for each service provided

P12. *Make payment.* The cash patient will settle the payment to the revenue collector

P13. *Enter encounter to patient record.* Document current encounter to create record of the visit.

P14. *Consultation queue.* Nurse will assign order according to the prioritization process based on time of arrival. Wait for clinician to conduct consultation.

2.2 Admission process

The admission process consists of various functions required to receive a patient at the Health facility. The purpose of the process is to obtain required information, and determine patient care needs. A patient can be received at various departments or units in the Health facility such as at the Emergency, or inpatient. Nurses will register the patient in the registration books or check from the computer if the patient is already registered in the specific ward. Refer Figure 3.

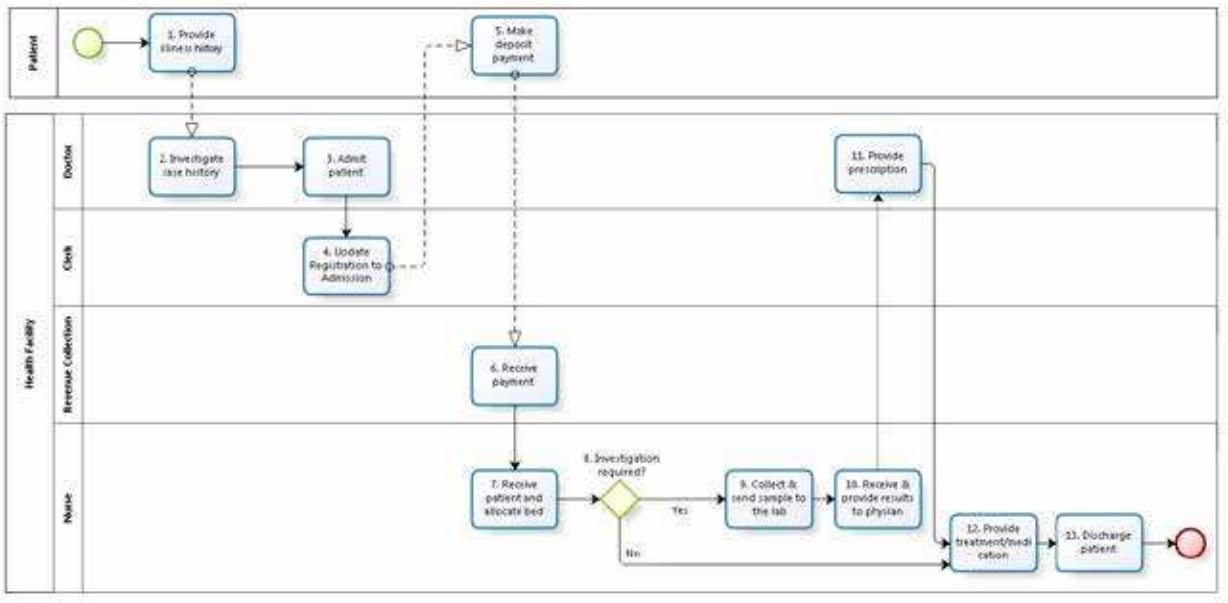

Figure 3: Admission Process Map

Procedures

In order to improve patient admission process the following procedures should followed:-

P1. Provide illness history. Patient meets the doctor; provide a detailed history of his/her illness.

P2. Admit patient. In case of admission, the patient is given the admission date and admission form is filled for further formalities

P3. Update registration to admission. Before admission, the patient is registered as admission and is counseled/clearly informed by the clerk regarding the treatment package, which includes estimated bill size, average length of stay and various mode of payment accepted.

P4. Investigate case history. A Doctor record detailed medical history background, observes the vital signs and requests various investigations depending on the condition to determine diagnosis. Doctor receives the results and plan for treatment. Also, decision is made based on the findings. Patient may be instructed to take appointment and continue with treatment as outpatient.

P5. Make deposit payment. Cash patient are required to make deposit payment on the estimated cost established by the Health facility policy. Otherwise for insurance or credit patient, the clerk issue bills for the service rendered and claim forms are filled properly.

P6. Receive payment. Revenue collector receives the payment and issue receipt to the patient.

P7. Receive patient and allocate bed. When the patient arrives at the ward, a nurse receives the patient and allocated him/her a bed. The patient is then attended by the clinician on duty, which involves taking/reviewing the detailed medical history and order the appropriate tests.

P8. Perform the required investigation/test. Investigation/tests are performed and included in the bill properly

P9. Billing notification required? The ward nurse liaises with billing section to get the cost and inform the relatives to pay. In some Health facility investigation bills are issued after service delivery.

P10. Receive and provide the test result to the physician/clinician.

P11. Provide treatment/administer medication. The doctor receives tests results, plans the medication to be administered to the patient. Nurse receives medication plans from the doctor for execution.

P12. Recovery and Discharge. After recovery patient is handed over with detailed discharge summary, which includes doctor's advice for further follow-up treatment and medical description. However, patient must settle the outstanding bills/charges before being handed the discharge summary. The doctor may give appointment for follow-up and that will be verified at outpatient clinic.

2.3 Diagnostics Processes

Diagnostics services (laboratory and radiology) have an important role in the provision of health care services. The activities of the laboratory process include: receiving test orders from clinicians, specimen collection, specimen identification, preparation and transport, analysis, result reporting and interpretation. The activities of the radiology process include: receiving patient who need a test, perform the test, analysis, result reporting and interpretation.

Standard Guidelines for process improvement

SG1. The laboratory and radiology machines should be integrated with iHFeMS such that only already billed or paid for samples and tests appear on the machine software for testing. This ensures that Laboratory technicians attend to the only billed or paid for samples and tests. The integration will remove the loopholes and increase revenue to the Health facility.

SG2. The laboratory/radiology technician should be given an option in the iHFeMS to disable temporarily all the tests, which may not be available due to reasons such as no reagents, machines out of order or under maintenance. This will alert the revenue clerk through warning messages.

SG3. Mechanism should enable Clinician to track progress status of samples/investigations sent to the laboratory or radiology section.

Procedures for Laboratory Process

In order to improve laboratory process the following procedures should followed:-

P1. *Order /sample booking.* The order booking process begins with a request for investigations by doctors. Patients' information and test requests are recorded in request forms and passed on to phlebotomists to collect samples from patients.

P2. *Billing and Payment.* The request forms are sent to cashiers for payment or billing for the requested tests before proceeds for laboratory process.

P3. *Sample/specimen collection.* The activity of collecting booked samples from different booking sources should be done by nurses.

P4. *Sample receiving and acceptance.* This is a process where samples are received and accepted for all orders released. The process involves the laboratory technician to check samples are qualified to process. A list of sample orders with the order number, date, time and the patient details verified and recorded.

P5. *Rejection of Samples.* The samples, which are not qualified, are rejected and request forms are returned back to the source. Reasons for rejections may be wrong container, clotted, expired etc

P6. *Results reporting.* The samples qualified are processed. The Laboratory Technician reports the findings for the processed tests.

P7. *Results approval and delivery.* Approval of the test results and authorizing for delivery of the report to the patient or the ward/clinic or outside agencies in case some reports belong to the outside agencies.

Procedures for Radiology Process

In order to improve radiology process the following procedures should followed:-

P1. Order of Investigation. A clinician may request an order or fill a form indicating queried diagnosis, symptoms and required radiological test, while booking of test is done depending on the nature of test.

P2. Billing and payment of test. On the date of test the request form is passed to finance section for billing or payments depending on the patient's category.

P3. Conducting Test. The test is performed after payment for cash paying patients or billing process for those under Insurance/credit companies.

P4. Reporting. Reports are forwarded back to the clinic through patients or relative after reported and verified by technician or radiologist.

2.4 Scheduling Appointment

The appointment scheduling process allows health worker to make patient appointment with preferred date and time to obviate the necessity to sit in queues and wait for consultation. The patient contacts the Health facility by agreed means of communication; say by telephone, personal contact, email etc., and books an advance appointment with the choice doctor/department on a given date and given slot of time. The consulting doctor also would have the idea of the load on a given day in the Health facility. Having a different person scheduling the next appointment date for follow up patients may distort the planned treatment of the doctor. Medical records of the patients visiting the Health facility will have to be maintained and updated. Hence the file is handled to and from the consulting room and the medical records Department.

Guidelines for process improvement

SG1. A doctor through the iHFeMS must make proper decision of the required dates for the requested appointment.

SG2. Referral protocol should be adhered.

Procedures

To ensure proper allocation and management of appointment based on the condition of the patient the following procedures should followed:-

P1. *Doctor issue appointment date.* After Consultation/treatment clinician provides the tentative time for patient to revisit the Health facility. Also the doctor may transfer the patient to another clinic based on the case of the patient.

P2. *Clerk verifies the appointment.* Patient submits the card to records clerk where the exactly date and time is issued as per system.

P3. *Scheduled date not available.* If the date preferred by clinician is not available, the clerk should look for the nearest available date. Clerk allocates the patient to a clinic, doctor and time.

P4. *Records clerk issue appointment slip.* Clerk issues the printed slip to the patient indicating the date, time and clinic or clinician for next visit.

P5. *Instruction on appointment.* Health records clerk inform the patient clearly on timely reporting and avoid missing of the scheduled date.

2.5 Pharmacy and Inventory Management Process

In Health facility settings stores and inventory are commonly categorized into general and pharmacy store. The activities performed at the pharmacy store include acquisition, control, management, tracking and dispensing of medicine and medical supplies. Whereas the activities related to the general store involves acquisition, control, management, and tracking of non-medical goods. While both stores are very important, this guideline document focused on the analysis and improvement of pharmacy store. This is because the pharmacy store is an essential and extensively used facility in the Health facility and in the health sector in general. It caters to outpatients, inpatients, and other treatment areas like operation theatre and clinical laboratory. Therefore the pharmacy store must efficiently be managed and organized to meet patient medication needs and comply with applicable laws and regulations and control medications throughout the Health facility.

Standard Guidelines for process improvement:

SG1. Integrate with MSD through eLMIS: The purpose of integrating with eLMIS is to make sure that the medical supplies are traced from MSD to the consumer, and the Health facility balance allocated by the government is known.

SG2. Introduce sub stores: The purpose of introducing sub stores, in regional referral, zonal referral and national Health facility, is two folds: (i) to reduce and control theft of medical supplies at the dispensing point by reducing amount of medical supplies. (ii) To reduce the complexity of managing main stores.

SG2. Automation of stock management: Facilities requires automation of stock management at various levels, the main store, sub store, and the despising point using the iHFeMS.

Following the introduction of the sub store section, the pharmacy and inventory business processes can be grouped into three main business processes: (i) Central inventory management process which includes activities ranging from requisition of medical supplies from MSD and other suppliers, receiving, storage, and management (ii) Distribution process which includes activities for receiving request from the main store, and dispatch to, dispensing point, (iii) Dispensing process that includes activities for delivering medicine to a patient. The process and the descriptions of the activities that reflect recommended improvements are discussed.

2.6 Main pharmacy management process

The central pharmacy management process activities include requisition, purchasing, receiving, checking and storing of medical supplies. Refer to Figure 4.

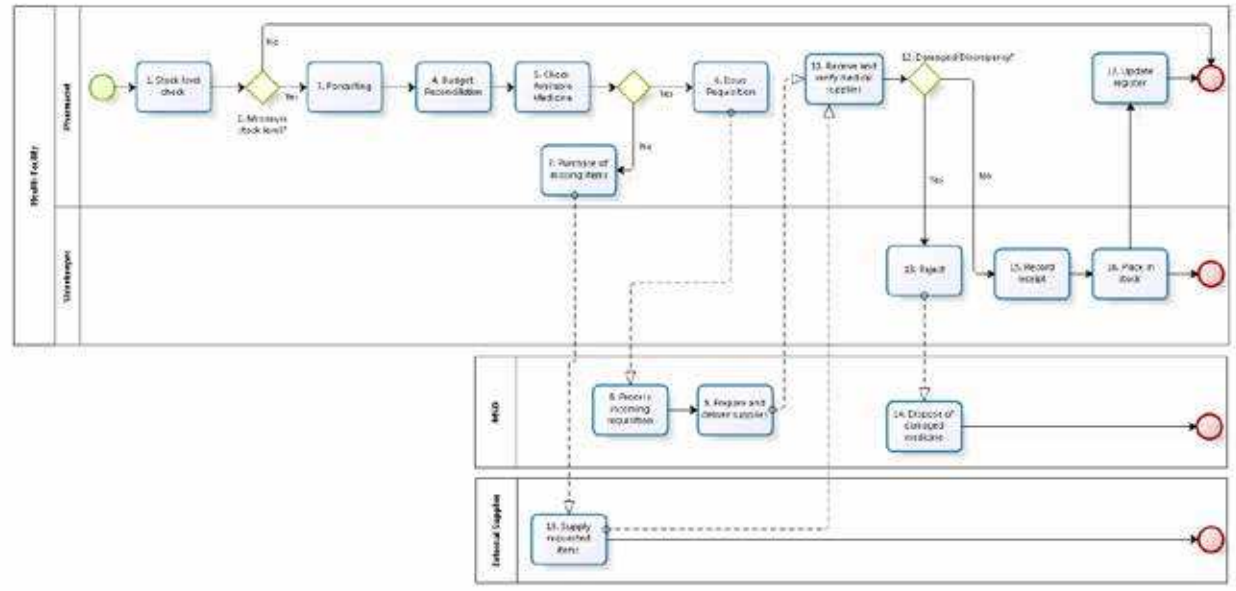

Figure 4: Main Inventory Management Process Map

Procedures for Central Inventory Management Process

To ensure the availability of the right medication at the right time, the right dosage, at the minimum possible cost in a proper manner the following procedures should be followed.

P1. *Stock level check.* The pharmacist performs regular stock level check to determine whether medical supplies are to be ordered.

P2. *Forecasting.* The user departments perform forecasting to aid the requisition/procurement process for ordering adequate stock and securing appropriate cold chain capacity throughout the health system. Forecasting can occur at multiple levels and use different methods of estimation. The most common estimation methods include target population estimation, previous consumption estimation, and estimation based on size of planned care service sessions.

P3. *Budget reconciliation.* Provides the mechanism for calculating and ordering goods for stores at intermediate and service delivery points. The process may be performed with a push or pull system. Different rules and guidelines for estimating the need for stock are used to create the requisition. Transmitted requisitions are submitted to the appropriate store and then go through a validation and approval process.

P4. *Issue requisition.* The pharmacist issue requisition based on the estimated need and the available budget

P5. *Receive and verify supply request.* MSD receive and verify the request for processing/

P6. *Provide profoma invoice and list of missing requested supplies.* The supplier checks the requested supplies against the available stock. The profoma invoice is provided for the available supplies along with any missing supplies.

P7. *Receive profoma invoice and list of missing supplies.* The pharmacist receives profoma invoice with quantity and price respectively of available requested supplies, and the list of missed items.

P8. *Procurement of missing supplies.* The User in collaboration with procurement unit completes the procurement of missing supplies from external suppliers.

P9. *Receive and verify medical and other supplies.* The pharmacists or inspection team receive and verify medical supplies delivered.

P10. *Damage/ discrepancy.* Check the delivered supplies if there any damage or discrepancy.

P11. *Reject the damaged/discrepancy items.* The pharmacists/inspection team rejects the damaged items. The documentation is done.

P12. *Supplier collects back the rejected items.* The responsibility of supplier to collects the rejected items from Health facility premises.

P13. *Generate the Good Receipt Note.* The items received and accepted by the pharmacists/inspection team, GRN should be generated for further procedure.

P14. *Update the updated physical stock.* The physical stock should be updated to reflect the received stock in main store.

2.7 Medical supplies distribution process

The distribution process is triggered by a requisition. Individual requisitions can be received from service delivery locations when a "pull" system has been implemented or in the case of a "push" system can be regularly scheduled based on a previously completed distribution plan or standing orders. Allocation of stock for a requisition can depend on stock status within the store, competing needs of other service delivery, consumption patterns, or budgetary status. Refer Figure 5.

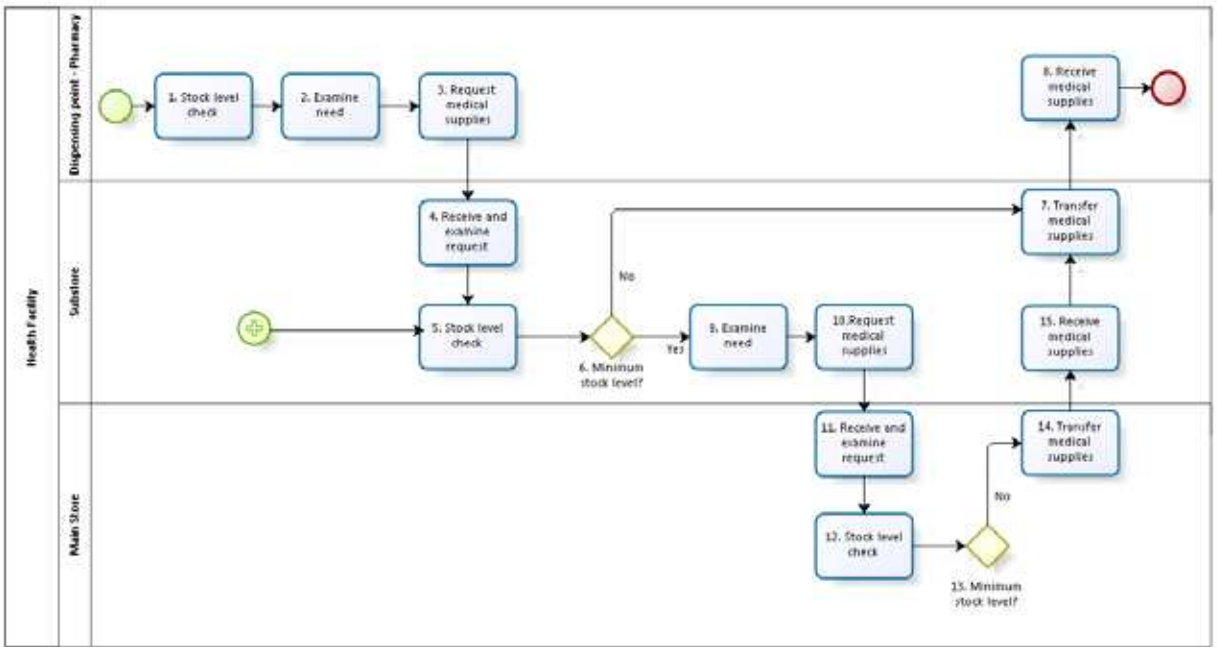

Figure 5: Medical Supplies Distribution Process Map

Procedures for Medical Supplies Distribution Process

In order to identify and prepare and deliver accurate quantities of medical supplies packed correctly from store needed at the pharmacy or any service delivery point the following procedures should be followed.

P1. Stock level check. Pharmacist/technician at the dispensing point perform a stock level checks

P2. Examine needs. Determine medical supplies needed at the dispensing point by calculating required quantities based previous consumptions, Health facility guidelines and rules in consideration of minimum and maximum medical supplies stock level at the dispensing point.

P3. Request medical supply. Issue requisition of medical supplies from the sub store.

P4. Receive and examine request. The pharmacist at the sub store receives and examines the request of medical supplies from the dispensing point.

P5. Stock level check. Pharmacist/technician at the sub store performs a stock level check to determine the availability of the requested medicines. The stock level check is also performed regularly to determine the general need of the sub store.

P6. Transfer medical supplies. If the stock is available, the pharmacist at the sub store transfers medical supplies to the dispensing point.

P7. Examine need. If the stock is equal to minimum, the pharmacist at the sub store examines the need for requisition from the main store.

P8. Request medical supplies. The pharmacist issues requisition of medical supplies from main store based on the established need.

P9. Receive and examine request. The pharmacist at the main store receives and examines the request of medical supplies from the sub store.

P10. Stock level check. Pharmacist/technician at the main store performs a stock level check to determine the availability of the requested medicines. The stock level check is also performed regularly to determine the general need of the main store.

P11. Transfer medical supplies. If the stock is available, the pharmacist at the main store will transfer medical supplies to the sub store.

2.8 Dispensing process

The dispensing business process is a high-level and generic process designed to cover the full spectrum of health-related products including medicines, vaccines and other medical supplies. Dispensing begins with a client encounter and a determination of the type(s) of medication, which the individual needs. If the medicines are available and in the correct quantity and quality, they will be dispensed to the individual and the client's record will be updated with appropriate information. This business process may trigger a scheduling process to inform the client of their next visit. Refer Figure 6.

Standard Guidelines for process improvement

SG1. Use of iHFeMS to make information of available medicines accessible to doctors during prescription to eliminate patient movement and repeat of prescription for missing medicines.

SG2. Enable online prescription verification by pharmacist to eliminate patient/pharmacist movement and queues to the pharmacist.

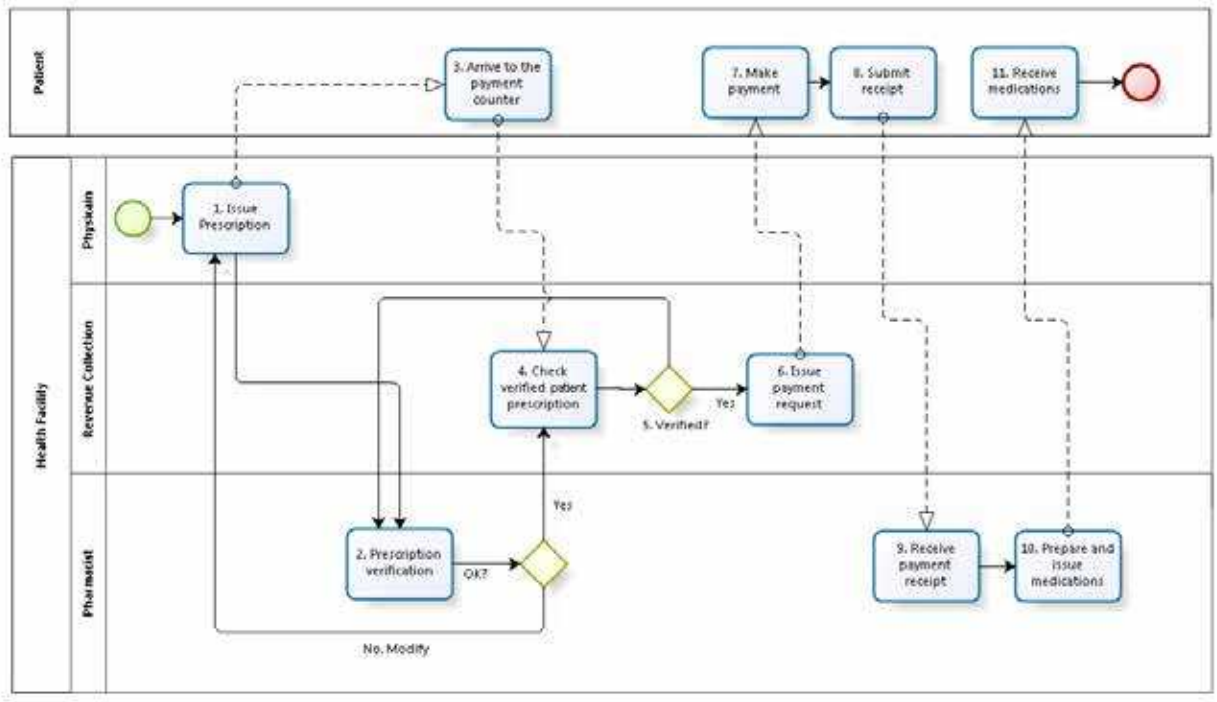

Figure 6: Dispensing Process Map

Procedures for Dispensing Process

In order to effective dispensing of right quantity and quality of medicine to the right client with right information for proper use the following procedures should be followed:-

P1. *Issue prescription.* Doctor examines the patient and issue prescription for medication. The verification request is sent to the pharmacist for approval.

P2. *Prescription verification.* Pharmacist receives, review and approve the verification request through online systems. Otherwise request is sent back to doctor for modification.

P3. *Check verified patient prescription.* Upon arrival of the patient at the payment counter, the revenue collector checks in the system to determine if pharmacist has passed/verified the prescription.

P4. *Issue payment request.* The revenue collector issues the payment request for passed/verified prescription.

P5. *Make payment.* Patient makes payment and receives receipt for the medicines.

P6. *Submit receipt.* Patient submits receipt to pharmacist for verification before issuing the medicine.

P7. *Receive payment receipt.* Pharmacist receives the payment receipt before issuing medicine

P8. *Prepare and issue medication.* The pharmacist prepares medicine as per doctor prescription and issue to patient. Give the patient right information on how to use the medication

P9. *Receive medication.* Patient receives the medication and instructions from pharmacist.

2.9 Patient Billing Process

Health facility billing is a process to obtain payments for services and items rendered by the Health facility. The Health facility billing process begins when a patient arrives at the Health facility for diagnosis and treatment of injury, illness, diseases, or any other health condition. Patient care services and items provided during the patient stay are recorded on the patients account. Charges are posted to patients account by various departments. When patient leaves the Health facility, all information and charges are prepared for billing. Refer Figure 7.

Standard Guidelines for process improvement

SG1. Health facility payment for services can be done directly through the bank, and other methods such as mobile payment.

SG2. Standardize the claim forms for the credit payments.

SG3. Enable detection of the services covered and those that are not by the credit payment during patient care delivery.

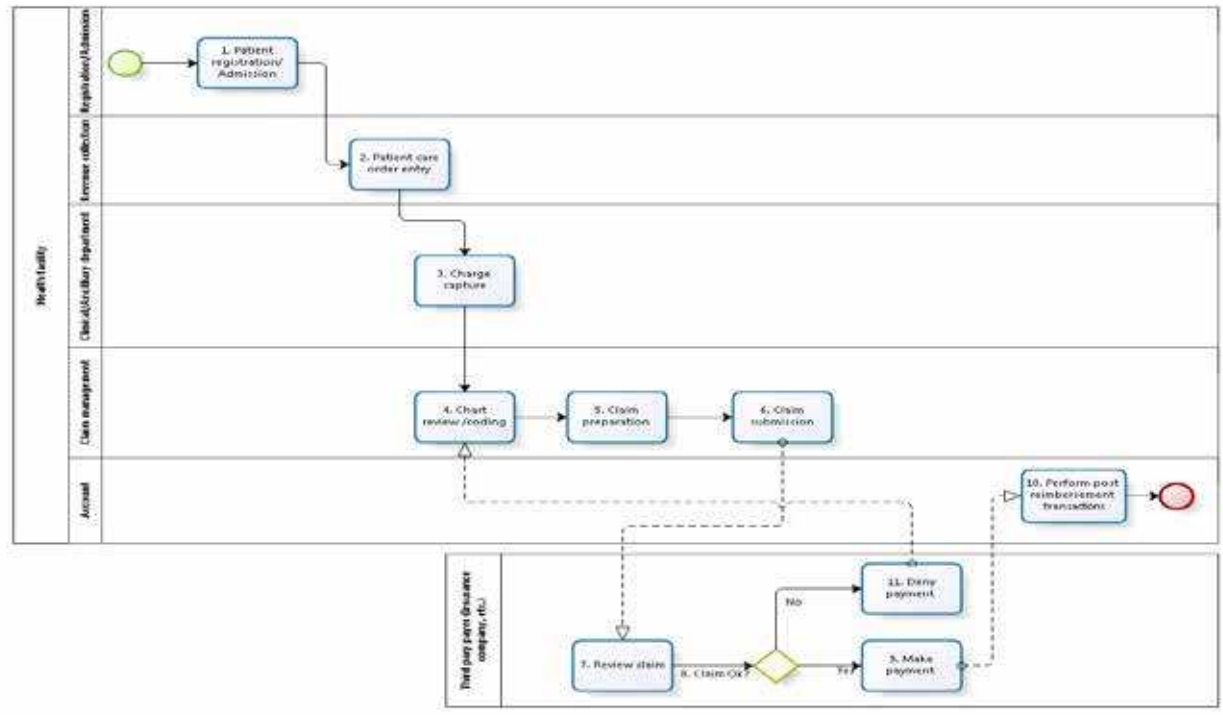

Figure 7: Patient Billing Process Map

Procedures for Patient Billing Process

To ensure services rendered in a health facility are properly charged to recover the incurred costs the following procedures should be followed:-

P1. *Patient registration and admission.* Patient is received at the Health facility either as an outpatient or inpatient basis.

P2. *Patient care order entry.* Patient care services are rendered in accordance with physician's order. The physician's order are entered in Health facility's information system and distributed to the appropriate department.

P3. *Charges capture.* All services and items provided during patient's stay are documented in the patient's record. All departments, including pharmacy and sterile supplies, involved in providing patient care are responsible for posting charges to the patient's account.

P4. *Chart review and coding.* The patient is released from the Health facility when attending physician provides a written discharge orders and instructions. Once the patient is discharged the completed medical record, is forwarded for coding and review of patient's medical record to identify and verify charges.

P5. *Charge/Claim preparation.* The claim management unit utilizes information gathered during the patient stay to prepare appropriate documents required for charge or claim submission. Patient invoice or statement is utilized to submit charges to the patient. Claim forms are utilized to submit charges to the third-party payer (i.e. Credit Company such as NHIF, AAR etc.).

P6. *Charge/Claim submission.* The claim management unit utilizes information gathered during the patent stay to prepare appropriate documents required for charge or claim submission. Patient invoice or statement is utilized to submit charges to the patient. Claim forms are utilized to submit charges to the third-party payer (i.e. Credit Company).

P7. *Bill payment.* Patient payments are posted and balance owed are printed on a statement and sent to the patient until the balance is paid. Claim received by payers (i.e. Credit Company) is processed after review is performed. Payment determination is conducted by the payers after claim review is performed which can results in one of the following: claim may be paid, or pended, or denied.

P8. *Post payment transaction.* Patient payments are posted and balance owed are printed on a statement and sent to the patient until the balance is paid. Claim received by payers (i.e. insurance) are processed after review is performed. Payment determination is conducted by the payers after claim review are performed which can results in one of the following: claim may be paid, or pended, or denied.

Chapter
THREE

REQUIREMENTS AND STANDARDS

This part provides the minimum requirements and standards the iHFeMS must meet to ensure that it creates value and the utility to its stakeholders. These requirements and standards have been drawn from the stakeholders, international literature and best practices. The requirements include both systems requirements, computing infrastructure and human resource requirements.

3. SYSTEMS FUNCTIONAL AND NON-FUNCTIONAL REQUIREMENTS

The requirements are designed for multispecialty Health facility covering a wide range of clinical, administrative and management processes. The aim is to ensure an integrated end–to-end Health facility management system that provides relevant information across the Health facility to support effective decision making for patient care, Health facility administration and critical financial accounting.

3.1 Functional Requirements

Functional requirements capture the intended behavior of the iHFeMS expressed as services, tasks or functions the system is required to perform. There are various techniques that will help you to indicate the level of priority of each system requirement. We have chosen to address the minimum requirement that must be incorporated in each iHFeMS with a word *Must* to indicate a *Mandatory* priority.

Objective

To provide the minimum iHFeMS functional requirements to be followed by health facilities during implementation of a new iHFeMS or improvement of an existing system

Scope

The Health facility functional areas covered in this document include; patient care management, laboratory, billing, pharmacy and inventory, medical record management, human resource management, management information system (dashboard), and financial management.

3.1.1 Patient Care Management

The iHFeMS must provide functionalities that capture the complete and relevant patient information. The system must also automate the patient administration functions to give a better and efficient patient care process.

The iHFeMS must answer all enquiries about the patient, which include admission, appointment scheduling, billing and discharge details.

Table 3.1: Patient Care Management

Section	User/Functional Requirements	Priority
1.0	**GENERAL**	
1.1	The system should handle all the admission, transfer and discharge operations for the Health facility. It should allow for a complete registration for a patient, or a quick registration for rapid registration at the Ambulatory & Emergency Department.	Must
1.2	System should generate a sequential Medical Record Number (MRN) for each new patient registration.	Must
1.3	MRN should be unique for each patient, and to be carried by the patient throughout the life of the Health facility.	Must
1.4	System generated sequential Account Number should be generated for each new patient visit.	Must
1.5	Account Number should be unique for each visit, and should be used for all billing purposes.	Must
1.6	The system should have the ability to capture billing and insurance payment details to enable bills to be sent to correct payer.	Must
1.7	The system should have the ability to make certain fields mandatory during the registration process as per MTUHA guideline.	Must
2.0	**ADMISSIONS / REGISTRATIONS (A&E)**	
2.1	All admissions must be performed through a registration function (inpatient, outpatient, A&E).	Must
2.2	The system should have the ability to carry out a quick registration with minimal mandatory registration information process, e.g. for the A&E Department	Must
2.3	System should be able to flash alert to Registration Clerk if patient has any outstanding bills	Must
2.4	The system should have the ability to capture insurance and billing information at admission/registration time. These details will include whether the patient should be billed or not, Guarantee Letter information, Third Party Payer/ Insurance information etc.	Must
2.5	If billing is applicable, the system should automatically determine the consultation charges applicable based on the billing rules, to determine the applicable charge, and to enable the charges to be collected prior to the consultation.	Must
3.0	**NEW BORN ADMISSIONS**	
3.1	Newborn admissions must be based on mother-baby link, i.e. admission details to be based on mother's admission record.	Must
4.0	**BED BOARD MANAGEMENT**	
4.1	Online, real time bed availability status by Ward / Department Health facility wide	Must
4.2	Ability to search for beds by ward	Must
4.3	Ability to search for beds by bed class, within the ward	Must
4.4	Ability to search for beds by bed class, throughout the Health facility	Must

Section	User/Functional Requirements	Priority
4.5	Ability to create dummy beds which can be used for admission when all beds in ward are occupied, but pending discharges. These beds are not to be included in the census count.	Must
5.0	**TRANSFERS**	
5.1	Can be effected between beds in the same ward or between wards	Must
5.2	System must chronologically sequence each transfer and keep track of patient's movement history.	Must
6.0	**REFERRALS**	
6.1	System must be online and able to provide real time status by inward/ outward referrals	Must
6.2	Ability to set Expected time of Arrival by inward referral (accept electronic referrals)	Must
6.3	Ability to prioritize referral by patient status	Must
6.4	Ability for system to reserve resources (including Operating rooms, ambulance, wheelchair etc) pending referral arrival	Must
7.0	**DISCHARGES**	
7.1	Ability for system to check that all formalities have been completed and to trigger warnings otherwise.	Must
7.2	If a patient has to be billed (i.e. a patient without a Guarantee Letter), the system will check that a Discharge Bill has been generated; otherwise the discharge is not to be effected.	Must
8.0	**MASTER CODES**	
8.1	The system must have a provision to set Master Codes	Must
8.2	The sex of the patients to be admitted into the ward must be validated during the admission process.	Must
8.3	Rooms within Wards: all rooms within the ward will be codified	Must
8.4	Beds for Wards: all beds within the ward will be codified, according to bed class	Must
8.5	Type of Ward: specifies classification of ward	Must
8.6	Bed Class: specifies classification of beds, and should be used to set up entitlements	Must
8.7	Admission Type: specifies the nature of admission	Must
8.8	Transfer Type: specifies the nature of transfer	Must
9.0	**REPORTS**	
9.1	Standard Reports: Based on the government requirements (MTUHA)	Must
9.2	Ad-hoc Reports: Based on emerging requirements	Must
10.0	BED CHARGES	
10.1	Calculation of bed charges based on number of days stayed	Must
10.2	Calculation of bed charges based on financial class of patient	Must
10.3	Calculation of bed charges based on bed type	Must
10.4	Automatic calculation of bed charge if the bed is occupied for more than a pre-defined number of days	Must

3.1.2 Laboratory

The iHFeMS shall automate the investigation request and the process involved in delivering the results to the concerned department/doctor of the Health facility.

The system shall start by receiving online requests from doctors and also allow laboratory personnel to generate requests.

The iHFeMS shall support performance of various tests such as:

- Biochemistry
- Histopathology
- Parasitology
- Hematology
- Microbiology
- Serology.

Laboratory tests shall be grouped under various sections and sample type (specimen). Based on the request the user can input the sample and generate the sample number. Results can be entered based on the sample type either to one test or multiple tests.

If the test result requires approval, the supervisor shall approve the result and make it available to concerned doctors.

Table 3.2: Laboratory

Section	Functional Description	Priority
1.0	**GENERAL**	
1.1	The system will be used in the AP Section of the Main Laboratory, serving the needs of the Inpatients, Outpatients, Emergency Departments, and Operating Theaters.	Must
2.0	**CHARGING**	
2.1	To create a charge in the patient's bill for any procedure that is carried out.	Must
2.2	There should be flexibility to determine at which point the patient will be charged for the procedure. For example, for Test A, the patient could be charged at the point the test is ordered, while he could be charged only when the procedure has been reported for Test B, or when the procedure has been completed for Test C.	Must
2.3	There will be an option for a supervisor to reverse a charge if required.	Must
3.0	**REPORTS**	
3.1	Inquiries by Patient name or MRN, Accession number, Physician, Source (ward / clinic / department), Test Charges collected lab wise.	Must

3.1.3 Laboratory Order Management

The Order Management application addresses the order entry, order review and/or validation

Table 3.3: Laboratory Order Management

Section	Functional Description	Priority
1.0	**GENERAL**	
1.1	The Order Management application addresses the order entry, order review and/or validation, It is envisioned that orders can be placed for any ancillary department by any user in the Health facility, depending on the security level assigned to him	Must
2.0	**ORDER ENTRY**	
2.1	The order entry process can be decentralized, i.e. an order can be placed from any PC within the Health facility.	Must
2.2	The system will be able to handle the following order types: single order, multi-departmental orders.	Must
2.3	Users should be able to place any type of order, clinical or non-clinical, from one application.	Must
2.4	Each order type must have its own set of pre-determined data fields.	Must
2.5	There is an option to identify the urgency of an order.	Must
2.6	There is an option to cancel or modify an order if it has not been processed yet.	Must
3.0	**ORDER PROCESSING**	
3.1	The status of any order will be updated automatically, real-time, by the system to enable users to have an online review of the status of any order for any patient.	Must
4.0	**ORDER INQUIRY**	
4.1	Users can review the status of any order online from anywhere within the Health facility.	Must
4.2	Users must be restricted into viewing information only on those patients in their assigned locations.	Must
6.0	**CHARGING**	
6.1	The system creates a charge in the patient's bill for any procedure that is carried out.	Must
6.2	There will be flexibility to determine at which point the patient will be charged for the procedure. For example, for Test A, the patient could be charged at the point the test is ordered, while he could be charged only when the procedure has been reported for Test B, or when the procedure has been completed for Test C.	Must
7.0	**REPORTS**	
7.1	Standard Reports: Based on the government requirements (MTUHA)	Must
7.2	Ad-hoc Reports: Based on emerging requirements	must

3.1.4 Operating Theatre Management

The iHFeMS shall have a component to provide all functions required for managing and charging operating theatres services of the Health facility.

The system component shall be able to automatically create a charge in the patient's bill for any procedure that is carried out.

It shall provide easily accessible and immediate reports on surgeries not yet charged, surgeries completed not yet charged, etc.

Table 3.4: Operating Theatre Management

Section	Functional Description	Priority
1.0	**GENERAL**	
1.1	The Operating Theatre (OT) Management application will provide all functions required for charging of the Operating Theatres of the Health facility.	Must
2.0	**CHARGING**	
2.1	The system automatically creates a charge in the patient's bill for any procedure that is carried out.	Must
2.2	There will be an option for a supervisor to reverse a charge if required.	Must
3.0	**REPORTS**	
3.1	Exception Reports for the following:	
3.1.1	Surgeries not yet Charged	Must
3.1.2	Surgeries completed but charging not done.	Must
3.1.3	Surgeries rescheduled	Must

3.1.5 Billing

The system must provide functionalities related to billing of the patient for all the services taken in the Health facility. Patients/clients must be billed according to business rules of the Health facility, which must be maintained and validated by the system.

Table 3.5: Billing

Section	Functional Description	Priority
1.0	**GENERAL**	
1.1	The system must provide the Health facility with a comprehensive facility to track all charges for a patient from the point of registration to the stage of discharge / completion of a visit.	Must
1.2	The billing process must be flexible so that it can be done for inpatients at pre defined periods or at end of the episode, while for outpatients it can be done at each service point (either at the point the order is placed or at the point it is completed), or at the end of the visit.	Must
1.3	The system must be fully integrated so that billing transactions can be automatically posted to the patient's account from the laboratory, radiology, operating theatres, pharmacy, wards/clinics and so on.	Must

Section	Functional Description	Priority
1.4	Patient Billing must also be integrated with Accounts Receivable for managing credit patients.	Must
1.5	Electronic payments must be directly credited to the health facility collection account.	Must
2.0	**BILLING GROUPS**	
2.1	The system must be able to classify patients into various Billing Groups in order to group patients into various paying categories.	Must
3.0	**BILLING CLASSES**	
3.1	System must be able to allow users to define various classes of service rendered in user-defined terms as say, first class single bed / first class double bed/ second class bed / ordinary class bed / etc	Must
3.2	Billing classes will be determined and entered into the system at registration time.	Must
4.0	**BED CHARGES**	
4.1	The system should provide flexibility in defining bed charges depending on the type of ward / room / bed	Must
4.2	If the patient occupies beds of differing classes on the same day, the bed, which has the higher daily bed charge, will be selected for billing.	Must
5.0	**BILLS**	
5.1	System must have flexibility to print inpatient bills periodically for all inpatients or individually at the end of the inpatient episode.	Must
5.2	The system must have flexibility to print interim bills for inpatients	Must
5.3	The system must have flexibility to print outpatient bills at each service point, at the point that the service is provided or consolidated at the end of the outpatient visit.	Must
5.4	The system must be able to automatically calculate all relevant government service taxes and add it to the bill. (Where applicable)	Must
6.0	**CASHIERING FUNCTIONS**	
6.1	There must be provision to identify the Cashier Counter during cashier operations to ensure accountability of all transactions processed. This will also record the cashier identifications such as his user id, which is unique within the system.	Must
6.2	The system must have facility to process various kinds of receipts, for example, Collection against a bill, Collection against an account receivable for patients with credit facility, Collection of a deposit, Collection of a pre-payment, etc.	Must
6.3	The system must have facility to process various kinds of refunds, for example, Refund against a bill, Refund of a deposit etc.	Must
6.4	Ability to print receipts / refund documents on pre-printed stationery in on-line mode or batch mode	Must
6.5	All receipts and refund documents must be customizable by the users	Must

Section	Functional Description	Priority
6.6	System must support various types of receipt printing based on visit type; for example, a different receipt is required for an emergency visit as compared to an Outpatient visit or Inpatient visit.	Must
6.7	Receipts must have system generated sequential numbers, the format of which will be user-defined.	Must
7.0	**REPORTS**	
7.1	Inquiry on Patient Details	Must
7.2	Inquiry on Patient Charge Profile	Must
7.3	Inquiry on account status	Must
7.4	List of Receipts	Must
7.5	List of Third Party Payer Bills, to be printed on a pre-defined schedule	Must
7.6	List of discharges to reconcile with bills	Must
7.7	Inpatient bills in detail as well as summary	Must
7.8	Inquiry on patient financial details by Patient name Account number	Must
7.9	Inquiry on any transactions recorded In an account	Must
7.10	Inquiry in patient's current charges and outstanding status	Must
7.11	Top up reports for patients whose current charges have exceeded the deposit paid	Must

3.1.6 Pharmacy and Inventory Management

The iHFeMS shall provide functionalities for requisition of medical supplies, purchase of items, issuance of items, stock management, automatic reorder level setting, online request for stock from main store to various sub-stores and dispensing points, management of stock at different categories such as physical stock verification and adjustment, return of medical supplies to supplier.

The system shall be able to receive prescriptions from the consulting doctors and reflect automatically into dispensing unit and payment counter of a respective patient.

Table 3.6: Pharmacy and Inventory Management – Dispensing

Section	User/Functional Requirements	Priority
	STOCK CONTROL	
1.1	The pharmacist may set the stock levels required by the Health facility to maintain one or more pharmacy outlets within the Health facility.	Must
1.2	The stocks can be replenished by a process or manually triggered by the person responsible.	Must
1.3	Automatically generate reorder documents for the procurement of new stock.	Must
1.4	The system will also facilitate manual entry of requisitions from the various wards/clinics/departments in the Health facility.	Must

Section	User/Functional Requirements	Priority
1.5	Expiry and non-expiry items must be supported. For expiry items stock is maintained at batch level with expiry date for each batch; and any store transaction must identify the batches being processed as part of the transaction.	Must
1.6	Facility must maintain preparation details and constituent items for manufacturing items. Manufacturing receipts use this information to receive the prepared item into stock and reduce stock from the constituents that have been used. Plus minus variation limits can be set on usage of constituents.	Must
1.7	Facility to record transfers between main stores, sub stores and dispensing points.	Must
1.8	Stock balance must be updated immediately on confirming a transaction (receipt of stock into inventory, returns to vendors, dispensing to patients) to reflect true on-hand status at any time.	Must
1.9	Automatic validation and warning on expiry of items.	Must
1.10	Provision to remove expired items from active stock to be replaced or destroyed.	Must
1.11	Provision for recording physical stock check figures and generating variance reports and automatic adjustments.	Must
1.12	Mandatory entry of reason in adjustments for audit purposes.	Must
1.13	Stock transactions effect on financial accounts need to be reflected in the General Ledger based on the accounting linkages.	Must
1.14	Provision to close each accounting month, after all transactions have been recorded for that month.	Must
1.15	Outgoing medicines and prescriptions are automatically deducted from its stock list.	Must
1.16	For each item-store combination, the minimum/maximum quantities and re-order quantities are maintained depending on the policies and procedures adopted for replenishment of stock at the sub-stores and non-stock stores.	Must
1.17	As the inventory levels reach reorder points, the system will automatically generate purchase orders for reordering by comparing the stock-on-hand with the reorder level. The orders must be reconciled upon delivery.	Must
2.0	**MEDICATION ORDERS**	
2.1	Medication orders can be entered for inpatients that are identified by their financial numbers so that medications can be connected to each term of stay separately.	Must
2.2	The medicine item codes must be easily and quickly retrieved in the system by trade or generic name search.	Must
2.3	The system will allow order entry in centralized or decentralized locations throughout the Health facility, by various categories of staff such as physicians, nurses, clerks or technicians.	Must

Section	User/Functional Requirements	Priority
2.4	Pharmacist verification, if required, will be quickly and efficiently entered or modified for conditional medication orders. Clinical alert warnings may be delayed until the pharmacist verification step or may appear during non-pharmacist order entry. In all cases, clinical warnings, including user actions, must be recorded for action and review at a later time.	Must
2.5	Master Codes – the following Master Codes must be set up within the system:	
2.5.1	Medication Forms: Code and description for the various forms in which medicines are Available.	Must
2.5.2	Route of Administration: Code and description for the different methods in which a medicine can be administered, e.g. Intravenous, Oral.	Must
2.5.3	Instructions for Administration: Code and description for brief instructions on the method of administering a medicine to patients.	Must
2.6	The system must enable users to enter all medications into the system from the same screen. Medications can be selected by generic name, therapeutic category or product codes.	Must
2.7	Common order entry sets should be defined to further expedite the order entry process by having the most commonly used items pre-selected for activation and the less customary items Available for activation.	Must
2.8	If there have been medication orders earlier for the same inpatient, then medications issued to the patient must be checked for inclusion of these medicines and warnings issued where appropriate	Must
2.9	For controlled medicines/drugs, a supervisor must authorize the issue before the transaction can be processed.	Must
2.10	The system must have provision for returns against prescriptions	Must
2.11	The system must provide support for all medication orders, processing, administration, and dispensing in a paperless environment.	Must
3.0	**REPORTS**	
3.1	Medicines formulary inquiry by code, trade name and generic name.	
3.2	Inquiry on medicine interactions.	Must
3.3	Inquiry on patient's total medicine profile (all medications and prescriptions to date).	Must
3.4	List of inpatient medication orders by patient, ward and doctor.	Must
3.5	List of outpatient prescriptions by patient, clinic and doctor.	Must
3.6	List of Repeating Orders for a given drug store/pharmacy and for a specified range of dates.	Must
3.6.1	Controlled drug register	Must
3.7	List of discontinued drugs	Must
3.8	Stock status report	Must
3.9	Stock ledger	Must

Section	User/Functional Requirements	Priority
3.10	Stock Analysis reports on fast moving items, slow moving items and non-moving items.	Must
3.11	Consumption statement by item and by ward/clinic/department.	Must
3.12	Valuation statements by costing units	Must
3.13	Expiration list by period	Must
3.14	Items to be re-ordered	Must
3.15	Items above maximum stock levels	Must
3.16	Daily transaction details report	Must
3.17	On-line stock status inquiry by item for all stores in the Health facility and by store for all items in that store.	Must
3.18	Inquiry on stock transactions for an item.	Must

Table 3.7: Pharmacy and Inventory Management – Report and Request

Section	Functional Description	Priority
1.0	**GENERAL**	
1.1	The system must be able to handle on-line data entry (including eLMIS)	Must
2.0	**VENDOR INFORMATION**	
2.1	Vendor codes should be alphanumeric.	Must
2.2	The vendor code should be either system generated or manually entered.	Must
2.3	A short name or vendor codes will be used to access vendors during transaction entry and enquiries.	Must
2.4	The system should cater for the following information on the vendor record:	
	Vendor code, vendor short name, vendor name, vendor address, vendor telephone, vendor facsimile number, vendor contact person, vendor type, optional bank details, optional or user-defined multiple credit terms or contract information, currency details, payment method, credit limit, last date of activity, lead time, history, GL codes for purchases, creditors and cash	Must
2.5	The system should produce a list of vendors with no activity for a specified period of time.	Must
3.0	**VOUCHER ENTRY**	
3.1	The system should provide:	
	Invoice register facilities	Must
	Validation of invoice values	Must
3.2	The system should register and certify the invoice at the same time.	Must
3.3	The system should record to whom invoices have been sent for either approval, General Ledger (GL) coding or adjustment.	Must

3.4	The system should allow for the following fields in the transaction record: Vendor code, vendor reference invoice number, transaction reference for internal use, invoice type, terms, invoice date, invoice receipt date, posting date, due date, period, gross amount, discount, net amount, optional quantity, optional unit price, transaction currency, currency rates, payment method e.g. cheque, bank details, order number and link to order details e.g. Item code, type, order quantity, GL code, hold information – before updating GL, status code – delivered or not, flag prepaid for items	Must
3.5	The system must check for duplicate vendor invoice numbers.	Must
3.6	There should be no limit to the number of lines per invoice.	Must
3.7	General ledger code distributions should be entered on: Purchase orders, vendor record, individual lines on an invoice	Must
3.8	General ledger distribution codes should be validated online in the Accounts Payable (AP) and invalid transactions rejected.	Must
3.9	The system must check that the total recorded against the distribution lines equals the total invoice sum.	Must
3.10	The system should be able to handle discounts as either a percentage or an amount.	Must
3.11	The system should automatically post a discount to the correct general ledger account for discounts.	Must
3.12	It should be possible for a group of invoices to be authorized for payment together.	Must
3.13	Matching should be available for both the whole invoice and line by line	Must
3.14	It should be possible to process and authorize a goods received note.	Must
315	A credit note can be matched with parts of one invoice	Must
3.16	Amount transactions entered on-line can be posted at the end of the day or period.	Must
3.17	Posting should update the accounts payable, general ledger	Must
4.0	**PROCESSING OPTIONS**	
4.1	The system should allow processing of more than one accounting period typically previous and future periods.	Must
4.2	The system should handle accruals with automatic reversal in the next period.	Must
4.3	The system accepts open item accounting.	Must
4.4	It should be possible to search using: Supplier name, supplier short name, invoice number, invoice reference, purchase order number, cheque number, transaction date	Must
5.0	**PAYMENTS**	
5.1	It should be possible to process manual cheque and they should appear on the cheque register.	Must
5.2	It should be possible to pay more than one cheque for a vendor.	Must
5.3	It should be possible to stop payment of a specific invoice temporarily.	Must

5.4	It should be possible to make a payment during the same processing cycle that the invoice was entered.	Must
5.5	It should be possible to pay invoices as specified without regard to the payment-scheduled date.	Must
5.6	The system should allow for part payments to be made.	Must
5.7	It should be possible for individual items to be paid on the next payment date to be listed in advance of the cheque processing cycle.	Must
5.8	Duplicate payments should be identified.	Must
5.9	Individual general ledger codes should be specified for each bank account.	Must
5.10	The system should be able to handle advance payments.	Must
5.11	The interface with the general ledger should allow the cheque number reference to be passed into the general ledger to assist with bank reconciliations.	Must
5.12	If a posted payment is voided, the GL posting should automatically be reversed.	Must
5.0	**PURCHASE ORDER PROCESSING**	
6.1	The system should facilitate matching, of purchase orders, receiving reports and vendor invoices.	Must
6.2	Matching should be available for both the whole invoice and manual matching.	Must
6.3	The system should produce exception reports of unmatched invoices.	Must
7.0	**INTERFACES**	
7.1	The user should have the option to post to the general ledger: at the detail level and summary level by voucher	Must
7.2	The general ledger should be posted at the same time as the accounts payable subsidiary ledger is posted.	Must
7.3	The system should support interfaces to other systems including: purchasing, receiving, general ledger, stock control	Must
7.4	The system should support interface to eLMIS (Public Health Facilities)	Must
8.0	**VENDOR PURCHASE ANALYSIS (REPORTS)**	
8.1	There should be a report summarizing purchase and payment history by vendor.	Must
8.2	There should be a report listing open items and paid items.	Must
8.3	The system should print vendor statements.	Must
8.4	The system should produce a vendor ledger listing by vendor number and alphabetically	Must
8.5	The system should be able to produce an accounts payable invoice/ voucher register.	Must
8.6	The system should produce an aged outstanding balance report by vendor in both detail and summary.	Must
8.9	Aging bands (e.g.. 30,60, 90 days) should be user-specified.	Must

3.1.7 Medical Record Management

The iHFeMS must be able to maintain the core information on clinical care. A complete standard International Classification Diagnosis (ICD) 10 must be used to build up the data for medical records. It must be possible to maintain diagnosis, treatment advised and surgery/treatment details in the record. The system must provide two levels of medical records: One must have the basic data and the other level must have the detailed records of diagnosis and treatments.

As part of the medical records, the iHFeMS must be able to store image outputs from used equipment.

Table 3.8: Medical Record Management

Section	Functional Description	Priority
1.0	**GENERAL**	
1.1	Collated and formatted of information on patients, as required	Must
1.2	Search on patient records by patient names, patient ID, etc.	Must
1.3	Complete clinical data repository	Must
1.4	Capturing basic patient demographic details	Must
1.5	ICD-10 codes for diagnosis and clinical findings	Must
1.6	Real time ordering of tests and medications	Must

3.1.8 Human Resource Management

The iHFeMS shall track and manage all the human resourcing activities with respect to the Personal and Payroll functions.

The system shall provide functionality related to employee management, directory management, leave management, and roaster management.

The iHFeMS shall be possible for the system to be integrated with biometric solutions to identify employees as they arrive and leave the Health facility premises.

Table 3.9: Human Resource Management

Section	Functional Description	Priority
1.0	**GENERAL**	
1.1	The system should perform and manage daily attendance	Must
1.2	Leave accounting and management	Must
1.3	Pay slips management	Must
1.4	Produce payroll reports	Must
1.5	The system should be able to be integrated with biometric solutions	Must
1.6	Real time ordering of tests and medications	Must

3.1.9 Reports Module

The iHFeMS should provide managers with a dashboard that offers real time, at-a-glance personalized information related to various activities.

The system shall be able to dig deep in the system and come up with real-time reports to support immediate decision-making.

Health Facilities must adhere to Government reporting standards. i.e. MTUHA, CCHP, RITA etc.

Table 3.10: Management Information System –Dashboard

Section	Functional Description	Priority
1.0	**GENERAL**	
1.1	Revenue profile doctor wise	Must
1.2	Revenue profile department wise	Must
1.3	Revenue profile procedure / package wise	Must
1.4	Expense profile doctor wise	Must
1.5	Expense profile department wise	Must
1.6	Expense profile procedure / package wise	Must
1.7	Treatment profile and collection profile	Must
1.8	Exception report on deviation from set of parameters for Purchase, discounts, collections, credits	Must
1.9	Patient registration statistics	Must
1.10	Patient admission statistics by date, ward and clinician	Must
1.11	Patient discharge statistics by date, ward and clinician	Must
1.12	Bed occupancy statistics by date and ward, by doctor	Must
1.13	Outpatient visit statistics by date, clinic and clinician	Must
1.14	Inpatient visit statistics by date, clinic and clinician	Must
1.15	Contribution Statement	Must

3.1.10 Mortuary

The iHFeMS shall track and manage deceased activities with respect to the storage, preparations, autopsy and viewing functions.

Table 3.11: Mortuary

Section	Functional Description	Priority
1.0	**GENERAL**	
1.1	Mortuary accepts only deceased who have been certified dead by authorized clinician.	Must
2.0	**ADMISSION/DISCHARGE**	
2.1	The system should accept deceased body with Clinician authorization	Must
2.2	The system should discharge deceased bodies after burial certificate rendered, outstanding charges for all services rendered paid and supervisor approval.	Must
3.0	**REPORTS**	
3.1	Bodies not yet collected	Must
3.2	Online, real time storage space availability status	Must
3.3	Ability to search deceased by clinician, name, next of kin, date of death	Must

3.1.11 Financial Management

The iHFeMS shall cater for the entire range of accounting activities that is conducted in a typical Health facility setting.

Right from when patient walks in to the time the Health facility presents its profit and loss accounts, the iHFeMS shall be able to manage and provide information from every transactional point of Health facility like pharmacy, canteen, blood bank, over time, maintenance.

Table 3.12: Financial Management

Section	Functional Description	Priority
1.0	**GENERAL**	
1.1	All transaction vouchers generated in the system are collated and they are posted on daily basis or online onto the system	Must
1.2	Cash/Credit/Bank Transaction	Must
1.3	Daily Cash Book	Must
1.4	Daily Bank Book	Must
1.5	Account Receivable Statement with Ageing Analysis	Must
1.6	Income & Expense profile department wise / Budget wise	Must
1.7	Supplier Ledger	Must
1.8	General Ledger	Must
1.9	Trial Balance	Must
1.10	Profit & Loss	Must
1.11	Balance Sheet	Must
1.12	Expenditure Analysis	Must
1.13	Exception Analysis	Must

3.2 Non-Functional Requirements

Non-functional requirements define the overall qualities or attributes of the resulting system that place restrictions or conditions on the system being developed, the development process, and specify external constraints that the system must meet. The non-functional requirements usually impact many parts of the system, and they may be related to one or many features e.g. How long can the system be down and how easy should it be to restart it, or if data becomes corrupt how does a user fix it and which users can do so? Taking into consideration the intricacies of Health facility setting, involving precarious situations of serving lives, ensuring that the iHFeMS adhere to a minimum set of non-functional attributes is indispensable.

Objectives

To ensure that the iHFeMS adhere to a minimum set of non-functional attributes for improved clinical and administrative service provision at the health facility.

Scope

The non-functional requirements covered in this guide revolve around the factors that ensure proper functioning of the iHFeMS such as usability, usefulness, etc. and its surrounding environment.

Standard Guidelines

The iHFeMS system should meet the following non-functional quality attributes:

3.2.1 Security Requirements

The system to be developed shall enforce security requirements based on different controls such as preventive controls, detective controls, compensating controls, corrective controls and recovery controls as well as standards and best practices. All these controls shall work while maintaining the following;

3.2.1.1 Confidentiality

SG1. The system will be handling massive of sensitive information and integrate with bodies that keep crucial information too. For this reason, sophisticated security measures must be implemented and tested from time to time to ensure their strength.

SG2. All sensitive data entered into the system must be encrypted by strong cryptographic techniques.

SG3. Additionally the system should provide security means to protect itself from automated attacks by using methods such as "CAPTCHA" when processing login requests in special cases (when the user has elevated privileges, or when a user repeatedly attempts to login without success).

SG4. The system shall provide the users with a secure way to change their passwords, whether when initializing a new account or by user request.

SG5. The system should use the HTTPS protocol in subsequent iterations in order to prevent unauthorized third-party viewing of the contents.

SG6. The system shall provide access for authorized users while screening out those who do not need to view confidential data.

SG7. The system shall provide transparent and automated security management of IDs, security policy enforcement and automated password resets. These features shall significantly reduce the on-going administration and management costs associated with web security.

3.2.1.2 Authentication

SG1. First Login password generation followed by mandatory account password be changed on next login

SG2. Passwords must adhere to complex password rules including encryption

SG3. Two Factors Authentication may be used when possible (a. Username & Password b. PIN)

SG4. Credential Control (Official Government Email as username for Public Institution)

SG5. Password Expiry (3 months Max)

SG6. Password Reset (automated)

SG7. Maximum number of login failures (4 times) followed by inactivity (5 minutes)

SG8. Minimum number of inactivity events (2 times) followed by account lockout

SG9. Issue (automated) alert on inactivity events

3.2.1.3 Log Audit/Traceability

SG1. Provide log records for audit and traceability on authentication violation

SG2. Provide automated notification when set thresholds exceed e.g. of authentication violations or role privilege violation

3.2.1.4 Information Access

SG1. Provide authorized access on role based and need to know basis

SG2. Provide information access (read, write, execute) right requests with respect to account role/ privilege

SG3. Roles mapped with Groups

3.2.1.5 Session Life Cycle

SG1. Limit session inactivity/idleness (5 minutes)

SG2. Limit concurrent account access i.e. inactivate any other live sessions should another session get

3.2.1.6 Access Mode

SG1. Allow only web access to all users

SG2. Allow SSH only from Facility Internal Network or via the VPN for remote access only to Facility System Administrator

3.2.1.7 Integrity

SG1. The system shall be shown to be capable of maintaining the integrity of all the data which it controls and makes it available.

SG2. Integrity testing shall form part of the system acquisition and acceptance process

SG3. The transaction history should be maintained

SG4. The system should retain partial data from interrupted entry for 15 minutes

3.2.1.8 Reliability

SG1. The system must be reliable in a sense that all the functions work properly as intended and therefore users have trust in it.

SG2. Additionally, whenever there is an error the system should be able to communicate the problem/ error to users by reporting the likely cause and propose solution(s).

SG3. All LAN and/or WAN infrastructure must be fully resilient so that the failure of any single component or link cannot cause interruption of service.

SG4. All computer hardware (particularly all servers) and associated equipment including power supply, network interfaces, air conditioning etc. must offer full fail over capability so that the failure of any one server or other component cannot cause interruption of service.

3.2.1.9 Availability

SG1. The systems shall be designed to allow for continuous operation on a 24 hour, 365 day per year basis.

SG2. The system shall deliver an overall availability of 99.95% with the maximum length of a single downtime incident in any one calendar (January - January) year being 4 hours. This shall be enhances also by the support of frequently taken data as well as disaster recovery plan to be put in place.

3.2.1.10 Safety

SG1. Data on the server shall be protected from power loss but data in transit from server to requester could be lost. Given that these data will also remain on the system, rather than expend resources to prevent this loss, such failures will be monitored and the uploading process will be repeated.

3.2.2 System Requirements

3.2.2.1 Scalability

SG1. The system shall be designed to allow expansion through additional web and mobile applications.

SG2. The system shall be "device aware" and vary content and access based on which device a user is utilizing i.e. users can securely access the system via alternate devices, such as handheld PDAs and mobile phones.

SG3. It will have the capability to integrate with more stakeholders that are not specified for the time being.

3.2.2.2 Usability

SG1. New visitors should not spend much time to understand how to use the system. It should be easy to use and navigate from page to page.

SG2. Other tools like search options and alphabetical arrangement of items can be implemented to help user obtain specific information easily and quickly.

SG3. Further the web interface of the system will be designed to be concise and user-friendly, with a well-designed graphical interface to help users identify the proper choice on the screen.

SG4. An online help shall be provided for the users.

SG5. Users are expected to be able to use the system productively with no training requiring only awareness of the availability of the system.

SG6. The system should provide interactive touch screen interface for ease and fast access

SG7. The average user learning time must be less than 1 day

SG8. The system should help users to avoid doing mistakes

SG9. The system should provide screen, mouse and keyboard navigation.

SG10. The system should be easy to navigate by using clear words, menus and drop-down lists.

3.2.2.3 Accessibility

SG1. System accessibility shall encompass all disabilities that affect access to the web-based systems, including visual, auditory, physical, speech, cognitive, and neurological disabilities.

SG2. The system shall provide handicap access and must provide multilingual support.

3.2.2.4 Adaptability

SG1. Implementation of the application software and design of database structure shall be flexible enough for the necessary changes in the later phase.

SG2. The software shall be flexible for migration to another Operating System platforms or Databases.

3.2.2.5 Maintainability

SG1. Essential maintenance to the system and all associated applications shall be capable of performance without interruption to service.

SG2. If downtime is experienced for any application delivered through the system, a notice should be displayed on the system stating the expected time to repair.

SG3. Within one hour of any malfunction, the problem will be logged, analyzed to gauge the severity of the problem and a course of remedial action identified with appropriate persons notified.

3.2.2.6 Performance

SG1. All pages shall be loaded within three seconds or less, assuming a broadband connection on the client side.

SG2. Therefore, response time for transactions will be three seconds or less.

SG3. The system shall support as many as 100 online users simultaneously with negligible response delay.

3.2.2.7 Portability

SG1. As a web-based application, the system shall support the latest version of the majority of browsers such as Internet Explorer, Firefox Mozilla, Chrome and Safari, as well as common mobile devices.

SG2. In addition, the system shall be easily migrated to other platform in case of hardware failure in both servers.

3.2.2.8 Standards

SG1. The project development in public health facility must comply with all the relevant e-Government related standards, guidelines, procedures and other best practices.

SG2. This will require a full risk assessment of the system implementation and the identification of suitable counter-measures where indicated.

SG3. The system's security and measures may be independently evaluated and audited.

SG4. The system must comply with a designated policy for the processes of secure data disposal from the system.

SG5. The system may also use the communications resources provided by the Government such as National ICT Backbone, GovNet, etc using HTTP/HTTPS protocol for communication with the web browser and the web server and TCP/IP network protocol with HTTP/HTTPS protocol.

3.3 General Constraints and Risk

The system shall be Web-based and Mobile enabled. There is an assumption that, users will have some familiarity with Web-based and mobile (text-messages and USSD) systems.

Each requirement listed above pose a number of risk(s), which may cause minimal or big impact. This part addresses the risks that cannot be accepted and propose mitigation strategies. The following are the main risks;

3.3.1 Registration of Illegal Employee

SG1. Employee who will be allowed to login to the system and provide required details has to be uniquely identified and real, to resolve the risk of getting the wrong information and from the wrong person.

SG2. Only responsible personnel(s) will be responsible to enter details into the system.

SG3. Further, the use of the employee's unique identifier such as his or her check number (for Government Health Facility) or email address may be implemented to distinguish the users uniquely.

3.3.2 Privacy of Alerts Information

SG1. Emphasis should focus on the use of official government or business mails to avoid risks of disclosing patient sensitive information when sending reports through emails.

SG2. Alternative solution can be to put control measures on the system to avoid the system from sending status to non-government/business mails.

3.3.3 Security of the System

SG1. Ensuring security of data and information stored and processed by the system is the top issues that need to be addressed.

SG2. Security loopholes can happen in various ways including Denial of Service, malicious attacks, access control and others that can affect the integrity, confidentiality and availability of data.

SG3. The threats mentioned above can be reduced/avoided by implementation of stronger firewall, antivirus, patches, and standard policy for access control

3.3.4 Technology

SG1. The iHFeMS is expected to run over proper infrastructures that do not allow single point of failure.

SG2. This means that if network/hardware failures occur, other link should pick up and continue operation without user noticing, the same apply to all hardware infrastructures.

SG3. This can be accomplished by deploying redundant network links and hardware.

3.3.5 Process Management Change

SG1. Since most of clinical operations are currently done manually, the automation of this entire process may cause collapsing of some functions and creation of new opportunities.

SG2. Set up training for using new system and process change will help users interacting with the system to migrate to new ways of doing their work and therefore enjoy the opportunities.

3.3.6 Interoperability

SG1. The system should be capable to talk with other systems.

SG2. It could be possible that technical complexities disable communication between system and other functionalities/systems.

SG3. When this happen, developer can outsource/joint venture/search secondary sources to resolve the difficulties.

3.3.7 Reliability

SG1. System parts must work as expected, and the entire system behaves the same.

SG2. Some parts may be forgotten during development or they may be incomplete or may be complete but did not meet standards specified.

SG3. All of these issues may result to unreliable system for its users and stakeholders.

SG4. To ensure the system developed is reliable, several tests must be conducted prior to system acceptance

3.3.8 Technical Obsolescence

New technologies evolve every day; most of the time the new one is more improved in-terms of its efficiency and effectiveness. As time goes on, it's likely that iHFeMS may become obsolete. This may cause entire system or parts to malfunction. This risk can be mitigated by frequent system upgrade and

when necessary replace with newer system.

3.3.9 Schedule

SG1. The project is expected to finish within (agreed number of days as per contract) business days.

SG2. The schedule can remain the same given that no any change occurs during the specified period.

SG3. But several things may happen that can alter the schedule; including delaying in finishing sub tasks, delay or non-response in preparing stakeholder meeting, changing project leaders/teams, delay in obtaining the resources and so forth.

SG4. In order to ensure that the project finish within time, project sponsor should guarantee that all the resources are available in time, Project leadership/teams remain unchanged and project leader should guarantee all the deliverables are produced and at least half of the stakeholders attend meeting/workshops.

3.4 Standards and Information Exchange

It is required that the iHFeMS be able to share and exchange information with other systems in the health sector. This is important because of several reasons; increased efficiency through decreasing entry of duplicate data, decreased errors in medical information through the same mechanism, increased availability of health information promoting better decision making and improved continuity of patient care. The integration and information sharing between health systems requires systems to be interoperable. The interoperability is achieved through standardization process that requires the creation, acceptance and implementation of clinical data standards to ensure that data in one system are available and meaningful in another system. The selection of iHFeMS data, coding and interoperability standards has been guided by the following principles:

i. Open non-proprietary standards will be given preference over proprietary ones.

ii. International standards, which have been implemented and validated, will be preferred.

iii. Development of a new standard will only be considered as a last resort when there is no international standard available.

iv. The standards proposed will ensure value for money and minimize cost of compliance

Objectives

To identify the minimum set of standards required for implementing iHFeMS. The standards have been drawn from international standards.

Scope

The scope of the iHFeMS standards covers data exchange, coding standards to enable interoperability and data sharing.

Standard Guidelines

3.4.1 iHFeMS shall support Data exchange (or messaging) standards

SG1. The iHFeMS must have the capability to transmit and receive a defined minimum set of patient data via standardized HL7 messaging. Health Level 7 (HL7) is a flexible standard by which various health care systems can communicate with each other; it is typically used for transmission of patient level data.

SG2. By using the HL7 the iHFeMS shall be able to exchange of information, data standards have to be developed to ensure consistency of both structure and meaning of data between information

systems. Standard formats require agreement both on format (syntax) and meaning (semantics). Format is the order and structure of specific data fields, while meaning is expressed through the choice of coding schemes, rules, and other constraints on content.

3.4.2 iHFeMS shall support coding standards

SG1. The iHFeMS system should be able to build up the data for medical records using standard the International Classification of Diseases (ICD) version 10. International Classification of Diseases (ICD) is a statistical classification system used to assign diagnostic and procedural codes in order to produce coded data for statistical analysis, epidemiology, reimbursement and resource allocation.

3.4.3 iHFeMS shall support interoperability standards

For information sharing between different systems to occur it requires data exchange standards for packaging and transmitting the data.

SG1. The iHFeMS must be able to share data with other systems such as DHIS2, HRHIS, PACS, financial systems etc. using data exchange standards /communication interfaces e.g. Application Programming Interfaces (APIs) developed based on different technologies such as JSON, XML, DXML etc.

SG2. The system shall also be able to interface seamlessly with third party diagnostic devices such as digital X-Rays, MRIs etc.

SG3. In addition to the above, Health Facilities should adhere to eGovernment related standards and guidelines such as eGovernment Interoperability Framework (eGIF), Data Architecture etc.

3.5 Infrastructure and Human Resource Requirements

Deployment and implementation of the iHFeMS requires adequate and reliable computing infrastructure and human resource necessary to provide both technical and manage the operation of the iHFeMS from inception to operations.

3.5.1 Computing Infrastructure Requirements

For successful iHFeMS deployment and implementation in any health facility, adequate and reliable computing infrastructure is indispensable. This section puts forth the minimum computing infrastructure requirements necessary to support deployment and sustainable use of iHFeMS in a Public Health facility or in any multispecialty private or faith based Health facility.

Objective

To provide the minimum computing infrastructure requirements necessary to support the hosting of iHFeMS applications and provide communication and system platforms for users to access and use the system.

Scope

The minimum computing infrastructure requirements covered include the data center, network and Internet connectivity, workstations and computer training.

Standard Guidelines

3.5.1.1 Hosting environment (data center or sever room)

In order to implement iHFeMS, a Health facility should ensure a spacious, user and environmental

friendly room for housing ICT infrastructure and systems. The hosting environment should meet the following minimum requirements:

SG1. It must have reliable primary and backup power supply. Backup power supply solutions may include uninterrupted power supply (UPS), Inverter with battery bank, generator or solar power system enough to power all servers and network devices for at least 8 hours (preferably 12 hrs.)

SG2. It must have proper security including physical access controls and all visits must be recorded. Logbook or an automatic access control system should be registering all visits to the server room/ Data Center.

SG3. The hosting environment must be temperature controlled with air conditioner and well furnished. Furthermore, it must be free from dust, water leaks and humidity.

SG4. The servers should be rack mountable servers installed in lockable rack cabinets, together with required backup storage.

SG5. The hosting environment must have fire extinguishers and fire detection systems (alarms)

3.5.1.2 Network infrastructure shall be in place to support iHFeMS

Network infrastructure refers to the hardware and software resources of an entire network that enable network connectivity, communication, operations and management of a Health facility network. It includes local area network, wide area networks and Internet connectivity. The network and Internet connectivity should meet the following requirements:

SG1. Network drawings should be well updated and available at all times for reference.

SG2. Local area network (LAN) should have well structured cabling and well labeled considering quality cabling design. The design should separate access network from the backbone network that connects buildings.

SG3. The Wide Area Network (WAN) / Internet connectivity should have the required speed capable of supporting the business requirements. Depending on the deployment architecture used, a backup or redundant connection is required.

SG4. The LAN connection to the Internet must be restricted by the firewall.

3.5.1.3 There shall be computer workstations/terminals for end users

For end users to be able to use the iHFeMS, the need for computers and other computing devices in various service points in the Health facility is indispensable. However, before iHFeMS implementation at any Health facility, assessment to validate actual requirements based on minimum requirements done, and inventory list should be well maintained. Refer checklist in Appendix E.

3.5.2 Human Resource Requirements

The successful iHFeMS implementation requires right people at the right time both within and outside the Health facility. This section presents the minimum recommended competencies and roles for key players in the system implementation and operational process required for a success implementation and management of the iHFeMS. However the human requirements analysis will be reviewed when implementation approach has been selected for example iHFeMS operations may adopt a data clerk centered approach (retrospective data entry) or a clinician centered data entry approach (point of care systems). Both approaches will have different human resource requirements in terms of numbers and skills required.

Objectives

To provide the minimum recommended competencies and key role players required for a successful implementation, operationalization and management of the iHFeMS.

Scope

The minimum human resource competencies and key role players requirements covered include systems analyst, systems/network administrator, ICT support technician, and data/medical records clerks. These minimum requirements focus on different levels of Health facility both public and private.

Standard Guidelines

3.5.2.1 System Analyst

A system analyst shall be responsible for a variety of technical duties involved in planning, installing, maintaining, testing, and management of the Health facility's computerized information systems. The analyst shall also be responsible for identifying business requirements and translate the requirements into systems requirements for implementation. The minimum numbers of systems analysts required in each category of health facility is stipulated in Table 14.

3.5.2.2 System/Network Administrator

The system/network administrator shall be responsible for the upkeep, configuration, and maintenance of hardware and computer systems that make up a Health facility-computing infrastructure including the maintenance and monitoring of active data network, servers and related network equipment. See the minimum requirements for system/network administrator in Table 14.

3.5.2.3 ICT technician

Information and communication technology (ICT) technician shall be responsible to provide assistance to end users on the use of computer systems by answering questions, resolving technical problems and maintaining a Health facility's network, software and computer equipment. They are also called desktop support technicians or computer support specialists. They are first line support on all issues related to ICT and the systems at large, including the iHFeMS. The minimum number required is presented in Table 14.

3.5.2.4 Data/Medical Record Clerks

A data entry clerk shall be responsible for entering or updating data into a computer system, often from paper documents using a keyboard, optical scanner, or data recorder. Data or medical record clerks should be conversant with medical coding and data entry. Error! Reference source not found. provides the recommended staffing level for data.

It should be noted that, before implementation at any Health facility, assessment to validate actual requirements based on these minimum requirements should be done.

Table 3.13: Recommended ICT Staff

S/N	JOB TITLE	ZONAL	REGIONAL	DISTRICT
1	System Analyst	3	2	1
2	System/Network Administrator	4	2	1
3	ICT Support Technician	8	6	4
4	Data Entry Clerk/Computer Operator	10	5	3

Chapter
FOUR

IMPLEMENTING THE iHFeMS: GUIDELINES

Part C presents the minimum requirements and standards that the iHFeMS must meet to ensure that it create the value and the utility to its stakeholders. However, meeting the above-mentioned requirements alone does not guarantee successful implementation and use of the iHFeMS in a Health facility. Therefore in this part we provide a set of guidelines to ensure successful implementation and use of the iHFeMS.

Activities related to the implementation and use of iHFeMS in a Health facility can be grouped into three main phases. They are planning, deployment, and maintenance and support. In the following sections, a set of activities and guidelines is presented for each of the phases.

4. MPLEMENTING iHFeMS

4.1 Phase 1: Planning

Description

The implementation of the iHFeMS requires careful planning to ensure that the implementation proceeds in comprehensive, cost-effective and timely ways. This involves a range of activities including establishment of the governance structure, budgeting, development of the implementation work plan, acquiring the iHFeMS software, readiness assessment and procurement of the required computing infrastructure.

Objective

To ensure adequate allocation of resources for successful iHFeMS implementation

Scope

All iHFeMS implementation activities in the health facility shall be subjected to a formal business planning process.

Standard Guidelines

4.1.1 Establishing iHFeMS Governance

The Permanent Secretary (PS) in the Ministry Of Health, Community Development, Gender, Elderly and Children should be the Executive Sponsor of the iHFeMS implementation Project. The overall oversight of this initiative should be led by the National eHealth Steering Committee. Key project decisions and go-ahead approvals should be presented to the group.

The iHFeMS implementation should be led by the Head ICT at Ministry of Health, Community Development, Gender, Elderly and Children who is the current Champion of the project on behalf of the Ministry of Health, Community Development, Gender, Elderly and Children. The iHFeMS champion should be supported by the NeHSC to ensure the attainment of established objectives. The NeHSC should be supported by PO-RALG and Health facility iHFeMS implementation Lead, at

the Health facility level as local supervisor. The Health facility level lead should be the primary link between the Health facility iHFeMS steering committee and NeHSC.

The overall oversight of the initiative at the Health facility level should be led by the Health facility iHFeMS Steering Committee. Key project decisions and go-ahead approvals should be presented to the group. The health facility in-charge shall be the chairperson for regional and district Health facility steering committees. Quarterly updates should be provided to National eHealth Steering Committee and the Permanent Secretary (PS) in the Ministry of Health, Community Development, Gender, Elderly and Children who is the Executive Sponsor of this initiative.

Standard Guidelines:

SG1. The implementation of the iHFeMS shall be transparently managed and inclusive to ensure broad-based buy-in from a range of stakeholders throughout the various phases of the implementation.

SG2. All major stakeholders shall be in agreement as to who will assume responsibility for funding and carrying out tasks, and who will have the authority to make decisions.

SG3. Each Health facility shall form an iHFeMS steering committee to provide high-level oversight and provide a conduit between the implementation team, the Health facility officials, Ministry of Health, Community Development, Gender, Elderly and Children, PO-RALG, and other stakeholders. The steering committee members shall consists of the Health facility management team and other individuals that are identified as important during the iHFeMS implementation process.

SG4. Each Health facility shall establish an iHFeMS implementation team for daily operations of the system implementation and operations

SG5. Each Health facility shall appoint implementation team leader who will be responsible to daily management and supervision of the implementation activities and report to the Medical officer In charge and steering committee

SG6. The steering committee shall conduct a thorough review of each phase of implementation

SG7. The Ministry of Health, Community Development, Gender, Elderly and Children shall appoint NeHSC Coordinator to oversee all activities and provide technical advice to the respective Health facility on matters related to the iHFeMS implementation and use.

SG8. In all phases of the iHFeMS implementation, the Health facility implementation team shall work closely with the NeHSC Coordinator.

SG9. A quality assurance officer shall be appointed in the Health facility and shall be responsible for quality assurance of the iHFeMS project and shall work with the implementation team and all the respective Health facility departments involved in the project.

SG10. For self-sustainability of iHFeMS, health facility must dedicate a certain amount for system maintenance and other ICT Investments.

SG11. The Ministry of Health, Community Development, Gender, Elderly and Children shall continue with coordination and supervision roles to make sure that the implemented systems doesn't compromise with quality of health service delivery.

Table 4.1: iHFeMS Health Facility Level Implementation Team

Role	*Competencies*
iHFeMS Implementation Lead	Acts as the Champion at a Health facility level Project Management Budgeting Communication Activity Coordinator at the Health facility level
IT Systems Analyst	Requirements gathering, analysis, and recommendation Issue and change request analysis and prioritization
Procurement	Procurement of software, infrastructure and other hardware Contract Negotiations
System/Network Administrator	Installation, Configuration and Continuous troubleshooting of iHFeMS network and systems
IT Technician	Dealing with issues and request from end users
IHFEMS Trainers	Training planning Training need assessment Conduct training Perform training evaluation

4.1.2 Budgeting

Implementation of iHFeMS is a complex and challenging task. One obstacle to successful implementation can be the cost of converting to an electronic system when insufficient health care funding has been budgeted. It is essential that Health facility management and stakeholders involved in planning for iHFeMS implementation understand what funding is available and develop a timeframe for funding in conjunction with timetables for implementation.

The high cost of the software and computers means that the initial costs associated with the introduction of an iHFeMS are significant, both in terms of time and finance. However, the ongoing costs of running an iHFeMS as well as longer-term issues of maintenance and support are significant as well.

Initial Cost	• Infrastructure (Data center, communication network, computers, Internet) • Software • Training • Consultants
Ongoing Costs	• Enhancements • Training of replacement staff members • Evaluations

Maintenance and Support	• Equipment maintenance: Care of equipment (computers, touch screens, keyboards, card readers, etc.) • Corrective maintenance: Fixing bugs in code • Adaptive maintenance: Adapting the software to new environments • Perfective maintenance: Updating the software according to changes in user requirements • Preventive maintenance: Updating documentation and making the software more maintainable.

4.1.3 Payment Modalities

TCO is a financial estimate of both the monetary impact and human resource impact of acquiring, deploying, and retiring an information technology system over the life cycle of the product. It is comprised of a number of factors that can be categorised as: Acquisition (one time) expenses and Operational (ongoing) expenses.

Public Health Facilities must adhere to the following payment modalities for Total cost of Ownership (TCO):

SG1. There must be mutual agreement between the health facility owner and the service provider on the TCO payment mode, either through one time or installment. The TCO must be jointly established using the following criteria/parameters.

Requirement/Cost Element	Vendor Cost	Health Facility Cost
1. Investment Cost (One time Cost):		
a. Hardware		
b. Software		
c. Training cost		
d. Installation cost		
2. Operation and Maintenance:		
a. Hardware servicing		
b. Network – e.g. Bandwidth		
c. Software License		
d. Users support		
e. Hardware License (Routers, Switches)		
f. Escrow account		
3. Other Costs:		
a. New Requirements (like new modules)		
b. Extension of Access Points		
c. Hardware refreshing (after 5 years of operation)		

SG2. Incase of Payment by installment the amount and both parties must mutually agree with timeframe.

SG3. Any commission paid to the vendor from revenue collections must be the payment, which compensates the cost incurred by the vendor during the implementation and/or operationalization of the system.

SG4. Public health facilities must enter into agreement with one of the Government pre-qualified service providers who have been approved by the National eHealth Steering Committee (NeHSC).

4.1.4 Implementation Work Plan

The implementation of the iHFeMS requires a well-established work plan. Therefore prior to commencing any activity, public Health facility must seek advice to Ministry of Health, Community Development, Gender, Elderly and Children, eGovernment Agency (eGA), through PO-RALG on how to create the implementation work plan, and inform NeHSC at Ministry of Health, Community Development, Gender, Elderly and Children for approval. The work plan should explicitly state:

- Activity of the project
- Effort needed for each activity
- Dependencies of each activity
- Deliverables and milestones
- Resources assigned

A template of the implementation work plan is provided in Appendix A.

4.1.5 Acquiring the iHFeMS

Before implementing the iHFeMS in a health facility, Health facility management has to decide how to acquire the software for implementation. There are two possible options to obtain the right software for the Health facility. There are two types:

i. Make and Build from scratch or customization of an existing software

Options for acquiring software at a facility are either in-house or outsourced development of the system or customization of existing software from a vendor or free and open source system market. The ministry or individual Health facility may consider using public private partnership (PPP) to acquire an iHFeMS through Build–operate–transfer (BOT) project-financing form. Customized software is an alternative, which will deliver value to a Health facility in providing software, which meets exact requirements as defined during analysis and specifications.

ii. Purchasing an existing software (Commercial-off-the-shelf software)

Another possible option to acquiring the software at a facility is to buy existing software from a vendor. This option is further divided into two alternatives.

- Purchase software as a product in which a Health facility purchases and host it and managing itself while paying for annual license and maintenance fees.
- Purchase software as service from a vendor who will be responsible for deployment, implementation and maintenance while a Health facility will be paying fees for the service provided by the vendor. The vendor will have sole ownership of the system.

There are several factors to consider when buying the software, however one of the main factor is the Total cost of ownership (TCO). The overall goal is to select technology that minimizes TCO while meeting minimum functional and operational standards. Other challenges which should be critically analysed in order avoid them from occurring include:

- Dependency on the software vendor which sometimes leads to vendor lock in
- Incompatibilities from future modifications or upgrades of other systems
- Difficulty in integration with other systems
- Security issues

When evaluating the total cost of ownership (TCO), the following factors are to be considered:

- Acquisition Expenses
    - Software licensing (for the Public Health facilities must opt for Open source software)
    - Hardware (server, client workstations, mobile devices)
    - Infrastructure (networking hardware and software)
    - Technical support for installation and configuration costs
    - Initial training costs
- Operational (Ongoing) expenses
    - Software support – Configuration changes and version updates
    - Training costs
    - Migration costs. Should it ever become necessary to move to another vendor or system then the data within the system should be easy to export to a standard open formats e.g. excel or csv.

4.1.6 Readiness Assessment and Implementation Analysis

4.1.6.1 Readiness Assessment

The primary purpose of the assessment is to identify the needs and determine Health facility specific strategy for the iHFeMS implementation. The readiness assessment should be performed before procurement of the computing infrastructure. This assessment should include the following:

1) Describe the current workflows and any changes needed for improvement
2) Identify existing electronic systems for potential data migration and potential dependencies and interactions
3) Existing hardware that can be used
4) Infrastructure assessment (i.e. networking capacity, power, cooling system, physical security)
5) Identification of staff
6) Anticipation usage of the system
7) Planning for computer placement
8) Training need
9) Any special consideration for the Health facility

Role Involved	Responsible: Health facility management. Helpers: Health facility implementation lead, IT Systems Analyst, staff Acceptance: Health facility In charge Inform: Health Facility Management, Councils, Region and Central steering committees.
Dependencies	
Outputs and Impacts	Document: Health facility Implementation Readiness Assessment
Next step(s)	Implementation Analysis
Resources and Tools	Health facility Implementation Readiness Assessment Tool (Appendix C)

4.1.6.2 Implementation Analysis

Health facility must perform the implementation analysis. The primary input to this analysis is the implementation readiness assessment. The main purpose of performing the implementation analysis is to:

- Specify the workflows of the iHFeMS,
- Produce the computing infrastructure specification that include network and other infrastructure specification
- Identify staff and create training plan

Role Involved	Responsible: Health facility Management Helpers: Health facility implementation lead, IT Systems Analyst, staff Acceptance: Medical officer In charge Inform: Health Facility Management, Councils, Region and Central steering committees.
Dependencies	
Outputs and Impacts	Decision: Agreed workflow Document: Computing Infrastructure Specification Document: Training plan
Next step(s)	Computing Infrastructure Specification
Resources and Tools	Computing Infrastructure Recommendation

4.1.7 Procurement of Computing Infrastructure

Procurement of power systems, Network systems, and hardware based on the computing infrastructure specification document from the implementation analysis task. Contracting for any installation should be in this task as well.

Role Involved	Responsible: Health facility management Helpers: Procurement Officer Acceptance: Health facility In charge Inform: Health Facility Management, Councils, Region and Central steering committees.

Dependencies	Implementation analysis – *Started* Computing Infrastructure specification - *Finished*
Outputs and Impacts	Action: Computing Infrastructure procured Action: Installation Contract in place
Next step(s)	Computing Infrastructure Installation Network and System Administration Training

4.1.8 Quality Assurance in Acquisition of iHFeMS and the Computing Infrastructure Equipment

It is important to ensure that quality standards are observed when acquiring the iHFeMS and new hardware and software into the Health facility operating environment.

Objective

To ensure that quality standards are implemented when acquiring the iHFeMS, computer hardware and software for usage within the Health facility environment.

Scope

This guideline applies to the acquisition of the iHFeMS, new hardware, networking and software within the Health facility environment

Standard Guidelines

i. The iHFeMS and the computing infrastructure equipment that shall be acquired and installed in the Health facility environment must be compliant with the requirements stated in this guideline document

ii. All off-the-shelf iHFeMS software and the computing infrastructure equipment shall be acquired from reputable companies with verifiable references and must comply with procurement regulations

Responsibility

Responsible Person/Team	Responsibilities
iHFeMS implementation team	1. Confirm terms of reference 2. Ensure implementation of quality Standards in the acquisition process 3. Address any recommendation from quality assurance
Quality Assurance Officer	1. Confirm terms of reference 2. Check compliance with Standards and guidelines 3. Report QA findings to the facility in-charge

Procedure

The following quality standards should be considered for iHFeMS and the computing infrastructure equipment.

P1. Prior to iHFeMS or any other software is acquired, there must be a formalized requirements specification document prepared based on the national iHFeMS standards and that will be signed off and approved.

P2. All off-the-shelf software identified for acquisition should satisfy the formalized requirements specification document and should ensure minimal customization where possible.

P3. It is highly recommended that vendors for off-the-shelf software should have implemented the software in at least one similar facility successfully and the reference should be verifiable.

P4. The vendor should be able to offer support of the iHFeMS software post implementation.

P5. Capacity building plan should be developed and approved in the acquisition process to ensure that internal staffs are capacitated to support the iHFeMS

P6. For all acquired hardware there must be requirements specified by the user department which will be signed off and approved

P7. All software and computing infrastructure equipment should have a warranty for a specified period of not less than 1 year

4.2 Phase 2: Deployment

Deployment of the iHFeMS includes the following activities: installation of the computing infrastructure, deploying and configuration of the new iHFeMS software in its target environment, iHFeMS software acceptance testing, and training. Most importantly the training should include the following: basic computer training, iHFeMS software end user training, network and system administrators training and ICT governance training for managers.

Objectives

To ensure that the installation or implementation of computing infrastructure, iHFeMS software acceptance and Training is compliant with Organization Guidelines and quality standards

Scope

To ensure that the iHFeMS is being deployed according the approved approach and Standards guidelines

Standard Guidelines

4.2.1 Installation of Computing Infrastructure

Prior to installation of iHFeMS software, the procured computing infrastructure must be delivered and installed. Experts hired by the Health facility through a competitive tendering process should perform the installation.

Role Involved	Responsible: Vendor Helpers: Health facility implementation lead, IT Systems Analyst, System/ Network Administrator Acceptance: Health facility In charge Inform: Health Facility Management, Councils, Region and Central steering committees.
Dependencies	Procurement – *Finished*
Outputs and Impacts	Action: Computing infrastructure Installed Document: Network Diagram, and System Configuration

Next step(s)	Server Setup and Software Installation
Resources and Tools	

The computing infrastructure should be appropriately documented to facilitate proper assessment, maintenance and support. The documentation should include network diagram, network devices configuration, and guidelines for data center management and network management.

4.2.2 Software Configuration and Installation

Once the computing infrastructures have been installed, the next step is the configuration and installation of the iHFeMS software. The configuration will include deployment of new forms, new reports and configuring the iHFeMS software for the specific Health facility. The installation will include server and software installation. This will depend on the deployment architecture adapted by the Ministry and the Health facility.

Role Involved	Responsible: Vendor Helpers: Implementation lead, IT System Analyst, Network/System Administrator Acceptance: Health facility management Inform: Health Facility Management, Councils, Region and Central steering committees.
Dependencies	iHFeMS acquisition – Finished Computing Infrastructure Installation - Started
Outputs and Impacts	Action: iHFeMS software configured and installed Document: System Configuration Document: Technical and user manual
Next step(s)	System Acceptance Testing
Resources and Tools	

The iHFeMS system should be appropriately documented to facilitate continuity among developers and the system users. The software vendor must provide the following types of documentation:

4.2.3 Technical documentation

Technical documentation should include maintenance and installation guides, ideally these should be available electronically as well as in printed format.

Technical documentation should also provide an overview of the system to enable further development work to happen without too much churn, it should include: diagrammatic illustrations of system data flow, logical and physical architecture, description of the software design methodologies, system code base, code patterns, description of the database design and the system's data dictionary.

i. User documentation

User documentation is needed by system end users and should be written in simple, user-friendly language. User documentation should include electronic context sensitive help and printable training manuals. This document provides a step-by-step guide on iHFeMS system functionalities and instructions on how to use the system. It should cover how to run the system, how to enter data, how to modify data and how to save and print reports. It should include a list of error messages and advice on what to do if something goes wrong.

ii. System Acceptance Testing

System testing is an important step when rolling out any software. Before the system is put into production, the key stakeholders must perform acceptance testing to get the buy-off of the functionality. This should be done after every release of the system.

Role Involved	Responsible: Vendor Helpers: Health facility implementation lead, Staff (target end users), NeHSC Inform: Health Facility Management, Councils, Region and Central steering committees.
Dependencies	Software Installation – *Finished* Software Configuration - *Finished*
Outputs and Impacts	Action: Stakeholders have approved the system
Next step(s)	Training
Resources and Tools	System Acceptance Testing Tool

4.2.4 Training

Critical to the success of the iHFeMS implementation and use is training of human capital of the Health facility. Users must be trained prior to iHFeMS implementation. Successful implementation will only occur if users like the system and commit to use it. Users need to understand what benefit the new system has for them, why they should use this new system, and how it is going to make their jobs easier. The Health facility management needs to understand how it is going to make them and their Health facility look better.

Health facility staff members must be trained in all aspects of managing the iHFeMS that are relevant to their roles and responsibilities. Specific training areas should include the following:

i. ***Basic computer training:*** This training is aimed at providing basic computer skills needed for users to use a computer. All prospective users of iHFeMS should be trained.
   - The training should be conducted prior to the implementation of the system
   - ICT staff of the Health facility, or ICT staff from the regional and district administration departments should conduct it.

ii. ***iHFeMS end user training:*** This training should cover how to use iHFeMS.
   - The training should take the training-of-trainers (ToT) cascade approach.
   - The training should be conducted before the system is put into production
   - The iHFeMS vendor should provide a training of trainers (TOTs) before training end users. The target group should be ICT staff and one member from each functional department.
   - Internal certified trainers should conduct end user training.
   - End user training should be user focused and tailored to individuals' roles in the Health facility and not the system functionality focused.

iii. ***Network and System Administration Training:*** The technical training is targeted at the ICT personnel at the Health facility. It covers areas related to planning, design, deployment, operationalization and management of IT infrastructure and information systems.

- It should be conducted after installation of the computing infrastructure and the software
- It should be conducted by iHFeMS vendor experts and coordinated by ICT Departments at POMRALG and Ministry of Health, Community Development, Gender, Elderly and Children in consultation with Health facility management.

iv. ***ICT governance:*** The ICT governance training aims at building the knowledge of managers and members of the management with knowledge and concept about the iHFeMS. Participants of the training should include members of Health facility management teams.

- This training should be conducted during kick off of the iHFeMS implementation in respective Health facility.
- It should be conducted by experts and coordinated by ICT department at PO-RALG in collaboration with ICT Department at the Ministry of Health, Community Development, Gender, Elderly and Children.

Role Involved	Responsible: Trainers Helpers: Health facility Implementation Lead, Vendor Acceptance: Health Facility In charge Inform: Health Facility Management, Councils, Region and Central steering committees.
Dependencies	Software Configuration – *Finished* System Acceptance Testing - *Finished*
Outputs and Impacts	Document: Training materials Action: end user trained and evaluated
Next step(s)	Trial-run
Resources and Tools	

4.2.5 Trial-run/Deployment Approach

Before the new system is put into production it should be piloted. After users have been trained, Health facility should run a limited trial-run of the iHFeMS in parallel to any previous system (paper or otherwise) to allow users to test their knowledge in using the system and make sure they full understand how to perform their job with the new system in place. At the end of the trial-run, the trial-run must be assessed to determine whether the Health facility is ready to go to production use of the new system. The assessment should be guided by a well define Trial-run to Production Readiness Assessment Tool (see Appendix D).

Role Involved	Responsible: Vendor Helpers: Health Facility In charge, Health facility staff, NeHSC Acceptance: Health Facility In charge Inform: Health Facility Management, Councils, Region and Central steering committees.
Dependencies	System Acceptance Testing – *Finished* Training - *Finished*
Outputs and Impacts	Action: Users using the system in timely manner, consistently, and accurately Action: Health facility passes pilot to production readiness assessment

Next step(s)	Pilot to production
Resources and Tools	Pilot to Production Assessment Tool

4.2.6 Trial-run to Production

Once the Health facility has passed the readiness assessment during the trial-run, the system should be moved into production.

Role Involved	Responsible: Vendor Helpers: Health Facility In charge, Health facility staff, NeHSC Acceptance: Health Facility In charge Inform: Health Facility Management, Councils, Region and Central steering committees.
Dependencies	Pilot– *Finished*
Outputs and Impacts	Action: New system is in use for production; previous systems are deprecated and cycled out of production
Next step(s)	
Resources and Tools	

4.2.7 Quality Assurance During iHFeMS Implementation

Description

Quality should be observed at implementation of iHFeMS project as well as installation of other software and computing infrastructure equipment.

Objective

To ensure that the installation or implementation of software and computing infrastructure equipment is compliant with standards and guidelines

Scope

This applies to all software and computing infrastructure equipment in the health facility environment

Standard Guidelines

i. The implementation of the iHFeMS and the computing infrastructure shall be compliant with the national iHFeMS standards and guidelines

Responsibility

Responsible Person/Team	Responsibilities
iHFeMS implementation team	1. Ensure implementation of quality standards in the acquisition process 2. Address any recommendation from quality assurance
Quality Assurance Officer	1. Check compliance with standards and guidelines 2. Report QA findings to the facility in-charge

Procedure

P1. Implementation of the iHFeMS and the computing infrastructure should be compliant with the national iHFeMS standards and guidelines. The following should be considered:

a. A quality plan should be developed and referenced in the implementation process and it should be approved by the iHFeMS steering committee.

b. Quality assurance should be deployed at all stages to ensure that the standards are maintained at all times.

c. Only competent individuals should be in the iHFeMS implementation team.

P2. The quality assurance officer (QAO) shall ensure that the implementation of the iHFeMS is in line with the stipulated guidelines related to iHFeMS software and the computing infrastructure. Where there are variations the QAO shall flag all the issues to the implementation team and the steering committee

4.3 Phase 3: Maintenance and Support

Maintenance and support of the iHFeMS operations is an essential ingredient in making its adoption successful and thus achieve the intended organizational goals. Maintenance aims at retaining the system in the working state; with support of the ICT Team to enable users achieve their objectives. Furthermore maintenance includes both preventive and incidental maintenance.

On the other hand, support include additional training, assisting end users, modifications and enhancements, disaster preparedness and recovery as well as undertaking activities such as upgrades, migration, re-installing software, trouble shooting, and regular assessment of system usage.

Objective

To guide iHFeMS maintenance and support activities to ensure smooth system performance and usage

Scope

The support and maintenance guidelines and procedures cover iHFeMS software, computing infrastructure equipment and end users

Standard Guidelines

SG1 Initial maintenance and support shall be provided by the supplier of the iHFeMS for at least six months, and should be part of the supply and implementation contract

SG2 Health facilities shall have at least one year maintenance and support Service Level Agreement (SLA) with the supplier of the iHFeMS after commissioning

SG3 Health facilities shall put in place change management mechanisms for identifying changes in Health facility functions and workflows that needs to be reflected and accommodated in the iHFeMS, and continuously track and identify bugs or errors (see iHFeMS change management sub section below)

SG4 Health facilities shall ensure security of ICT infrastructure and systems and patient and other business data and information. (See iHFeMS security monitoring subsection)

Responsibility

End users	1. Request support and maintenance services from approved ICT personnel/ Team 2. Maintain proper operations of the system and related hardware
ICT Team	1. Ensure that all support activities are done in a timely manner in accordance to support and maintenance guidelines 2. Ensure that competent and approved personnel carry out support either internally or externally 3. Liaise with the vendor on addition and modification of iHFeMS functionalities 4. Determine and conduct continuous training to end users

4.3.1 iHFeMS Change Management

This guideline ensures standardized methods; processes and procedures are used for all changes, and maintain proper balance between the need for change and the potential detrimental impact of changes. Effective change management is very crucial in Health facility settings for controlling changes to iHFeMS and other supporting systems within the live Health facility environment.

Objective

To implement formal change management control procedures that protect Health facility information assets and to ensure that the change management procedure is used for efficient, planned, authorized and prompt handling of all changes, in order to minimize the impact of any related incidents upon service provision in a live healthcare environment.

Scope

This guideline addresses the definition and documentation of Health facility information assets change management control procedures. The guideline applies to normal and emergency changes that affect the iHFeMS, and the computing infrastructure including network, and hardware, software and all documentation and procedures associated with the running, support and maintenance of live ICT systems in the Health facility settings. Changes to iHFeMS and other supporting systems & applications include the following categories:

i. Changes to hardware and hardware configurations;

ii. Changes to operating systems and operating system configurations;

iii. Changes to iHFeMS software and other supporting application software configurations;

iv. Changes to user access configurations;

v. Changes to network and communication device configurations;

vi. Changes to configuration of physical access and environmental control devices.

vii. iHFeMS Functionality enhancements

Standard Guidelines

Changes to all information processing facilities, systems, software, or procedure should be strictly controlled according to formal change management procedures. This section contains the Standard guidelines.

SG1 **Change Initiation:** All system changes shall be initiated by filling in the change control form, which will be signed by the respective heads of department, and addressed to the ICT department.

SG2 **Change Authorization:** Authorization for any changes, whether urgent or not, shall be given by the head of the ICT department if satisfied that the reason for the change is sound and that there is no adverse effect as a result of the change.

SG3 **Testing of changes:** All testing shall be done from a test environment. No change will be applied to the live/production environment without having been tested in the test environment.

SG4 **Change approval:** The concerned user departments shall check the system to see whether the results produced are as expected and a user acceptance testing (UAT) form shall be signed off.

SG5 **Change Scheduling:** To minimize disruption to the normal working operations of the Health facility, no changes shall be effected in the system during normal working hours unless absolutely necessary. All changes will be scheduled during weekends, public holidays or after business working hours.

SG6 **Change Communication:** All planned system changes shall be communicated in advance to the concerned parties to minimize on business disruption and inconveniences. For avoidance of doubt, no scheduled system change should be effected in the live iHFeMS during a busy business cycle.

SG7 **Change Recovery, Safety measures:** Before effecting any change in the production environment, a backup on a clearly labelled storage media shall be taken and kept for good. In the event that the change made produces unexpected results, the backup taken before the change was effected has to be used to restore the system to the point before the change.

SG8 **Change Documentation and tracking:** All system changes, whether approved or not shall be documented and filed. The documentation shall include a duly completed and signed off "change request form", the test results and any other comments/documents used.

4.3.2 iHFeMS Security Monitoring

This guideline and its supporting standards outline the requirements needed to protect the iHFeMS information through the enforcement of logging, monitoring and auditing processes

Objective

To provide for the tracking of computing resource activity that will benefit the disclosure of unauthorized activity and to ensure the security status of the iHFeMS is known and understood by those who are responsible for maintaining that security.

Scope

The tracking of security related events and the data logs produced by the tracking mechanisms.

Standard Guidelines

SG1 Daily logs of all security events will be reviewed for unusual security events with further investigation of unusual events.

SG2 Sufficient information for after-the-fact investigation of unauthorized activity must be logged. At a minimum the information in the tracking record associated with each event must include: User ID; Associated terminal, port, network address, communication device; Information or system accessed; Date and time of access; and Event Description.

SG3 Health facility computing resources should be sufficiently monitored by a person responsible for ICT security to detect deviations from authorized use.

SG4 Regular monitoring of the secure status of all Health facility electronic information must be undertaken, principally through the applications, platforms and infrastructure that support it.

SG5 Monitoring of user activity on Health facility applications and the platforms supporting them must be undertaken on a regular basis, using the logs of user activity provided by those systems.

SG6 Any actual or suspected breach of security or related incident will be reported, recorded and appropriate action taken to limit and remedy any impact on the security of the Health facility.

SG7 The Health facility reserves the right to conduct all such monitoring activities on its systems as are necessary to preserve and measure the security of its information and assets.

SG8 All employees, agents and contractors who make any use of Health facility systems must be informed of the Health facility's right to monitor all such use and inspect any information entrusted to Health facility systems, whether personal or not.

SG9 Monitoring of Health facility systems and access to logs and other information produced during monitoring must be restricted to employees specifically authorized to conduct such monitoring as part of their normal duties.

SG10 Measures must be put in place to protect logging facilities and log information against tampering and unauthorized access.

SG11 The clocks of all relevant information systems (e.g., networking devices, servers, and PC's) must be synchronized with an accurate time source for accuracy of timestamps on logs.

Responsibility

Role	Responsibilities
All Users	All Health facility users who are in possession of, or control access to Health facility information or computers covered by this Guideline are responsible and accountable for its protection in accordance with this Guideline and supporting guidelines and procedures.

Chapter
FIVE

MONITORING AND EVALUATION (M & E)

5. MONITORING AND EVALUATION (M & E)

5.1 Description

Monitoring and evaluation is vital to ensure successful implementation and smooth operation of iHFeMS. As part of M & E, quality assurance exercise should run throughout the life cycle of the project especially during procurement of the iHFeMS and implementation process to ensure compliance with the national iHFeMS standards and guidelines. Furthermore, it is necessary to track and evaluate the implementation and functioning of the system in order to understand how well the implementation objectives have been met and the effect of iHFeMS in the day-to-day Health facility operations.

5.2 Objective

- To ensure iHFeMS implementation activities are performed as intended, compliant with the national iHFeMS standards and guidelines and the system is functioning as expected
- To measure the effects of the iHFeMS in the Health facility performance such as boosting Health facility revenues, improving administration and service provision, as well as preventing loss of medicines and other medical supplies.

5.3 cope

Applies to all activities pertaining to the implementation and use of iHFeMS

5.4 Standard Guidelines

SG1 Monitoring and Evaluation shall run throughout the life span of the iHFeMS implementation project

SG2 Health facilities shall develop an M & E plan during the planning phase as an integral component of the iHFeMS implementation work plan.

SG3 Health facilities shall assess whether implementation activities have been performed as intended, and the system is functioning as expected.

SG4 Health facility shall measure the effects of the iHFeMS, by assessing its impact or outcome including:

a. Whether it boost Health facility revenues

b. Improve Health facility administration

c. Improve performance of Health facility operations

d. Prevent loss of medicines and other medical supplies

e. Enable and improves patient tracking

f. Optimize iHFeMS performance and operations

5.5 Procedures

P1. Develop an M&E plan describing:

   a. What will be monitored and/or evaluated

   b. What data are needed and will be collected

   c. How data will be used

   d. How M&E activities will be managed and supported

P2. Develop a monitoring toolkit (methodologies, tools, and analysis plan)

P3. Carry out the M & E exercise based on the plan and the implementation phase

P4. Make use of monitoring findings

P5. Take action and document lessons

P6. Submit monitoring & evaluation report to the relevant authorities.

Chapter
SIX

iHFeMS IMPLEMENTATION CLOSURE AND SIGN-OFF

6. iHFeMS IMPLEMENTATION CLOSURE AND SIGN-OFF

6.1 Description

iHFeMS implementation closure and sign-off is a formal process of winding up the activity. It helps the health facility management to account for the activities and the deliverables.

6.2 Objective

To confirm and approve the final iHFeMS project deliverables and officially close the iHFeMS implementation

6.3 Scope

The scope covers the entire iHFeMS implementation within the health facility setting.

6.4 Standard Guidelines

SG1 The iHFeMS implementation must come to an end either through abortion or completion and in all cases closure processes and sign- off shall be conducted and completed

SG2 The completed iHFeMS implementation must be officially signed off by health facility in-charge

SG3 The iHFeMS implementation must come to an end after all the deliverables have been delivered and accepted by the user departments

SG4 All deliverables resulting from the iHFeMS implementation shall be recorded and archived.

Responsibility

Roles	Responsibilities
User department	Approve and signoff deliverables (Modules)
iHFeMS implementation team	1. Ensure that all project deliverables are completed. 2. Confirm with user departments for all completed deliverables 3. Record and achieve completed deliverables 4. Submit deliverables to the health facility in-charge
Health Facility in-charge	Approve and sign off completed deliverables.

6.5 Procedures

The iHFeMS implementation closure procedure shall commence with the delivery and handover of the project final deliverables to the user department.

P1. Upon the user department testing and accepting the deliverable(s), a sign-off or a rejection of the deliverable(s) shall be made by the head of the user department.

P2. Rejection of the deliverable shall lead to a rework in order to address all the issues raised.

P3. Document lessons learnt from iHFeMS implementation

P4. Documentation of any outstanding issues

P5. Documentation of iHFeMS project risks

P6. Acceptance of the iHFeMS implementation deliverables

P7. All hard copy documentation such as signed off files and documentation shall be compiled, indexed and archived using the Health facility archiving procedures.

Chapter
SEVEN

GUIDELINES FOR ACCESSING COMPLIANCE OF EXISTING iHFeMS

7. GUIDELINES FOR ACCESSING COMPLIANCE OF EXISTING iHFeMS

7.1 Description

It is undeniable fact that there are efforts to computerize various clinical and administrative functions noticeable in some health facilities in the country. While there is significant improvement in management of health resources and service provision in those facilities, the degree of success on these automations varies significantly, with some obtaining suboptimal results. In order to ensure that Health facility accrue maximum benefits from the existing systems and be able to address issues of standards and data exchange, a number of activities need to be carried out by the respective facilities. This will ensure that the existing systems become compliant with the national iHFeMS standards and guidelines.

7.2 Objective

To guide health facilities with existing iHFeMS to improve their systems to meet the national iHFeMS standards and guidelines

7.3 Scope

The guidelines cater for the health facilities that need to improve their existing iHFeMS.

7.4 Standard Guidelines

SG1 Health facilities with existing iHFeMS should conduct assessment to ensure compliance with the national iHFeMS implementation standards and guidelines.

SG2 The health facilities with existing iHFeMS that meets the stipulated national standards upon passing rigorous assessment by Central Certification Team in collaboration with the health facility shall officially be certified as an indication of compliance with the national iHFeMS standards and guidelines.

SG3 The health facility that fall short of the stipulated national iHFeMS guidelines and standards shall improve their existing system by following the stipulated standards, guidelines and procedures (See Figure 9).

SG4 Following improvement of the existing iHFeMS, the health facility shall conduct again a thorough and rigorous assessment of the same, to ensure compliance with the national standards and guidelines. Upon passing the rigorous assessment the health facility shall be certified by the Ministry of Health, Community Development, Gender, Elderly and Children as an indication of compliance with the national iHFeMS standards and guidelines.

SG5 The existing iHFeMS systems that prove difficult to improve as per the rigorous assessment and a thorough cost-benefit analysis of the system conducted by the Health facility in collaboration with the Central Certification Team `shall require total replacement. The health facility shall then follow the stipulated guidelines and procedures to acquire and implement a new iHFeMS system (Refer to Figure 9)

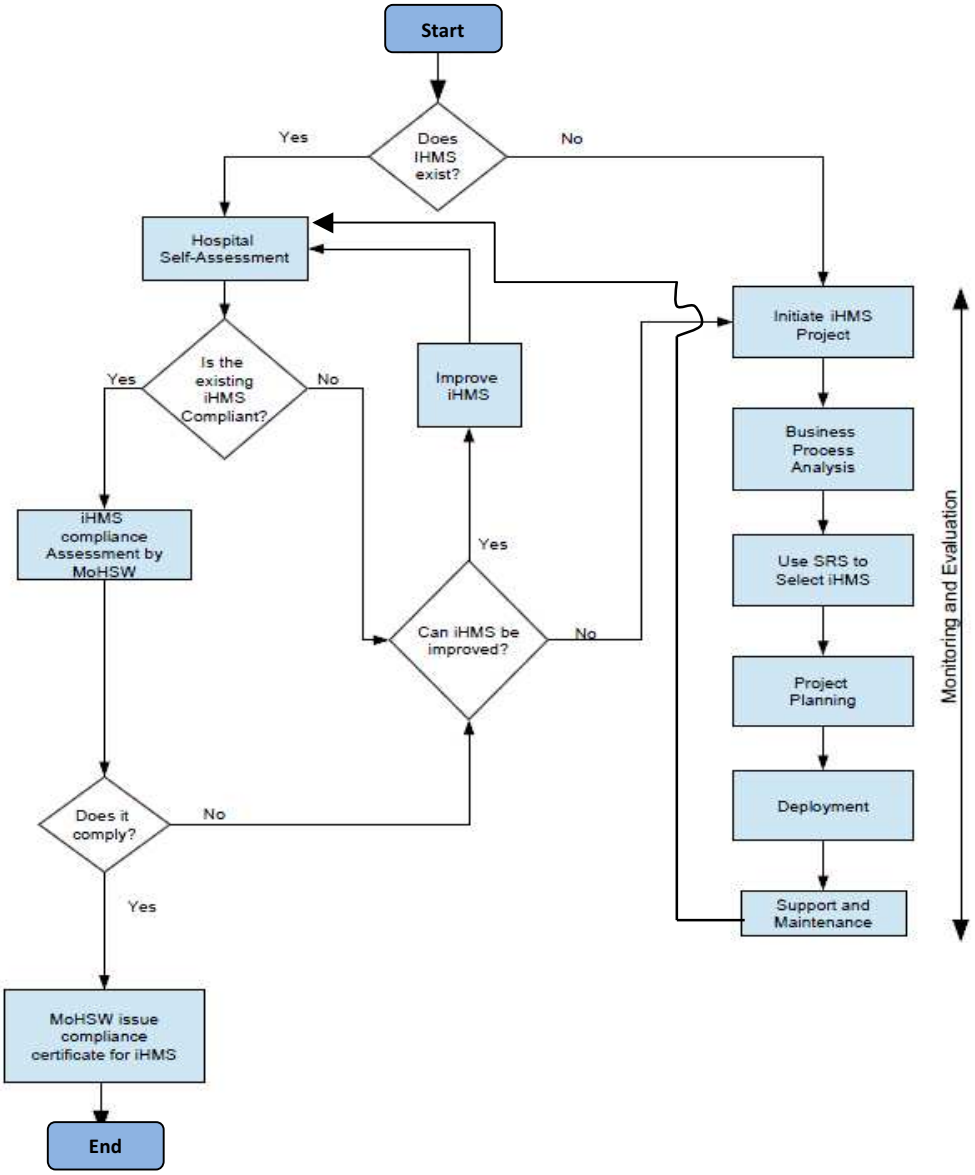

Figure 8: Flow of Activities for Assessing and Improving an Existing iHFeMS

Responsibilities

Responsible Person/team	Roles
iHFeMS implementation team	1. Prepare, review and test the iHFeMS assessment tool using the iHFeMS assessment template 2. Conduct assessment of the existing iHFeMS 3. Analyze the data and prepare assessment report 4. Share assessment report with the Health facility in-charge
Health facility Management Team	5. Review the assessment report and make a decision as per the national iHFeMS standards and guidelines 6. Take action to certify, improve or replace the existing iHFeMS with a new system as per the assessment results

7.5 Procedures

P1. Review the standard iHFeMS assessment tool. Health facilities are at liberty to add more parameters in the assessment tool, as long as the standard parameters remain intact.

P2. Test and review the assessment tool to ensure consistent and effective results

P3. Conduct the assessment of the existing iHFeMS covering all the areas stipulated in the tool

P4. Conduct data analysis and report writing

P5. Submit the assessment report to the facility in-charge, who will table it to the Health facility management team for review, and comments

P6. Take action in-line with the assessment results and the national iHFeMS standards and guidelines (Refer Figure 9)

APPENDICES

Appendix A: Participants Involved in the Development of the Document

No.	Name	Organization
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11	Dr. Angelina Sijaona	Ministry of Health, Community Development, Gender, Elderly and Children
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12	Dr. Nicholas Chiduo	MMOH- Morogoro
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16	Christopher Kikongi	Muhimbili National Hospital (MNH)
15	Geofrey Semu	Muhimbili National Hospital (MNH)
17	Patrick Muro	Muhimbili National Hospital (MNH)
18	Bakari Yahaya	NHIF
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20	Godfrey Nyombi	RS/RHMT Mtwara
21	Nseya Kipilyango	RTI
22	Dr. Elias Mturi	University Computing Center (UCC)
23	Dr. John Paul Kaswija	Zonal Health Resource Center, Lake Zone

Appendix B: Implementation Work Plan Template

No.	Activities	Input	Responsible Person	Outputs and Target
Phase 1 – Planning				
1.1	Formation of Health facility iHFeMS steering committees	• iHFeMS implementation Guidelines	• Health facility	iHFeMS steering committees
1.2	Formation of Health facility iHFeMS implementation team	• iHFeMS implementation Guidelines	• Health facility	iHFeMS implementation team
1.3	Appointing iHFeMS project team leader	• iHFeMS implementation Guidelines	• Health facility	iHFeMS project team leader
1.4	Preparation of the iHFeMS implementation budget	• Feasibility Study Report • iHFeMS implementation Guidelines	• iHFeMS implementation team • Health facility iHFeMS steering committees • iHFeMS project team leader	iHFeMS implementation budget
1.5	Resource mobilization for iHFeMS implementation	• iHFeMS implementation Guidelines	• Ministry of Health, Community Development, Gender, Elderly and Children • iHFeMS implementation team • Health facility iHFeMS steering committees • iHFeMS project team leader	Required resources available
1.6	Creating Implementation Work Plan (using this template)	• Feasibility study report • iHFeMS implementation Guidelines	• iHFeMS implementation team • Health facility iHFeMS steering committees • iHFeMS project team leader	Implementation Work Plan
No.	**Activities**	**Input**	**Responsible Person**	**Outputs and Target**

1.7	Conducting iHFeMS stakeholder awareness workshop including all top level Health facility officials	• iHFeMS implementation Guidelines	• iHFeMS implementation team • Health facility iHFeMS steering committees • iHFeMS project team leader	iHFeMS stakeholder awareness workshop
1.8	Acquiring the iHFeMS Software	• iHFeMS implementation Guidelines	• iHFeMS implementation team • Health facility iHFeMS steering committees • iHFeMS project team leader	iHFeMS Software
1.9	Conducting Health facility Readiness Assessment	• iHFeMS implementation Guidelines	• iHFeMS implementation team • iHFeMS project team leader	Health facility Readiness Assessment report
1.10	Conducting iHFeMS Implementation Analysis	• iHFeMS implementation Guidelines	• iHFeMS implementation team • iHFeMS project leader	iHFeMS Implementation Analysis report
1.11	Procurement of Computing Infrastructure	• iHFeMS implementation Guidelines • Funds	• iHFeMS implementation team • iHFeMS project leader • Procurement unit	Computing Infrastructure equipment
Phase 2 – Installation				
2.1	Installation of Computing Infrastructure	• ToR • iHFeMS implementation Guidelines	• Consultant • iHFeMS implementation team • Health facility iHFeMS project leader	Computing Infrastructure
No.	**Activities**	**Input**	**Responsible Person**	**Outputs and Target**

2.2	Software Configuration and Installation	• ToR • iHFeMS implementation Guidelines	• Consultant • iHFeMS implementation team • Health facility iHFeMS project leader	Software Configured
2.2.1	Preparation of Technical documentation	• ToR • iHFeMS implementation Guidelines	• Consultant • iHFeMS implementation team • Health facility iHFeMS implementation leader	Technical documentation
2.2.2	Preparation of User documentation	• ToR • iHFeMS implementation Guidelines	• Consultant • iHFeMS implementation team • Health facility iHFeMS implementation leader	User documentation
2.3	System Acceptance Testing	• ToR • iHFeMS implementation Guidelines	• Consultant • iHFeMS implementation team • Health facility iHFeMS implementation leader	System Acceptance Testing report
2.4	Training			
2.4.1	Basic computer training	• ToR • iHFeMS implementation Guidelines	• Consultant • iHFeMS implementation team • Health facility iHFeMS implementation leader	Health facility Staff trained on basic computer
2.4.2	iHFeMS end user training	• ToR • iHFeMS implementation Guidelines	• Consultant • iHFeMS implementation team • Health facility iHFeMS implementation leader	Health facility Staff trained on iHFeMS
No.	**Activities**	**Input**	**Responsible Person**	**Outputs and Target**

2.4.3	Network and System Administration Training	• ToR • iHFeMS implementation Guidelines	• Consultant • iHFeMS implementation team • Health facility iHFeMS implementation leader	Network and System Administrators trained
2.4.4	ICT governance Training	• ToR • iHFeMS implementation Guidelines	• Consultant • iHFeMS implementation team • Health facility iHFeMS implementation leader	Managers trained on ICT governance
2.5	iHFeMS Piloting	• ToR • iHFeMS implementation Guidelines	• Consultant • iHFeMS implementation team	iHFeMS piloted
2.6	iHFeMS production	• ToR • iHFeMS implementation Guidelines	• Consultant • iHFeMS implementation team • Health facility iHFeMS implementation leader	iHFeMS in actual use
3.0	***iHFeMS Maintenance and Support***			
3.1	Provision of iHFeMS maintenance and support for a period of six months (should be part of the implementation contract)	• iHFeMS software maintenance & support plan • iHFeMS performance analysis tool	• iHFeMS Consultant • iHFeMS implementation team • Health facility iHFeMS implementation leader	List of issues attended
3.2	Monthly maintenance and support reports covering issues reported and attended to, performance of the Health facility based on the system performance analysis tool	• List of issues attended	• iHFeMS Consultant • iHFeMS implementation team • Health facility iHFeMS project leader	iHFeMS monthly maintenance and support reports

3.3	One year maintenance and support Service Level Agreement (SLA) with the supplier of the iHFeMS after commissioning	• iHFeMS quarterly maintenance and support reports • Final project implementation report	• Ministry of Health, Community Development, Gender, Elderly and Children • iHFeMS Consultant • iHFeMS implementation team • Health facility iHFeMS project leader	iHFeMS maintenance and support Service Level Agreement (SLA)

Appendix C: Implementation Readiness Assessment Tool

iHFeMS Implementation Readiness Assessment

Facility Overview

Health Facility Name	
Location (Region, District, County, etc)	
Assessment Date	
Assessor(s) Name(s)	
Facility Representative Name and Contact	Name: Position: Phone: Email:
Hours of Operation	
No. Of patient encounter points	
No. Of clinical rooms	

Workflow Assessment

Current workflow in the clinic:

Task	Who performs the task?	Where is the task performed?	Constraints & Remarks
Register Patient (in Logbook, in HMIS)			
Create New Patient Record (in HMIS)			
Measure Vital Signs			
Document Vital Signs			
Conduct Patient Examination			
Document Patient Examination			
Write Drug Order			
Write Lab Order			
Obtain Patient Drugs			
Take Patient Blood Sample			
Enter Test Results in HMIS			
Print Visit Summary			
Schedule Next Visit			

After the system is implemented at the clinic, who will be responsible for:

	Doctor	Nurse	M&E staff	Receptionist	Other
Entering patient visit data into system					
Running reports using system					
Assigning and managing user accounts for system					
Checking data quality on a regular basis					
Checking that the most recent version of the system is being used at the clinic					
Backing up data on a regular basis					

How do you think using the new system will impact workflow in the hospital? What processes might change?

How do you think using the new system will impact practice in the hospital? What practices might change?

Existing Systems

Health Facility Management System

Name: _____

Developing Organization: _____

Open Source? YES NO

Can we have the code and database? YES NO

Web-based? YES NO

Technologies Used (check all that apply):

___ Access ___ Access/MYSQL ___ JAVA ___ PHP

___ VB ___ .NET ___ FileMakerPro ___ Excel

___ OTHER: SPECIFY _____

Database Used:

Is it used as the Patient Registration system? YES NO

Other Information? _____

Other Systems

[Repeat for each other system]

Type of System / Function: _____

Name: _____

Developing Organization: _____

Open Source? YES NO

Can we have the code and database? YES NO

Web-based? YES NO

Technologies Used (check all that apply):

___ Access ___ Access/MYSQL ___ JAVA ___ PHP

___ VB ___ .NET ___ FileMakerPro ___ Excel

___ OTHER: SPECIFY _____

Database Used:

Do any other systems interact with this?

Other Information?

Training Needs

Trainers

Who will be able to use and teach the system functions to other staff (after receiving training)?

Is this person willing to be the facility mentor? YES NO

Does this person already have?

Mentoring skills YES NO

Technical ability YES NO

Relationship and interpersonal skills YES NO

Staff

How many of the following personnel work at this Hospital?

Doctors: _____

Nurses: _____

M&E staff: _____

Receptionist: _____

Volunteers: _____

Pharmacist: _____

IT Support: _____

Other: _____

Who currently uses computers to complete their work?

Does any staff NOT know how to use a computer? If so, WHO does not know how to use a computer?

Has anyone at the clinic used an electronic health information system before? Who? When?

Who provides support when there is a computer problem at the clinic ?

Which of the following training topics would be most beneficial to clinic staff? (please check three):

____ Integrating software into clinic practices and information needs

____ Accessing, navigating, and using the system to manage clinic data

____ Accessing IT assistance for the system

____ Maintaining the quality of clinic data

____ Ethical and legal issues related to clinic data

____ Basic computer use and troubleshooting

Other: _____

How much experience does staffs have using data about patients to manage work in the clinic?

Novice	Advanced Beginner	Competent	Proficient	Expert

How much experience does staffs have checking data quality?

Novice	Advanced Beginner	Competent	Proficient	Expert

How much experience does staffs have keeping patient data private?

Novice	Advanced Beginner	Competent	Proficient	Expert

How much experience does staffs have using a mouse and keyboard?

Novice	Advanced Beginner	Competent	Proficient	Expert

How much experience does staffs have fixing a computer when something goes wrong?

Novice	Advanced Beginner	Competent	Proficient	Expert

Infrastructure

Power Supply

Does the facility have electrical power capacity? YES NO

Number of full days without power in last month: _____

Number of hours without power in the last week: _____

The primary source of power: Power Grid Solar Generator

Other: Specify _____

The backup source of power: UPS Solar Generator

Other: Specify _____

Are there voltage stabilizers? YES NO

Internet Network

What Internet connection is available at the health facility?

___ Landline Modem ___ Cellular Modem ___ Dedicated Line

___ None ___ Other: Specify _____

Can we use the existing Internet for the system? YES NO

Performance using http://www.speedtest.net:

UP _____ DOWN _____ LATENCY _____

Performance using http://www.testmyspeed.com:

UP _____ DOWN _____ LATENCY _____

What hours is the Internet normally available each day? _____

Number of days in the last month Internet connection was not available: _____

Longest duration in the last month Internet connection was not available: _____

Intranet Network

Is there a local area network (LAN)? YES NO

If "Yes":

Can we use the LAN for the system network?

Is it DHCP or static addressing?

Are there wireless access points?

Equipment Placement

Is there locked storage to store spare computer equipment? YES NO

Is there a dedicated room for server equipment? YES NO

Will the server be placed in a secured / locked area? YES NO

If yes, what kind of security is used? (Check all that apply)

___ Lockable door

___ Lockable cabinet

___ Lockable windows

___ Bars on door

___ Bars on windows

Is there a place to install a server security solution (e.g. mac mini security mount, rack, etc)?

Who will have access to the server?

Where will the external hard drive with backups be stored?

Who will have access to the external hard drives?

Where will the router be placed?

Will a bridge / access point be needed? YES NO

If yes, How many? _____

If yes, cable or wireless bridge? _____

If yes, where will they be placed?

Unit 1 (repeat for each unit)

Name / Function:

Equipment will be placed:

Equipment needed for unit:

Keyboard, monitor, and mouse needed? YES NO

OR KVM switch needed instead? YES NO

Printer needed? YES NO

Extension cord to plug-in? YES NO

If yes, length? _____ m/ft

New electrical outlet needed? YES NO

Distance of PC to router/access point? _____ m/ft

Wired cabling needed to reach EPTS network? YES NO

Equipment Needs

Number of existing computers available for use? _____

Number of existing printers available for use? _____

Site/Unit	Servers	Clients	Wireless Routers	Wireless Adapters	UPS	Printer
Total Items						
~Price/Item (USD)						
~Price/Item (local)						
Item Budget (USD)						
Total Budget (USD)						

Peripherals

_____ External hard drives for data backups (e.g. at least 1 for onsite and 1 to be stored offsite)

_____ Power supply strips

_____ Extension cords for power

_____ KVM switches (control multiple computers with single "Keyboard, Video, Mouse - KVM")

_____ mini-DVI to VGA converters

_____ HDMI cables

_____ US power cord adapters for country

_____ Flash drives (size: _____)

Zip ties to wrap cords out of the way

Inventory labels

Other: _____

Appendix D: Trial-run to Rollout Assessment Tool

Position: _____ **Department:** _____

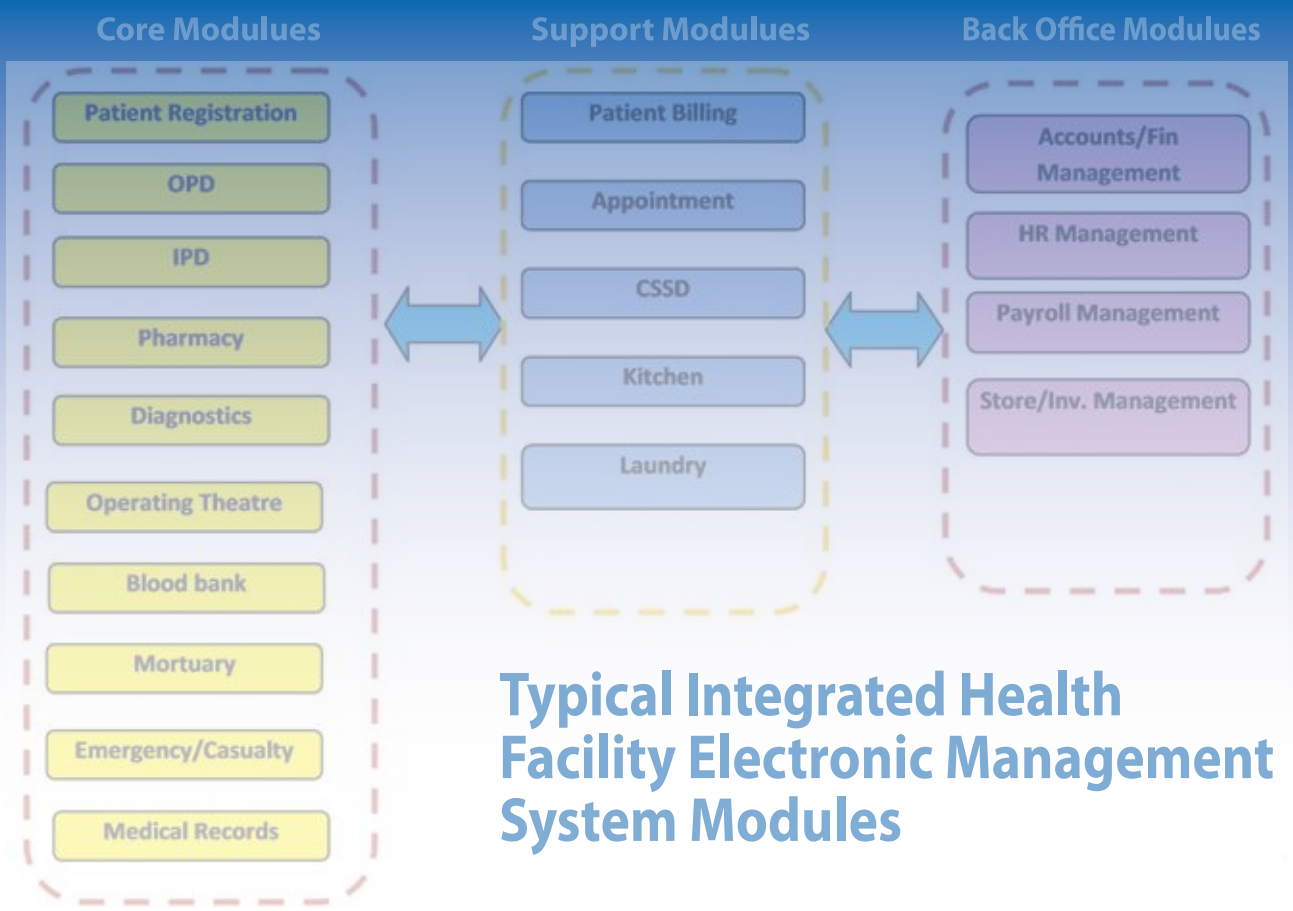
Business Process: _____

		5	4	3	2	1	Reasoning/ Comments (if any)
		Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree	
A:	**Perceived Easy of Use**						
1.	I found the system easy to use						
2.	It was easy to learn how to use the system						
3.	The system was flexible to interact with						
4.	I would like to continue to use the system to do what I do						
5.	It was easy for me to get help in the system						
B:	**Perceived Usefulness**						
6.	The system has improved my work						
7.	I think the system will improves facility operations						
8.	I think the system reduce patient waiting time						
9.	I was able to enter the data correctly						

10	The system has helped me to identify problems with the data entered						
11.	Did the system helps you identify adherence issues						
C:	**Intention To Use**						
12.	In the future I would like to use the system to perform my work						
13.	I will promote the use of system in my section						
14.	I need more time to learn how to use the system before using it for my daily work						
15.	I recommend the rollout of the system						

Appendix E: Checklist for Computing Infrastructure in Health facility

Item Description	Quantity
Data Center/Server Room	
Servers	
Software (OS, DB system, utilities)	
Routers/Firewall	
Network switches	
Data cabinet	
Power distribution Units (PDUs)	
Cooling system	
Network and power cabling accessories	
Fire detectors and extinguishers	
Computer Room	
Desktop computers	
Laptop computers	
Software (OS, utilities)	
Tables	
Chairs	
Projectors	
Projection Screen	
Power distribution Units (PDUs)	
Network switches	
Data cabinets	
Cooling system	
Network and power cabling accessories	
Network and Internet Connectivity	
LAN Switch 48ports	
LAN Switch 24ports	
LAN Switch 16 ports	
Data cabinets	
Network and power cabling accessories	
Workstations (Desktop, thin clients, Laptops)	
Software (OS, utilities)	
Tables	
Chairs	
Power distribution Units (PDUs)	
Printers	



Typical Integrated Health Facility Electronic Management System Modules

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