

MINISTRY OF HEALTH

Software Requirements and Design Specifications

Kenya Electronic Community Health Information System (eCHIS)





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Foreword

The Ministry of Health (MOH) is committed to the digitization of health care across all Kenya Essential Package for Health (KEPH) levels. This includes Level 1 which is realized through frontline Community Health Volunteers (CHVs) at the household level. The journey of adopting the electronic Community Health Information System (eCHIS) began with the development of a National Community Health Digitization Strategy (Phase I). Phase II of the process is focused on designing, developing, testing and piloting the eCHIS prototype in selected counties. Towards this end, this Software Requirements Specification (SRS) document was developed through a consultative process involving the MOH and its development partners as well as the supporting technical experts. The SRS serves as a catalogue of the features and functionality expected to be offered by the eCHIS. It also provides a framework for conducting an in-depth technical review of existing digital solutions for community health. This will help the MOH to identify the “shortest path to success” towards the achievement of digitization for community health.

This SRS covers the overall eCHIS architecture and how it fits within the Health Information System ecosystem in Kenya. It also identifies and describes the intended users of the eCHIS along with their unique needs and characteristics. In addition, this SRS covers specific system functionalities including household enrolment, service delivery, commodity supply chain management, community based disease surveillance, client messaging, data reporting and user management. Lastly, the SRS articulates the expected non-functional requirements for the eCHIS.



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Acknowledgment

The eCHIS Software Requirements and Design Specifications document was developed through broad stakeholder engagement that included the Ministry of Health and its partners at both the national and county levels. Consultations were conducted through virtual and in-person meetings, as well as focused workshops aimed at maximising the healthy exchange of ideas towards the technical design of the eCHIS. This participatory process was guided through the leadership of the Ministry of Health, spearheaded by Dr. Joseph Sitienei, Dr. Salim Hussein, Dr. Maureen Kimani, and Mr. John Wanyungu. Special thanks also go to the officers in the Divisions of Community Health Services, Health Informatics and Information Communication Technology among others for their invaluable contribution towards this document. Gratitude is also extended to partner organizations who contributed their financial and technical support towards the process including Living Goods, Medic Mobile, AMREF, Lwala and InSupply among others.



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List Of Abbreviations

Abbreviation	Meaning
API	Application Programming Interface
CBDS	Community Based Disease Surveillance
CCHFP	County Community Health Focal Person
CHA	Community Health Assistant
CHFP	Community Health Focal Person
CHRIO	County Health Records and Information Officer
CHU	Community Health Unit
CHV	Community Health Volunteer
CHW	Community Health Worker
eCHIS	Electronic Community Health Information System
CR	Client Registry
EHR	Electronic Health Record
DHIS	District Health Information System
DHP	Digital Health Platform
DHIS2	District Health Information System (Version 2)
HIS	Health Information System
HL7	Health Level 7
HRIO	Health Records and Information Officer
IHRIS	Integrated Human Resource Information System
KEPH	Kenya Essential Package for Health
KHIS	Kenya Health Information System
KMHFL	Kenya Master Health Facility List
LIMS	Logistics Information Management System
LMIS	Logistics Management Information System



Abbreviations continued...

Abbreviation	Meaning
MCHUL	Master Community Health Unit List
MHFL	Master Health Facility List
MOH	Ministry of Health
NIIMS	National Integrated Identity Management System
NOFBI	National Optic Fibre Backbone
SCCHFP	Sub-County Community Health Focal Person
SCHRIO	Sub-County Health Records and Information Officer
SHR	Shared Health Record
SRS	Software Requirement Specification



1. Introduction

1.1 Purpose

This document specifies both the functional and non-functional requirements for the electronic Community Health Information System (eCHIS). The eCHIS is a digital health intervention for community health that is expected to improve the quality of community health services by; increasing efficiency, enhancing program management and driving evidence-based decision-making through timely and accurate data. In turn, this will contribute towards reduced morbidity and mortality, better health outcomes and ultimately a healthier and more productive population.

1.2 Scope

The eCHIS is envisaged as a digital health information system for the collection, storage, processing, analysis, integration and security of community health data in Kenya. It is intended to cover the entire continuum of KEPH Level 1 services. These include household enrolment, service delivery, client referral, supply chain management, community-based surveillance, client messaging, and reporting at the community, sub-national and national levels. It also includes interoperability with other digital systems used for health and other kinds of information management in the country such as the National Integrated Identity Management System (NIIMS), the Digital Health Platform (DHP), Logistics Information Management System (LIMS), the Master Community Health Unit List (MCHUL), the District Health Information System (DHIS), among others.

1.3 Target Audience

This specification is intended for the developers and implementers of the eCHIS. It is meant to serve as the basis for the design, development, testing and deployment of the eCHIS to ensure that it conforms to the expectations of the system's users and stakeholders.



2. Overall Description

2.1 Architecture

The eCHIS is envisioned as a crucial part of the wider goal to digitize health information in Kenya. At the point of care, the eCHIS will play a complementary role to the facility based DHP. Besides linkages with the DHP, the eCHIS will also interoperate with other systems such as the Client Registry (CR), Shared Health Record (SHR), MCHUL and the DHIS2.

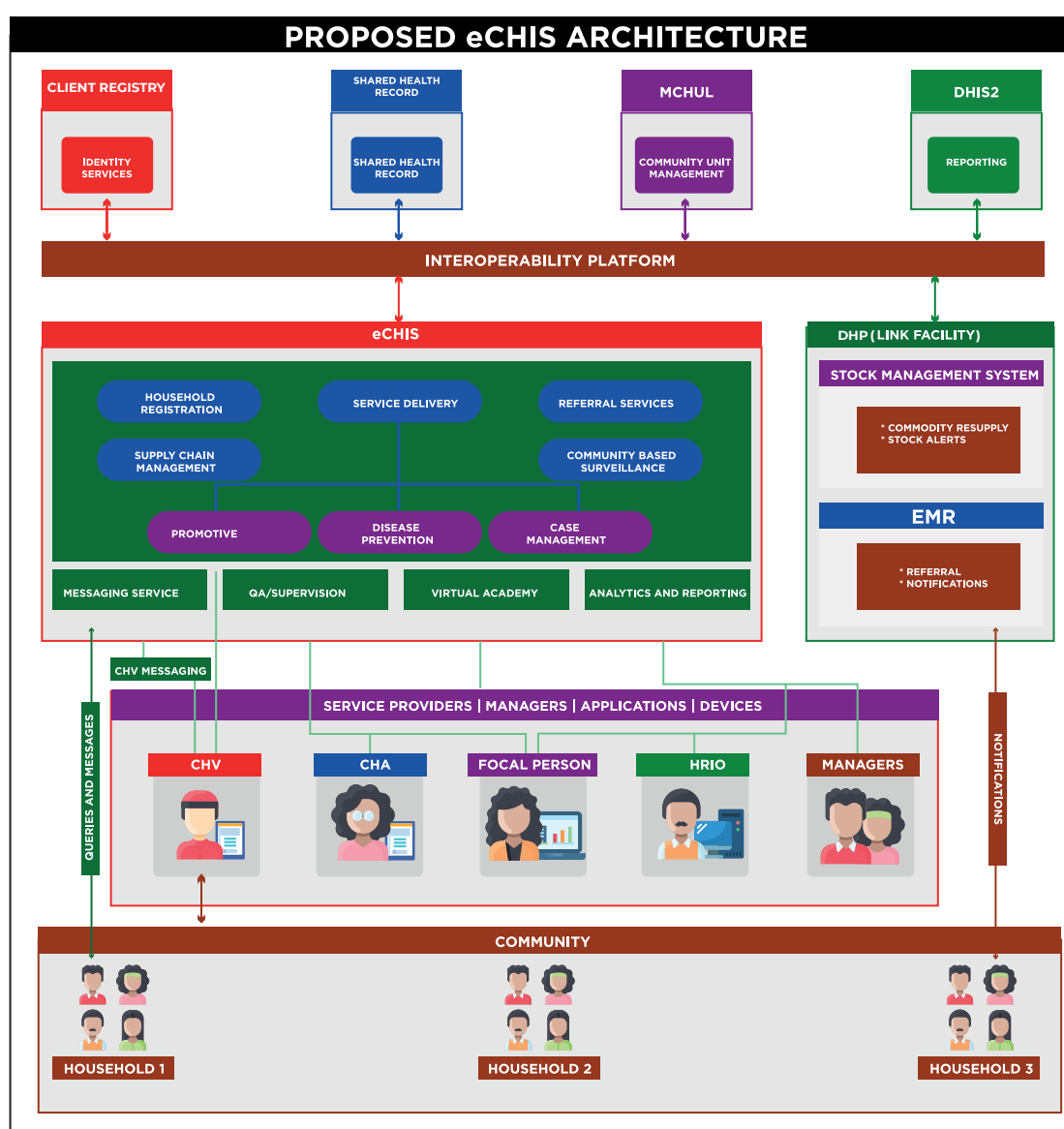


Fig 1: The proposed eCHIS architecture. See detailed description below.

The eCHIS is depicted in red in the middle of the diagram above. The blue boxes inside the eCHIS represent the core functionalities provided by the system which include household enrolment, service delivery, client referral, supply chain management and community based surveillance. As illustrated, community health service is concerned with health promotion and preventive healthcare,



as well as case management at the community level. The green boxes within the eCHIS represent other supportive functionalities that facilitate the effective delivery of community health service. They include client messaging, CHA-CHV supervision, linkage to the MOH virtual academy, and data analytics and reporting.

Clients interact with the eCHIS through CHVs who visit households and collect information from household members through a mobile application. Household members can also interact with the eCHIS through messages sent directly to their phones. CHAs may also interact with households as part of their supervisory and mentorship activities in the field. On their part, CHFPs, HRIOs and Health Managers interact with the eCHIS primarily to access reports and analytics through a web interface.

The boxes above and to the right of the eCHIS represent other applications that the eCHIS interoperates with through the Interoperability Platform. The Interoperability Platform is a general purpose health data interoperability engine that is responsible for facilitating information exchange between various HIS. The box to the right of the eCHIS represents a link health facility running the DHP. The DHP provides, among other features, an EMR and a Stock Management module at the health facility level. The eCHIS interfaces with the DHP to facilitate upward and downward client referral, as well as commodity supply chain management for commodities issued to CHAs for onward transmission to CHVs. At the national level, the eCHIS is expected to have linkages with the CR for identity resolution, the SHR for de-identified patient-level data aggregation, MCHUL for Community Health Unit(CHU) management and DHIS2 for aggregate data reporting.

2.2 User Classes And Characteristics

The delivery and management of community health services involves multiple actors who play different but complementary roles. The following subsections describe the characteristics and roles of each of the main user categories of the eCHIS;

2.2.1 Client

The client is a member of the community and is the primary recipient of community health services. Community health members fall into one or more cohorts defined by sex, age group, pregnancy status, health status and so on. These characteristics should be taken into account when enrolling community members into specific community health services. Clients are normally organized into households, with each household having one member as the household head. Households are organized into small groups referred to as Community Health Units (CHUs). Some community health services such as immunizations are provided to individual community members. Other services, such as the assessment of sanitation facilities, relate to the household as a whole. Besides receiving direct visits from CHVs, clients can also remotely interact with the community health system through bi-directional mobile-powered messages or through referrals to link health facilities. Households may also be visited by CHAs for supervision and quality assurance.



2.2.2 Community Health Volunteer (CHV)

The CHV is the primary agent of community health service delivery at the household level. Their main role is to provide community health services, while also collecting key program data in an efficient and accurate manner. CHVs are normally members of the communities in which they work, hence, an intimate familiarity with those communities is assumed. CHVs comprise a mixture of literate, semi-literate and sometimes even illiterate individuals. This reality must be considered when designing the eCHIS in order to ensure that it is user-friendly for such individuals. It is also important to note that CHVs perform their community health work on a part-time and voluntary basis. Much of their working time is spent in the field, and sometimes in resource limited circumstances where electrical power or cellular connectivity may be limited. CHVs may meet their clients both by appointment or on an ad hoc basis. Each CHU is covered by a number of CHVs.

2.2.3 Community Health Assistant (CHA)

CHAs are responsible for supervising and overseeing CHVs. Unlike CHVs who are part-time volunteers, CHAs are full-time salaried government employees charged with the management of health services at the community level. Although CHAs are also typically members of the communities where they serve, they oversee a larger geographical area than CHVs, usually an entire CHU. Like CHVs, CHAs also occasionally visit clients in their households. However, their visits are typically supervisory in nature and are aimed at assessing and promoting service quality. CHAs also mediate between CHVs and link health facilities. In particular, they are responsible for facilitating commodity supplies to CHVs, as well as verifying and escalating reports of notifiable diseases or events of public health interest. Their other tasks include mentoring and training CHVs and also performing routine data quality checks on the data collected and submitted by CHVs.

2.2.4 Community Health Focal Person (CHFP)

Community Health Focal Persons (CHFPs) serve as the managers of the community health program at the sub county and county levels. At the county level, this role is referred to as the County Community Health Focal Person (CCHFP). At the sub-county level, the role is referred to as the Sub-County Community Health Focal Person (SCCHFP). SCCHFPs responsibilities include supervising and facilitating CHAs.

2.2.5 Health Records and Information Officer (HRIO)

Health Records and Information Officers serve as the managers of all paper-based and electronic records at the sub-county and county levels. At the county level, this role is referred to as the County Health Records and Information Officer (CHRIO). At the sub-county level, the role is referred to as the Sub-County Health Records and Information Officer (SCHRIO). The records managed by the HRIO include summary reports of activities at health facilities and CHUs within their jurisdiction.



2.2.6 Healthcare Provider

The healthcare provider user class covers all healthcare providers at the health facility level. This includes nurses, clinical officers, doctors, laboratory technicians, radiologists, pharmacists and even physiotherapists and nutritionists. In general, anyone who attends to clients at a health facility falls under this category. Healthcare providers primarily interface with community health in terms of processing upward client referrals (community-to-facility) and initiating downward client referrals (facility-to-community). Facility to community referrals are also known as counter referrals. For example, health providers may refer clients to CHVs for psychosocial support or handover defaulter lists to CHVs for tracing. They may also receive and attend to clients that are referred to the health facility from the community.

2.2.7 Healthcare Manager

The healthcare manager user class covers all officers responsible for the management of healthcare programs at national and subnational levels. Duly authorized individuals employed by implementing partner organizations that support the government in delivering healthcare also fall under this category. Healthcare managers are mainly interested in routine performance and program monitoring reports to enable them to make evidence-based decisions.

2.2.8 System Administrator

The system administrator user class covers the individuals responsible for ensuring the smooth operation of the eCHIS at the various levels. This includes the people responsible for providing technical support at the field, sub-county, county and national levels. It also includes technology experts responsible for setting up and operating eCHIS servers and other infrastructure. The permissions assigned to individual system administrators should correspond to their scope of work and area of jurisdiction.

2.3 Functions

The eCHIS shall provide the following key functionalities. Details of these functionalities are covered in Chapter 4: System Features.

Household enrolment	<ul style="list-style-type: none">• Enrolment of household and household member data.• Updating of household and household member data.
Service delivery	<ul style="list-style-type: none">• Digital data collection forms and workflows for service delivery.• Digital data collection forms and workflows for supervision.
Client referral	<ul style="list-style-type: none">• Data collection and workflows for referring clients from the community to health facilities and vice versa.• Interoperability with DHP to facilitate upward and downward referral coordination.



Commodity supply chain management	<ul style="list-style-type: none"> Commodity ordering, order fulfilment, commodity dispensing, adjustments and stock levels monitoring.
Surveillance	<ul style="list-style-type: none"> Reporting suspected cases of notifiable diseases and events of public health interest. Verifying and escalating cases of notifiable diseases and events of public health interest.
Messaging	<ul style="list-style-type: none"> Sending unidirectional and bi-directional messages to clients to create general awareness, encourage behaviour change or service client queries.
Reporting	<ul style="list-style-type: none"> Generating case-based and aggregate client, CHV and CHA reports to drive evidence-based decision making.
System administration	<ul style="list-style-type: none"> Configuring the system with organizational hierarchies, users, user roles, commodities etc. Providing technical support and keeping the eCHIS alive and healthy.

2.4 Operating Environment

The eCHIS will be centrally hosted with mobile, web and application programming interfaces:

Central Server	<ul style="list-style-type: none"> Centrally hosted cloud server with support for multi-tenant architecture. Multiple logical partitions per county(tenants)
Android Client	<ul style="list-style-type: none"> Android-based mobile app for use by CHVs and CHAs to access the eCHIS. Mobile app supports offline data collection.
Web Client	<ul style="list-style-type: none"> Web client for use by CHFPPs, HRIOs and Health Managers to access the eCHIS. Accessible via common desktop and mobile web browsers.
API	<ul style="list-style-type: none"> Inbound and outbound Application Programming Interfaces to facilitate interoperability with other systems

2.5 Assumptions and Dependencies

This specification is based on the following assumptions:

1. CHVs will have a basic level of literacy or have their capacity built to be able to use simple smartphone features and applications.
2. Third party applications e.g. the DHP that interface with eCHIS, will provide information through well-defined Application Programming Interfaces.
3. Applications to which the eCHIS will send information will provide well defined Application Programming Interfaces for receiving it.
4. A common interoperability layer or service bus will be provided for facilitating the exchange of information between the eCHIS and other systems.

3. External Interface Requirement

External Interface	Requirements
User Interfaces	<ul style="list-style-type: none">• Android app• Web app
Hardware Interfaces	<ul style="list-style-type: none">• Android devices• Laptop/desktop computers
Software Interfaces	<ul style="list-style-type: none">• DHP APIs• DHIS2 APIs• Client Registry APIs• SHR APIs• MCHUL APIs
Network Interfaces	<ul style="list-style-type: none">• National Optic Fibre Backbone (NOF-BI)• Cellular network• Mobile internet

4. System Features

The sections below describe the major features that shall be provided by the eCHIS in order to satisfy the needs of the various user classes described before. The features are classified according to the three main ways in which the system will be used.

These are;

1. **Transactional** i.e. using the eCHIS to conduct the day-to-day business of community service delivery. It mainly involves data entry.
2. **Reporting** i.e. using the eCHIS to generate and consume information emanating from the transactional data stored in the system.
3. **System administration** i.e. using the eCHIS to add and manage organizational hierarchies, users and user permissions as well as performing troubleshooting and data quality checks.

Transactional uses of the eCHIS will facilitate interaction between community health workers, the community and link health facilities. These uses are further classified according to the six core components of community health provision, namely;

1. Household enrolment
2. Service delivery
3. Commodity management
4. Client referral
5. Community-based surveillance
6. Client messaging.

Reporting uses of the eCHIS will facilitate the generation of information and insights from the system to support quality assurance and program monitoring as well as drive evidence-based decision-making. These uses are classified into two categories;

1. *Case-based reports* i.e. reports offered at the lower levels to support quality assurance activities while safeguarding client privacy and confidentiality.
2. *Aggregate reports* i.e. reports offered at higher levels to support program monitoring and drive evidence-based decision-making.

System administration uses of the eCHIS will provide the means to conduct the following core activities;

1. Create and maintain organizational hierarchies
2. Create and manage users and their permissions
3. Perform technical troubleshooting
4. Perform routine system updates
5. Run data quality assurance algorithms.

NOTE 1: Both transactional and reporting use cases may involve interactions between the eCHIS and other systems. For example, a client referral to a link health facility - which is a transactional use case may necessitate interoperability with the EHR system used at the facility. Similarly, an aggregate report generated

through the eCHIS - which is a reporting use case may be sent to DHIS2. For this reason, all interoperability use cases are covered under the relevant sub-sections rather than in their own dedicated sections.

NOTE 2: The above classification of system features merely provides a more convenient and logical way of specifying the requirements. Within the system itself, there is no expectation that features specified under the same category should be offered as standalone modules. The software implementation may adopt whichever approach makes the most sense provided it meets the requirements.

4.1 Transactional Features

4.1.1 Household Enrolment

Summary: The features described under the sub-headings below will support the enrolment, updating and management of identity and demographic data on individual households and their members.

4.1.1.1 Enrol Household

Priority	High
User	CHV
Interface	Mobile app

Description: This feature will allow a CHV to enrol new households and household members. A new household or household member is one that does not exist in the eCHIS database.

Details: Household enrolment is a two-step process that involves recording identity and demographic data for both the household itself and for its individual members.

The following household characteristics shall be entered into the system to complete the first step of the enrolment process.

Variable	Description
County	The county under which the household is enrolled (<i>should be populated automatically by the eCHIS based on the logged in CHV</i>)
Sub County	The sub county under which the household is enrolled (<i>should be populated automatically by the eCHIS based on the logged in CHV</i>)
Ward	The ward under which the household is enrolled (<i>should be populated automatically by the eCHIS based on the logged in CHV</i>)

Location	The location under which the household is enrolled (<i>should be populated automatically by the eCHIS based on the logged in CHV</i>)
KMCHUL	The community unit under which the household is enrolled (<i>should be populated automatically by the eCHIS based on the logged in CHV</i>)
Link Facility	The health facility to which the household is linked (<i>should be populated automatically by the eCHIS based on the logged in CHV</i>)
Name of CHV	The CHV conducting the household enrollment (<i>should be populated automatically by the eCHIS based on the logged in CHV</i>)
Name of Village	The village under which the household is enrolled (<i>should be entered by the CHV</i>)
Start Date	The date when the household was enrolled in the eCHIS under (<i>should be entered by the CHV</i>)
End Date	The date when the household was discontinued in the eCHIS. (<i>Should be left blank during enrolment</i>)
Household Number	The number assigned to the household during mapping (<i>Should be entered by the CHV</i>)

The following details shall be entered into the system for each household member to complete the second step of the enrolment process. Internally, the eCHIS shall link every household member to the household under which they are enrolled.

Variable	Description
Date of Enrolment	Date of Enrolment
Individual Code	Individual Code
Name of Household Member	Name of Household Member
Date of Birth	Date of Birth
Sex	Sex
Relationship with Household Head	Relationship with Household Head
Orphan	Orphan
Birth Certificate Serial Number	Birth Certificate Serial Number



NOTE 1: Ideally the individual code should be a symbol that uniquely identifies an individual household member across the entire country. Initially, this code may be assigned automatically by the eCHIS. However, it should eventually be drawn from a centrally managed identity management system such as the National Integrated Identity Management System (NIIMS), or another implementation of a patient registry.

NOTE 2: Should other identity or demographic variables be added later to eCHIS, care should be taken to only include immutable attributes in the enrolment process. Immutable attributes are attributes of a household or household member that are not liable to change on a routine basis. Mutable attributes will be tracked separately as part of updating household data.

4.1.1.2 Update Household

Priority	High
User	CHV
Interface	Mobile app

Description: This feature will allow a CHV to update mutable demographic data on households and household members. In order to update this data, the household must first have been entered into the eCHIS.

Details: Only mutable household data will be subject to routine updating. Mutable data refers to data that is liable to change. For example, whether or not a household has a functional latrine, or the pregnancy status of a household member. Data that is not liable to change i.e. immutable data, must be captured only once during household enrolment.

The data on each household and household member shall be updated on the system once every year, with the very first occasion being immediately upon registration in order to establish a baseline. The system may be configured to remind the CHV to perform this task at the right time.

The following household characteristics shall be updated in the system once every year.

Variable	Description
Household has functional latrine	Household has functional latrine
Household has access to safe water	Household has access to safe water
Household has handwashing facilities	Household has handwashing facilities



Household has refuse disposal facilities	Household has refuse disposal facilities
Number of deaths in the month/year	Number of deaths in the month/year
Comments	Comments

The following details shall be updated in the system for each household member once every year.

Variable	Description
In school	In school
Pregnant	Pregnant
Mother and child health booklet	Mother and child health booklet
MUAC (Red) indicating severe malnutrition	MUAC (Red) indicating severe malnutrition
MUAC (Yellow) indicating moderate malnutrition	MUAC (Yellow) indicating moderate malnutrition
Vitamin A given	Vitamin A given
Penta 3 given	Penta 3 given
Fully immunized	Fully immunized
Measles Rubella at 2 years	Measles Rubella at 2 years
Place of delivery	Place of delivery
Known disability	Known disability

NOTE 1: The system should only offer for data entry the appropriate variables based on the demographic characteristics of the household member. For example, some variables may only be relevant to children or women of child bearing age. These specifications are clearly documented in the MOH 513 paper-based tool.

4.1.1.3 Void Household

Priority	Medium
User	CHA
Interface	Mobile app



Description: This feature will allow a CHA to void a household which either physically ceases to exist or voluntarily drops off the program.

Details: The importance of voiding a household in the eCHIS is to relieve the system and its users of any responsibility to track that household in the future. This may be necessary if the household physically ceases to exist, or voluntarily opts out of being tracked through the eCHIS. The exact protocol for designating a household for voiding will take place outside the eCHIS, but the system should support the execution of the decision once it has been made.

The following household characteristics shall be updated in the system upon the voidance of the household.

Variable	Description
End Date	The date when the household was discontinued (voided) in the eCHIS.
Reason	The reason the household was discontinued (voided) in the eCHIS.

NOTE 1: Voiding a household should be implemented in such a way that existing data on the affected household is maintained in the system for future reference. In other words, voiding cannot be implemented through the deletion of household data.

4.1.2 Service Delivery

Summary: The features described under the sub-headings below will support the delivery of various community health services digitally. A service is a group of related community health activities targeted at households or household members and delivered as a single package. The list below covers all the community health services that are currently defined.

1. Pregnancy, delivery and the new-born
2. Early childhood
3. Late childhood
4. Adolescent and youth
5. Adults
6. Elderly persons (over 60 Years)

Each of these services caters to the unique needs of its target population. The eCHIS should be designed to accommodate not only these six services but also any other service that may be defined in the future. In order to support this level of flexibility, services within the eCHIS should cover five critical structural components, namely;

1. Name i.e. the name of the community health service.
2. Target i.e. the population targeted by the service, defined by its demographic characteristics.



3. Data i.e. the series of variables constituting the data gathered every time the service is provided. These may be grouped in one or more data entry forms.
4. Workflow i.e. the logical process for gathering the requisite data for the service, including sequencing and skip logic.
5. Periodicity i.e. the standard frequency of provision for the service e.g. monthly, quarterly etc. Ad hoc frequency should also be supported.

As variable entities are susceptible to changes, the eCHIS should provide a flexible mechanism for defining services without committing to specific target populations, data, workflows or periodicity. The system administrator should then be able to define these specifics per service as part of an access-controlled configuration process as described below.

4.1.2.1 Create Services

Priority	High
User	System Administrator
Interface	Web app

Description: This feature will allow the System Administrator to define new services.

Details: New services shall be defined on the basis of their target population, data, workflows or periodicity. A new service is one that does not exist in the eCHIS. Once a service has been created, it may be modified to suit emerging needs or updated guidelines but it should not be created again.

Component	Description
Service ID	A unique identifier for the service (automatically generated and assigned by the eCHIS).
Service name	The name of the service.
Service target	The population targeted by the service, defined by its demographic characteristics.
Service data	The series of variables constituting the data gathered every time the service is provided. These may be grouped in one or more data entry forms.
Service workflow	The logical process for gathering the requisite data for the service, including sequencing and skip logic.
Service periodicity	The standard frequency of provision for the service e.g. monthly, quarterly e.t.c. Ad hoc frequency should also be supported.

4.1.2.2 Modify Services

Priority	High
User	System Administrator
Interface	Web app

Description: This feature will allow the System Administrator to update existing services.

Details: Existing services may be modified to respond to emerging needs or conform to new guidelines. As with creating new services, the process of updating a service will involve updating its target population, data, workflows and/or periodicity.

Component	Description
Service name	The name of the service.
Service target	The population targeted by the service, defined by its demographic characteristics.
Service data	The series of variables constituting the data gathered every time the service is provided. These may be grouped in one or more data entry forms.
Service workflow	The logical process for gathering the requisite data for the service, including sequencing and skip logic.
Service periodicity	The standard frequency of provision for the service e.g. monthly, quarterly etc. Ad hoc frequency should also be supported.

NOTE 1: As a service evolves through subsequent modifications, the system should internally maintain a “service version” as a means of tracking this evolution. The variables which constitute the data for the service should be compatible across service versions. For example, data collected against old variables that are no longer tracked should continue to exist in the eCHIS and should be available for the periods during which the data was entered.

4.1.2.3 Publish Services

Priority	High
User	System Administrator
Interface	Web app

Description: This feature will allow the System Administrator to publish new or modified services to CHVs mobile devices for digital service delivery and data collection.

Details: Whenever new services are created or existing ones are modified, the associated templates on CHV's mobile devices shall be updated accordingly to enable them to deliver services using the latest tools. The System Administrator shall achieve this by publishing new and modified services to CHVs mobile devices. Upon publication, CHVs shall receive a notification within the eCHIS app notifying them of the availability of updated tools. The CHVs will then either manually update their templates, or the system may do so automatically at the next available opportunity that does not interrupt the CHVs workflow e.g. once they visit the application home page.

Upon publication, the following data will be delivered to the CHV's mobile devices.

Variable	Description
Service version	The current version of the service. This is useful for tracking compliance with the latest versions of data collection tools.

4.1.2.4 Deliver Services

Priority	High
User	CHV
Interface	Mobile app

Description: This feature will allow a CHV to digitally deliver community health services while collecting all the requisite data.

Details: Upon the publication of services, CHVs will receive on their mobile devices the full set of templates constituting the service delivery toolkit as defined by the System Administrator. These templates will enable the CHVs to digitally deliver the various services to the specified target populations while collecting the relevant data according to the workflows and periodicity defined in the template.

The following data shall be gathered as part of the service delivery process.

Data	Description
As defined in the service template by the System Administrator	Whatever set of variables defined as the service data by the System Administrator. May be grouped into one or more data entry forms.

4.1.2.5 Create Supervision Checklists

Priority	Medium
User	System Administrator
Interface	Web app

Description: This feature will allow a System Administrator to create quantitative ad hoc surveys for CHVs to administer at the community level.

Details: Upon the publication of services, CHVs will receive on their mobile devices the full set of templates constituting the service delivery toolkit as defined by the System Administrator. These templates will enable the CHVs to digitally deliver the various services to the specified target populations while collecting the relevant data according to the workflows and periodicity defined in the template.

The following data shall be gathered as part of the service delivery process.

Variable	Description
As defined in the service template by the System Administrator	Whatever set of variables defined as the service data by the System Administrator. May be grouped into one or more data entry forms.

4.1.2.6 Modify Supervision Checklists

This is a high priority feature and will be provided to the CHV through a mobile interface. It will allow the CHV to collect service data.

4.1.2.7 Publish Supervision Checklists

This is a high priority feature and will be provided to the CHV through a mobile interface. It will allow the CHV to collect service data.

4.1.2.8 Conduct Field Supervision and Mentorship

This is a high priority feature and will be provided to the CHA through a mobile interface. It will allow the CHA to collect service quality data.

4.1.2.9 Link to Content E.g. Manuals

This is a high priority feature and will be provided to the CHV through a mobile interface. It will allow the CHV to collect service data.

4.1.3 Commodity Management

Summary: The features described under the sub-headings below will support the ordering, receipt, issuance and disposal of commodities by the CHV. It will also provide a basic level of inventory management for CHVs.

4.1.3.1 Monitor Stock Levels

Priority	Medium
User	CHV
Interface	Mobile app

Description: This feature will allow the CHV to monitor the amount of commodities in their possession (stock on hand) based on the items previously received and issued or otherwise disposed of.

Details: Each commodity in the eCHIS will be configured with a reorder level. The reorder level may be static i.e. always the same regardless of historical consumption data, or dynamic i.e. automatically adjusted to reflect historical consumption data. On the basis of this reorder level, the system will notify the eCHIS whenever the stock levels for a particular commodity or set of commodities goes below the specified reorder level.

The following specific data will be shown to the CHV as part of the stock level monitoring feedback.

Variable	Description
Commodity	The commodity whose stock is below the reorder level
Reorder level	The quantity of the commodity that the CHV ought to have before it's time to reorder.
Stock on hand	The quantity of the commodity that the CHV has on hand.

4.1.3.2 Make Commodity Order

Priority	Medium
User	CHV
Interface	Mobile app

Description: This feature will allow the CHV to make commodity orders.

Details: At any point in time and provided that there are one or more commodities that are below the stipulated reorder level, the CHV may raise an order for resupply.

The resupply order will contain the following information.

Variable	Description
Commodity	The commodity being reordered.
Stock at hand	The quantity of the commodity that the CHV has on hand.
Reorder quantity	The quantity of the commodity that the CHV is ordering.

NOTE 1: The commodity order raised by the CHV via the eCHIS mobile app shall be forwarded through the interoperability platform to the Pharmacy Information Management System (PIMS) at the link health facility for fulfilment.

4.1.3.3 Receive Commodities

Priority	Medium
User	CHV
Interface	Mobile app

Description: This feature will allow the CHV to receive commodity orders from the link health facility.

Details: On designated commodity resupply days, a CHV shall visit the link health facility to collect the commodities that they ordered. During this visit, the PIMS operator at the facility shall process the CHV's order by restocking their commodities. The PIMS shall then update the eCHIS accordingly by sending the appropriate data through the interoperability layer.

The specific information sent to the eCHIS upon resupply shall be as follows.

Data	Description
Order No	An identifier for the order that originated from the CHV. This includes a reference to the CHV user account for accountability.
Commodities	A set of all commodities resupplied and the quantities resupplied.
Comment	Any comments associated with partial order fulfilment or any other remarks.

4.1.3.4 Issue Commodities

Priority	Medium
User	CHV
Interface	Mobile app



Description: This feature will allow a CHV to issue commodities at the household level.

Details: A CHV may issue commodities at the household level in one of the following two ways;

1. Under the guidance of a decision support algorithm within the eCHIS.
2. On an ad hoc basis according to their training, experience and judgement.

Decision support for commodity issuance shall be defined as part of the workflow of a service as described under the “Create a service” feature. It shall include the commodity or commodities to be issued as well as the associated quantities and dosages. CHVs shall also be able to issue designated commodities on an ad hoc basis.

During each commodity issuance, the CHV will record the following data

Variable	Description
Household member	The individual household member to whom the commodity or commodities are issued.
Commodities	The set of all commodities issued to the individual, including their quantities.

4.1.3.5 Dispose Commodities

Priority	Medium
User	CHV
Interface	Mobile app

Description: This feature will allow a CHV to otherwise dispose of commodities from within the system by means other than issuance to clients.

Details: Ideally, the only means by which a CHV may dispose of commodities from within the eCHIS is by issuing them to clients. In reality, however, commodities may be disposed of for other reasons such as expiry or wastage. The eCHIS shall allow the CHV to record the commodities and their quantities that are disposed of in these alternative means. This will allow the eCHIS to accurately track stock levels based on usable stock on hand.

Commodity disposal shall involve the recording of the following data.

Variable	Description
Commodity	The commodity that is disposed of by any means other than issuance to clients.
Quantity	The quantity of the commodity that is disposed of.
Reason	The reason for the disposal.
Comment	Any extra information on the reason for the disposal for quality assurance purposes.

4.1.4 Client Referral

The eCHIS will provide the following features to support requisitioning, order fulfilment and CHV-level inventory management.

Summary: The features described under the sub-headings below will support the client referral mechanism for linking clients to health facilities. Clients may be referred to health facilities under two distinct circumstances:

1. The client located by the CHV as part of a tracing exercise instigated by the health facility e.g. because they have defaulted on their appointment.
2. The CHV finds a patient whose condition by nature necessitates medical attention at a health facility.

4.1.4.1 Receive Defaulter Lists from Health Facilities


Priority	High
User	HCW, CHV, CHA, Health Manager
Interface	Mobile app

Description: The feature will allow the healthcare workers to send a list of the names of registered clients who have defaulted on treatment/services.

Details: The facility will have a client database with each client mapped to their respective CHUs and CHVs. If there is a case of defaulter, the HCW sends out a notification to the CHV/CHU through the CHA. The CHV then begins the process of tracing the defaulter.

4.1.4.2 Refer Client to Health Facility

Priority	High
User	HCW, CHV, CHA
Interface	Mobile app



Description: The feature will allow the CHV to refer clients to the health facility and push a notification to the HCW who should then be expecting the referred client.

Details: The CHV will identify the candidate for referral through the defaulter list received from the facility or conduct household client assessment to identify reason for referral. The CHV then fills the referral form and submits. Upon submitting, the HCW receives a notification of referral from the community. The same notification also goes to the CHA. The CHV then sends the client to the link facility and follows up once they have received services.

4.1.4.3 Notify Successful Client Referral

Priority	High
User	HCW, CHV, CHA
Interface	Mobile app

Description: The feature will allow the HCW to send notifications to the CHV/CHU after offering services to the referred client.

Details: Upon receiving the referred client, the HCW offers the required service and fills the referral notification/task. Once the task is completed, a notification is sent to the CHU/CHV alerting them that the client has successfully received the services referred for.

4.1.4.4 Refer Client to the Community

Priority	High
User	HCW, CHV, CHA
Interface	Mobile app

Description: The feature will allow the HCW to refer the client back to the community and send notifications to the CHV/CHU after offering services to the referred client.

Details: The HCW allows the client to go back and continue getting care at home. The HCW sends a notification to the CHV/CHU with details on the instructions for home care and the return dates if any.

4.1.5 Surveillance

The features described under the sub-headings below will help leverage digital solutions to strengthen surveillance of events, diseases and conditions at the community level.



4.1.5.1 Detect Events

Priority	High
User	CHV
Interface	Mobile app

Description: This feature will allow the CHV report details of events or diseases in the community.

Details: The surveillance system will have pre-defined signals/alerts for use in Community Event Based Surveillance (CEBS) and lay case definitions for use in Community Based Disease Surveillance (CBDS). The CHVs undertake detection by making observations during household visits or while going through their day to day activities in the community. The community networks can also detect events and diseases after sensitization on signals/alerts and lay case definitions after which they report to the CHVs.

The event detection will contain the following information.

Variable	Description
Type	The event or disease detected
Person	Social and demographic characteristics
Place	Place of event/disease
Time	Date and time stamps

4.1.5.2 Notify Events

Priority	High
User	CHV
Interface	Mobile app

Description: This feature will allow the CHV to notify on any event or disease and report to the next level in real-time.

Details: This will allow the CHV to make a report at any time on any event or disease in the community.

The notification form will contain the following information.

Variable	Description
Type	The event or disease detected
Location	The geographical location the event/disease was detected.
Date and Time	Time characteristics of the event/disease
Population affected	Estimate on the number of people affected in the community

4.1.5.3 Investigate Events

Priority	High
User	CHV/Healthcare Provider
Interface	Mobile app

Description: This feature will allow the CHV/Healthcare Provider to carry out an investigation on the reported event.

Details: The CHV or a designated HCW will use the event notification data to undertake an in depth investigation to establish more details on the report.

The investigation report will contain the following information.

Variable	Description
Event/Disease	The event/disease notified
Location	The geographical location the event/disease was detected.
Date and Time	Time characteristics of the event/disease
Finding	The result of the investigation
Recommendation and Action	What should be done to address the reported issue based on the findings

4.1.5.4 Citizen-based Reporting

Priority	High
User	Members of the public(Citizen)
Interface	Mobile app



Description: This feature will allow the citizens to report on events.

Details: Citizens will be able to make a report of any event identified in the community. The citizen reporting data reporting form will contain the following information;

Variable	Description
Event	The event identified or suspected by the citizen
Person	Social and demographic characteristics
Place	Place of event/disease
Time	Date and time stamps

4.1.6 Messaging

The eCHIS application will have features to support one-way and two-way targeted and non-targeted messaging between clients and system users in an intuitive and simple way.

Priority	High
User	System users and clients
Interface	Mobile and web app

4.1.6.1 One-way messaging

Summary

The eCHIS system will support sending of unidirectional messages to clients, healthcare providers and healthcare managers. The recipients are not expected to respond or reply.

Description

- The system will provide an interface for grouping of users to whom messages will be sent.
- The system will provide an interface to define SMS messages/ SMS campaigns with the following parameters

Variable	Description
Message	SMS message to be sent (160 characters). May be structured or unstructured
Target	The individuals/groups/cohorts that will receive the messages
Schedule	The timing for sending of messages
Frequency	The number of times messages need to be sent to the target groups. Can either be one time or repetitive.



- The system will provide an interface to design SMS sequences.
- The system will have a provision to define messages to be sent based on system events and configured rules. For example, based on escalation matrices, system user identity verification, etc.

4.1.6.1.1 Targeted messaging

This feature will support one-way SMS messaging from an interface provided within the eCHIS application targeted to specific system users and clients on specific thematic areas based on defined criteria. For example, messages can be sent to specific CHVS on healthcare policies, guidelines, alerts, etc.

4.1.6.1.2 Non-targeted messaging

The system will support general broadcast messages to groups of people

4.1.6.2.1 Two-way messaging

Summary

The system will be able to support interaction between users and clients. In addition to the ability to send messages, the system will be able to respond to structured messages from clients and system users based on predefined workflows. The system should also support unstructured messages from clients and have a provision for system users to respond to these messages. Refer to the table above on the variable and description.

Description

The eCHIS system will have an interface to visually define SMS workflows that have;

- Conditional logic and repeat logic
- Interpretation of vague messages to the highest degree possible

Targeted messaging

This feature will support two-way SMS messaging from an interface provided within the eCHIS application targeted to specific system users and clients on specific thematic areas based on defined criteria. This may include surveys, client follow ups, appointment reminders etc.

4.2 Reporting Features

Summary: The features described under the sub-headings below will allow designated users to securely access the eCHIS to analyse data and generate reports to facilitate evidence-based decision making. The reporting in the eCHIS will be aligned to the Monitoring and Evaluation Framework and eHealth strategy. The report will be standardised to respond to the Kenya Health Sector strategic plan(KHSSP), and the Health Sector Indicator manual, and will follow the reporting timelines as described in the HIS policy and M&E framework. Users will be able to access standard reports as well as create customized or ad hoc reports to meet their specific needs. The eCHIS will allow users who create custom or ad hoc reports to organize them into dashboards and save them for future access without the need for recreation.



4.2.1 Case-based Reports

Case-based reports will be reports on events, episodes or household visits generated at person/people level. These reports should support search for individual, people, or client encounters as well as upcoming activities by the community health worker at the household level. They should allow the user to view the profile, validate the captured information and produce information products. A line list of activities should be able to be populated at individual/person level in the household, which will include the following community unit service received/offered; date of an event, age of the client, sex of the client, service offered/received, service provider, rescheduling and appointments.

4.2.1.1 Client Lists

Priority	High
User	Health managers, HRIOs, CHFPs,
Interface	Web app

Description: This feature will allow designated users to generate lists of clients based on client characteristics for a defined time period. Additionally, client lists may be filtered by organizational hierarchy.

Details: The client characteristics used to generate client lists include any of the attributes collected during household enrolment, service delivery, client referral, messaging and any other area of functionality where client-level data is collected. Client characteristics can also be “calculated” from other characteristics. For example, the system might store the attribute “Date of Birth” from which the client characteristic “Age” may be calculated.

Example 1: A client list might be defined as “All clients who were tested for TB in January 2020”. In this case, the characteristic is “TB Test Status” and the defined time period is January 2020.

Client lists may further be filtered by organizational hierarchy.

Example 2: A client list might be defined as “All clients who were tested for TB in January 2020 in Mombasa County”. In this case, the characteristic is “TB Test Status”, the defined time period is January 2020 and the hierarchy filter is “County- Mombasa County”.

NOTE 1:

4.2.1.2 CHV/CHA Lists

Priority	High
User	Health Managers, CHFP,HRIO, CHA,CHVs,
Interface	Web app



Description: This feature will allow designated users to generate lists of users based on CHVs characteristics for a defined period of time.

Details: CHV characteristics used to generate the CHV list will include attributes like the user name, the number of CHVs/CHAs in the area, the number of households, the number of household members, the number of pregnant mothers visited, ANC visits, skilled deliveries and the fully immunized. These attributes should be collected during household visits.

4.2.2 Aggregate Reports

Aggregate reports will comprise aggregation of events by organization units (community units, wards, sub county, county and national levels), Period (daily, weekly, monthly, quarterly, bi -annually and annually), sex, age and services provided (data elements, events). The reports should be in line with the harmonised and standardised reporting protocols according to HIS policy and Health Act, 2017. The aggregate reports will be customised to reflect the standards of reporting which will include standard tools and formats of reporting in the routine reporting.

4.2.2.1 Client Summaries

Priority	High
User	Health managers, HRIOs, CHFPs,
Interface	Web app

Description: This feature will allow designated users to create service statistics reports based on client characteristics for a defined time period. Additionally, client statistics may be disaggregated by organizational hierarchy.

Details: The client characteristics used to generate client lists include any of the attributes collected during household enrolment, service delivery, client referral, messaging and any other area of functionality where client-level data is collected. Client characteristics can also be “calculated” from other characteristics. For example, the system might store the attribute “Date of Birth” from which the client characteristic “Age” may be calculated.

Example 1: A client summary might be defined as “The total number of clients who were tested for TB in January 2020”. In this case, the characteristic is “TB Test Status”, the aggregation is “Count” i.e. “Total Number of Clients Tested for TB” and the defined time period is January 2020.

Client summaries may further be disaggregated by other client characteristics and/or organizational hierarchy.

Example 2: A client summary might be defined as “The total number of Male clients who were tested for TB in January 2020 in Mombasa County”. In this case, the characteristic is “TB Test Status”, the statistic is “Count” i.e. “Total Number

of Clients Tested for TB”, the defined time period is “January 2020”, the client characteristic disaggregation is “Sex =Male”, and the hierarchy disaggregation is “County = Mombasa Country”.

NOTE 1: The eCHIS will support the ability to assemble individual client summaries into a list of summaries. Such list of summaries will form a service statistic report. Service statistic reports can be saved on the system for future access or can be downloaded for archiving and sharing.

4.2.2.2 CHV/CHA Summaries

Priority	High
User	Health Managers, HRIOs, CHFPs,
Interface	Web app

Description: This feature will allow designated users to create service statistics reports based on CHV characteristics for a defined time period. Additionally, CHV statistics may be disaggregated by organizational hierarchy.

Details: The CHV characteristics used to generate client lists include any of the attributes collected when registering CHVs on the eCHIS. CHV characteristics can also be “calculated” based on data entered by a CHV. For example, the system might calculate the “Total number of households visited” or “The total number of family planning commodities issued” for a particular CHV.

Example 1: A CHV summary might be defined as “The total number of households visited in January 2020”. In this case, the characteristic is “Number of households visited”, the aggregation is “Sum” i.e. “Total number of households visited” and the defined time period is “January 2020”.

CHV summaries may further be disaggregated by other CHV characteristics and/or organizational hierarchy.

Example 1: A CHV summary might be defined as “The total number of households visited by AMREF Funded CHVs in January 2020 in Mombasa County”. In this case, the characteristic is “Number of households visited”, the aggregation is “Sum” i.e. “Total number of households visited” and the defined time period is “January 2020”.

Example 2: A client summary might be defined as “The total number of Male clients who were tested for TB in January 2020 in Mombasa County”. In this case, the characteristic is “TB Test Status”, the statistic is “Count” i.e. “Total Number of Clients Tested for TB”, the defined time period is “January 2020”, the client characteristic disaggregation is “Sex =Male”, and the hierarchy disaggregation is “County = Mombasa County”.

4.3 System Administration

4.3.1 User Management

User roles management

Users shall be grouped based on the roles they have in the health services provision. User roles and permissions shall be configured by the system administrators.

User role functions should include the permissions such as add new user, modify user details, view users and remove a user. The specific roles can be defined per modules, sub-module and module function.

Group roles and permissions will be set as per the departments and departmental roles within a facility.

User accounts Creation process

User creation will be done through the system administrator.

New user account process: Community health units' staff that require to use the system shall fill a user account request form which shall be approved by their supervisor and forwarded to the head of department for approval. Upon approval by the HOD, the form shall be forwarded to the system administrator who shall create the user and send them an email notification with instruction on how to access the system.

For the CHVs, upon filling the user account creation form, the CHA will access the form and either approve it or reject it. Upon approval, the form will be sent to the system administrator who will create the user account and configure the hand held device to use the created user account credentials.

Update user rights process: The system users that are redeployed to new duty stations shall fill in a user account update form that shall be approved by their supervisor and forwarded to the head of department for approval. Upon approval by the HOD, the form shall be forwarded to the system administrator who shall update the user and send them an email notification with instruction on how to access the system.

Deactivate a user: the HOD shall notify the system administrator for account deactivation of the staff in her department that no longer require access to the system or have left the department or organization. The system administrator shall upon receiving the deactivate user request, deactivate the user.





**New User Account Request Form
User Bio-data**

Name of the staff (first name, last name) _____

Personal number/staff number _____

Phone number _____

Email address _____

Department _____

Roles in the department _____

Signature _____

Date _____

Tick appropriately

_____ New user _____ User account update _____ Deactivate user account





Supervisor's Section

User role to be assigned;

System Roles	Tick appropriately
Registration clerk	
Registration supervisor	
Registration manager	
Laboratory technician	
Medical doctor	
Nurse	

Comment _____

Name of the supervisor _____

Signature _____

Date _____

Head of Department

Approved _____ Yes _____ No

Comment _____

Name of the HOD _____

Signature _____

Date _____

System Administrator

User account created _____ Yes _____ No

Signature _____

Date _____





5. Non-Functional Requirements

Non-functional requirements refer to the requirements that specify criteria that can be used to judge the operation of a system, rather than specific behaviours (functional requirements). Non-functional requirements ensure the optimal usability and effectiveness of the system as a whole. The table below covers the eCHIS non-functional requirements.

Attribute	Definition and Approach
Security	<p>Definition: The assurance that the data stored within a system and transmitted from the system has the necessary security measures in place to prevent unauthorized access.</p> <p>Approach:</p> <ol style="list-style-type: none">1. Define the mechanism in the system to deter potential threats occurrence. <i>For example; malware, unauthorized users, network compromises</i>2. Define the user management including authorities' definition, users grouping functionality, user adding, deactivation and removal functionalities. The user management should cover the application and database access as necessary3. Implementation of best practices on system security policies by expanding the non-functional requirement to functional requirement. <i>For example; password requirement, login requirement, inactivity timeouts, audit log trails</i>4. Adopt internationally accredited system security standards and protocols for the application, network and data transmission

Data Integrity

Definition:

This focuses on the validity, consistency and accuracy of data that is stored within the system.

Approach:

1. Identify the common threats that would compromise on data quality and define mitigations implemented in the system. *For example; human error, compromised hardware, misconfiguration, security errors, errors in data transfer, cyber-attacks.*
2. Define the data integrity preservation checklist applicable for use in the system's audit. *For example; input validation, eliminate data duplications, data audit trailing, data backup, access controls.*
3. Define the database management and security measures to prevent database attacks. *For example; data store encryption function to deter database injection attacks.*
4. Develop the database maintenance policies to address data duplicity, database translation audit trails and data encryption modes and management.

Interoperability

Definition:

The ability of systems to exchange in an automated methodology.

Approach:

1. The system should adhere to the Kenya Health Information Systems Interoperability Standards and Guidelines
2. The system should have APIs that are secure and have data integrity management policies
3. Define the interoperability standards required by the system. *For example;*
 - a) *Information interoperability - seamless or on-demand, data formatting.*
 - b) *Hardware interoperability - system device-readiness, hardware generational compatibility*
 - c) *Technical interoperability - environmental definition. Development versus Production.*
 - d) *Business interoperability - definition of the use cases that share processes and information.*





Portability & Compatibility

Definition:

This describes how elements from one platform can be easily accessed and interacted with from a different environment.

Approach:

Define the system's compatibility requirements that should be met by other applications, software, hardware and networking aspects.

For example, this system should support the following mobile operating systems; Android and iOS devices

Performance & Scalability

Definition:

The ability of the system to accommodate a large number of users and extension of functionality without affecting its access or use.

Approach:

1. Define the specific measurement scenarios of the system's throughput. *For example, latency and content type.*
 2. Specify the workload for measurement. *For example, the number of users accessing the system at certain times in a day*
 3. Assess response time against a defined threshold. *For example, instantaneous response time = x, delayed response time = y.*
 4. Test the current maximum load that the system can handle and prepare to increase it in the near future. *For example, stress testing*
 5. Define a test for the system's modules extension and their regression effects on other components of the system.
-



Reliability

Definition:

The ability of a system to run without expressing a failure for any given period of time under a set of predefined conditions.

Approach:

1. Define the normal usage conditions and uptimes in probability percentage. *For example, the system guarantees x% reliability implying that under the normal conditions, the system guarantees x% probability that it will not experience failures.*
2. Define the acceptable mean uptimes between failures
3. Define the mean time to recovery.

Maintainability

Definition:

This is a measure of time taken for a system maintenance, upgrade or performance optimization.

Approach:

1. Define the maintenance time frame in probability percentage. *For example, x% maintainability in y time implies that there is a x% probability that the system can be maintained within y time*
2. Define the acceptable mean times between failures
3. Define the system roll backs functionality and timelines
4. Define the system's support mechanisms that are inbuilt or require external interventions

Availability

Definition:

The likelihood that the system will be accessible for the users at any given point in time.

Approach:

1. Define system availability timelines estimates during testing and production
 2. Define the system recovery and business continuity measure. *For example, define the redundancy modes of system hosting and database synchronization models.*
-





Usability

Definition:

The ease in which the users are able to utilize the system with minimal difficulty and having the need addressed by the system achieved.

Approach:

1. Run a prototype usability test with the targeted audience
 2. Reference the prior system that was in use as a benchmark
 3. Conduct a comprehensive user requirements gathering and field study where necessary to understand the context and ensure that the system matches up to the user needs.
For example; laws, regulations, culture, date formatting.
-





APPENDIX 1:
eCHIS SOFTWARE DESIGN SPECIFICATION
April 2021





1. Introduction

1.1 Background

The Ministry of Health (MOH) is committed to the digitization of healthcare services across the Kenya Essential Package for Health (KEPH) levels. This includes Level 1 which is realized through frontline community health volunteers (CHVs) at the household level. The journey of adopting the electronic Community Health Information System (eCHIS) began with the development of a National Community Health Digitization Strategy (Phase I). Phase II of the process is focused on designing, developing, testing and piloting the eCHIS prototype in selected counties. To support this process, a Software Requirements Specification (SRS) document was prepared through a consultative process involving the MOH and its development partners. The SRS serves as a catalogue of the features and functionality expected to be offered by the eCHIS. In addition to developing the SRS, the ministry also reviewed existing digital interventions for community health with a view to characterizing and understanding their level of comprehensiveness, maturity and conformance with the requirements specified in the SRS.

By evaluating existing community health digital interventions against the SRS, the MOH identified critical feature gaps that need to be addressed before the eCHIS can be piloted ahead of nationwide scale-up. Enhancing existing digital solutions to meet the requirements of the community health division rather than developing a new information system from scratch represents the “shortest path to success” for the implementation of the National Community Health Digitization Strategy. This document proceeds from the SRS and the in-depth eCHIS evaluation (see annexure) to describe in detail the design of the components to be enhanced and developed to achieve a pilot-ready eCHIS.


1.2 Objectives

This software design specification aims to achieve the following objectives:

1. To describe the design of system components that will be enhanced before the eCHIS prototype is piloted.
2. To describe the interoperability approach for enabling the eCHIS and the Digital Health Platform(DHP) to exchange data in order to facilitate client referral coordination, supply chain management and other areas.
3. To identify the other systems required to support seamless interoperability between the eCHIS and the DHP.

1.3 Context

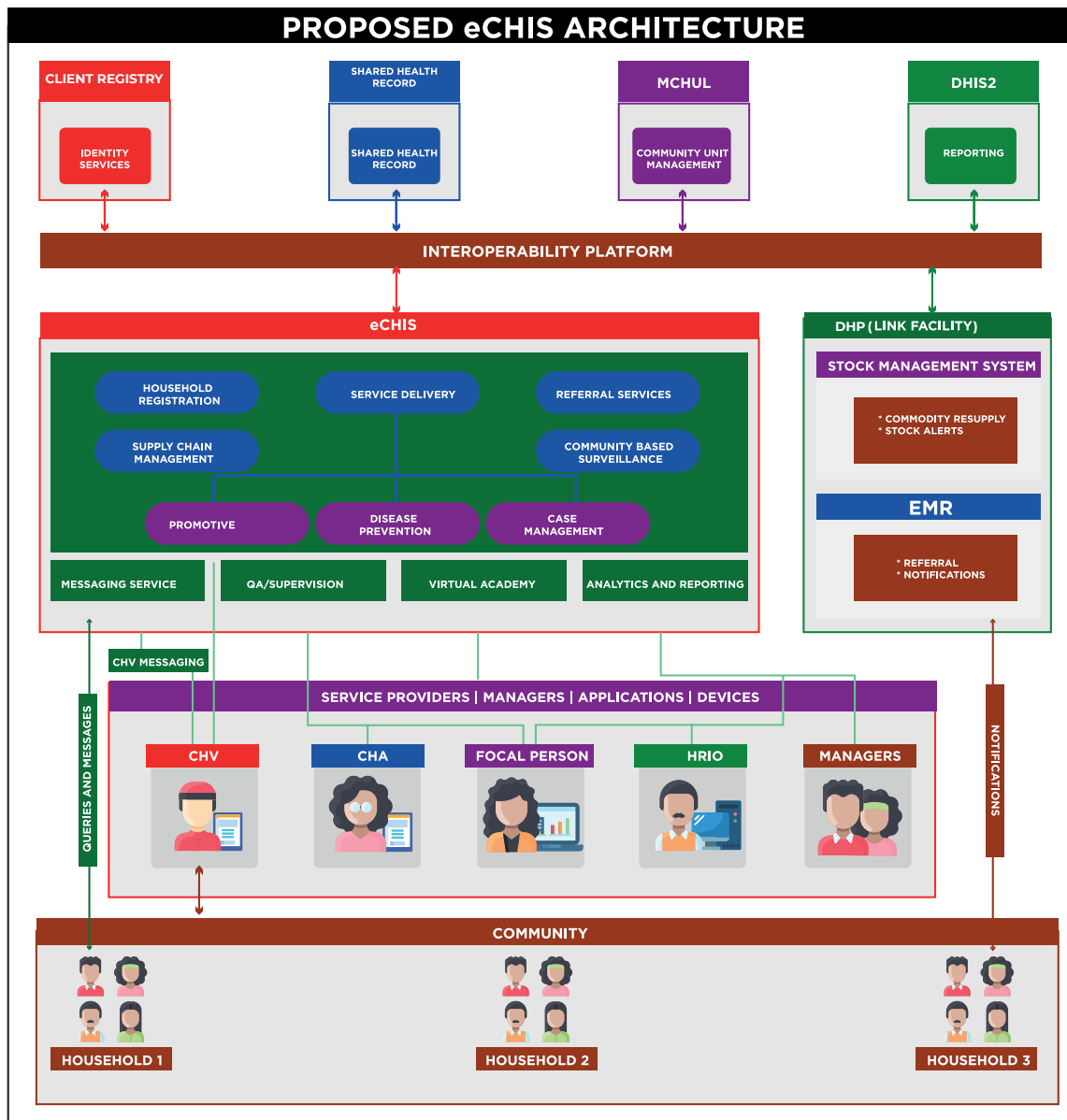
The eCHIS represents one component in a comprehensive suite of Health Information Systems (HIS) designed to promote optimal healthcare service delivery using digital technology. Other applications in the suite include the DHP, which digitizes patient management at the health facility; the Client Registry (CR), which will provide identity resolution services to other systems; the Shared Health Record (SHR), which will aggregate de-identified client-level



data; the Kenya Master Health Facility List (KMHFL), which serves as registries for community units; and the Kenya Health Information System (KHIS), which is used for routine service statistics reporting at the county and national levels. Also included in the list of HIS used by the MOH are the Integrated Human Resource Information System (IHRS), which serves as a registry of healthcare workers; and the Logistics Management Information System (LMIS), which is used to manage the supply chain of medical supplies.

Unlike the other applications which are deployed at the health facility or higher levels, the eCHIS is unique in that it is deployed at the community level to facilitate the delivery of KEPH Level 1 services. It is envisaged that the eCHIS will also be interoperable with other applications in order to facilitate healthcare delivery and health records management for all clients regardless of their point of contact with the healthcare system. For example, the eCHIS is expected to support interoperability with the DHP to facilitate community-to-facility and facility-to-community client referral as well as commodity supply chain management for health commodities used at the community level. Similarly, the eCHIS is also expected to interoperate with KHIS in order to support routine aggregate community health service statistics for national and subnational reporting. The high-level architecture diagram below shows the various HIS used or envisaged for future deployment by the MOH, as well as their expected relationship and interactions with the eCHIS.






A high-level architecture diagram of the eCHIS showing its planned interactions with other HIS.

1.4 Constraints

The design of the eCHIS components described in this document is subject to the following constraints:

1. **Mobile access:** All functionality intended for Community Health Volunteers (CHVs) and Community Health Assistants (CHAs) must be accessible via handheld Android devices.
2. **Offline use:** CHVs and CHAs must be able to use the eCHIS offline and then synchronize data with the server when internet connectivity becomes available.
3. **Identity resolution:** The eCHIS must be able to resolve client identities against a Client Registry in order to ensure consistent client identification with DHP and other systems.

- 
- 4. Structural interoperability:** The interoperability between eCHIS and other HIS must achieve at least structural interoperability or higher.

1.5 Dependencies

The successful implementation of a fully interoperable and production-ready eCHIS is dependent on the following external components. These components are necessary to achieve structural interoperability. In order to achieve semantic interoperability, a terminology service is also required. However, the pilot phase of the eCHIS aims for structural interoperability. Semantic interoperability will be incorporated in future versions of the application.

1.5.1. Client Registry

In order for the eCHIS to exchange data with the DHP, it is critical for clients to be consistently and unambiguously identified across both systems. Failure to do so has serious clinical and operational implications. For example, a misidentified client can be treated based on another client's condition or be billed for services offered to someone else. To achieve consistent and reliable client identification, both the eCHIS and DHP architectures envisage a third-party service known as the client registry.

The client registry shall serve as an accurate and up-to-date electronic database containing the demographic information on every client who receives healthcare services in Kenya. It shall also offer the capability to service client resolution queries from duly authenticated third-party applications such as the eCHIS and the DHP, according to well-defined communication protocols. The CR shall provide functionality to query for client identity, enrol new clients, update existing clients, merge duplicate clients and archive deceased clients.

1.5.2. CHW Registry

In addition to uniquely identifying clients, proper identification of Community Health Workers (CHWs) including CHVs and CHAs across all levels is important to ensure a seamless implementation of interoperability between the eCHIS and DHP. The proposed CHW registry, therefore, will serve as an accurate and up-to-date record of every CHW. The registry will include information about each CHW by cadre, CHU, and other details necessary to promote optimal coordination and human resource management.

It will also include functionality to add new CHWs, update data on existing ones, and remove those who transition out of community health service. The registry shall be accessible directly, as well as through both the eCHIS and the DHP to facilitate consistent CHW identification during referral coordination and other workflows.

1.5.3. Interoperability Platform

The DHP and eCHIS architectures also anticipate the implementation of a general-purpose interoperability platform. The role of the interoperability platform is to serve as an enterprise service bus responsible for routing messages between various endpoints. In addition, the interoperability platform will handle network





optimization and failure recovery mechanisms such as message queuing and retries, as well as message routing that is agnostic to physical network addresses. The goal of the interoperability platform is to achieve loose coupling between communicating systems, while at the same time defining a simple, high-level communication protocol for applications. In the absence of the interoperability platform, direct point-to-point communication between the eCHIS, DHP and other systems will be used.



2. eCHIS Enhancements

The following key enhancements arise from the SRS and the eCHIS in-depth evaluation (see annexure). They represent the gaps that must be addressed ahead of the eCHIS pilot in the field. As mentioned in the introduction, the implementation of these features represents the “shortest path to success” towards the achievement of a pilot-ready eCHIS implementation. The gaps take into account the totality of all features available in the most comprehensive eCHIS reviewed and identify what is missing to complete those particular implementations.

2.1 Client Referral

The eCHIS shall provide a comprehensive feature for client referral with the following characteristics:

1. The ability for the CHV to fill out a digital version of the MOH 100 client referral form on their mobile app.
2. The ability for the eCHIS to automatically send the data from the digital MOH 100 client referral form to the DHP instance at the client’s link facility.
3. The ability for the eCHIS to automatically receive a client’s counter-referral form from the health facility and present it to the CHV for processing.

2.2 Commodity Supply Chain

The eCHIS shall provide a comprehensive feature for commodity supply chain with the following characteristics:

1. The ability for the CHA to view CHV commodity movement records and identify resupply needs.
2. The ability for the CHA to fill out a commodity requisition form on the eCHIS.
3. The ability for the eCHIS to automatically send the requisition form to the DHP instance at the CHA’s link health facility.
4. The ability for the eCHIS to receive and present to the CHA a commodity resupply offer emanating from the DHP.
5. The ability for the CHA to accept or decline a commodity resupply offer, indicating the reasons thereof.
6. The ability for the eCHIS to automatically update CHA commodity stock once a resupply offer has been accepted and fulfilled.
7. The ability for the CHA to issue commodities to individual CHVs through the eCHIS and have their commodity stock levels updated accordingly.
8. The ability for CHVs to dispense commodities during service delivery and have their stock levels updated accordingly.
9. The ability for CHVs to perform adjustments to their stock levels including recording expired, damaged or lost commodities.
10. A comprehensive audit trail to track the movement of stocks throughout the supply chain.



3. eCHIS-DHP Interoperability

3.1 Introduction

According to the Health Information and Management Systems Society, interoperability in the healthcare system is defined as, “the ability of different information systems, devices and applications to access, exchange, integrate and cooperatively use data in a coordinated manner, within and across organizational, regional and national boundaries, and to provide timely and seamless portability of information, as well as optimize the health of individuals and populations”. Interoperability is achieved through data exchange architectures, application interfaces and standards that enable data to be accessed and shared appropriately and securely across the complete spectrum of care, within all applicable settings with relevant stakeholders, including individuals. The goal of data exchange schema and standards should be to allow for the sharing of data among healthcare community participants irrespective of which applications or vendors they use, thereby transcending organizational boundaries and promoting effective healthcare delivery. Therefore, interoperability offers the potential to help healthcare organizations to break down the barriers that block meaningful communication among Health IT systems. Health systems interoperability is recognized as having the following 3 levels. The initial implementation of eCHIS-DHP interoperability aims to achieve at least structural interoperability (Level 2).

3.1.1 Foundational Interoperability


Foundational interoperability is the least sophisticated level and refers to the ability of systems to exchange data securely without any requirement for either of them to interpret the information received. This is the most basic level of interoperability that systems must meet in order to be considered to be sharing data. The format of the data exchanged at this level is not governed by any standards. Consequently, foundational interoperability on its own is not very useful. However, it forms the foundation for higher levels of interoperability.

3.1.2 Structural Interoperability

Structural interoperability represents an intermediate level of sophistication and improves on functional interoperability by introducing standardized information exchange formats. On this level, the focus is on packaging the shared data according to standards agreed upon. The standards may be international, e.g., Health Level 7 (HL7), or local, i.e., internal formatting agreements, that the communicating systems must adhere to within a particular organization or set of organizations. Structural interoperability guarantees that the systems exchanging data can do so in a way that preserves the integrity of the original and allows them to process the data to a minimal degree, e.g., by extracting the constituent fields and saving them to a database.

3.1.3 Semantic Interoperability

Semantic interoperability represents the highest level of sophistication. It allows



participating systems to interpret and therefore, be able to use the data received as part of an information exchange transaction. To achieve this, systems must share a common understanding of the data at the data field level. This calls for a centrally shared reference or dictionary to support the unambiguous interpretation of the meanings of terms. Such a reference is sometimes also referred to as metadata, i.e. “data about data” and is typically managed centrally by a local or international organization mandated to do so. By coupling the health information exchange standards discussed under structural interoperability with a shared vocabulary, systems can transmit data in a single, self-contained information package that both preserves the integrity of the original, and ensures that it can be interpreted at the destination.

3.2 Interoperability For Client Referral

3.2.1 Community to Health Facility Referral

3.2.1.1 Description

A community-to-facility referral occurs when a CHV identifies a client who needs to be sent to a health facility for one or more of a variety of health reasons that the CHV cannot handle at the community level. Reasons for a referral may include danger signs e.g., reduced foetal movement in pregnancy, or clients who have defaulted on their clinic appointments. The CHV is trained to identify referral cases. The role of the eCHIS is to facilitate the referral process once the need for a referral has been identified. In order for a referral to be digitally sent to a health facility, the health facility must be running an Electronic Health Record(EHR). For the purposes of this description, DHP is assumed to be the default EHR. However, the process is applicable to other EHR implementations.

Normally, a community-to-facility referral is targeted at the client’s link health facility. However, the design described below takes into consideration the fact that a client may exercise their right to seek healthcare at a clinic that is different from their link health facility. For this reason, the community-to-facility referral workflow not only provides for the eCHIS to send a client referral to the client’s link facility, but also allows any authorized health facility to query for a client’s referral information on demand.

Once a client is referred from the community to a health facility, the underlying expectation is that the client makes a clinic visit. Ideally, the client is expected to indicate to the healthcare provider that their visit is in fulfilment of a community-based referral. However, the eCHIS referral workflow is designed to work correctly regardless of whether or not the client reveals the referral nature of their visit. This is achieved by requiring healthcare providers to query the eCHIS for a client’s list of active referrals whenever they are processing the client.

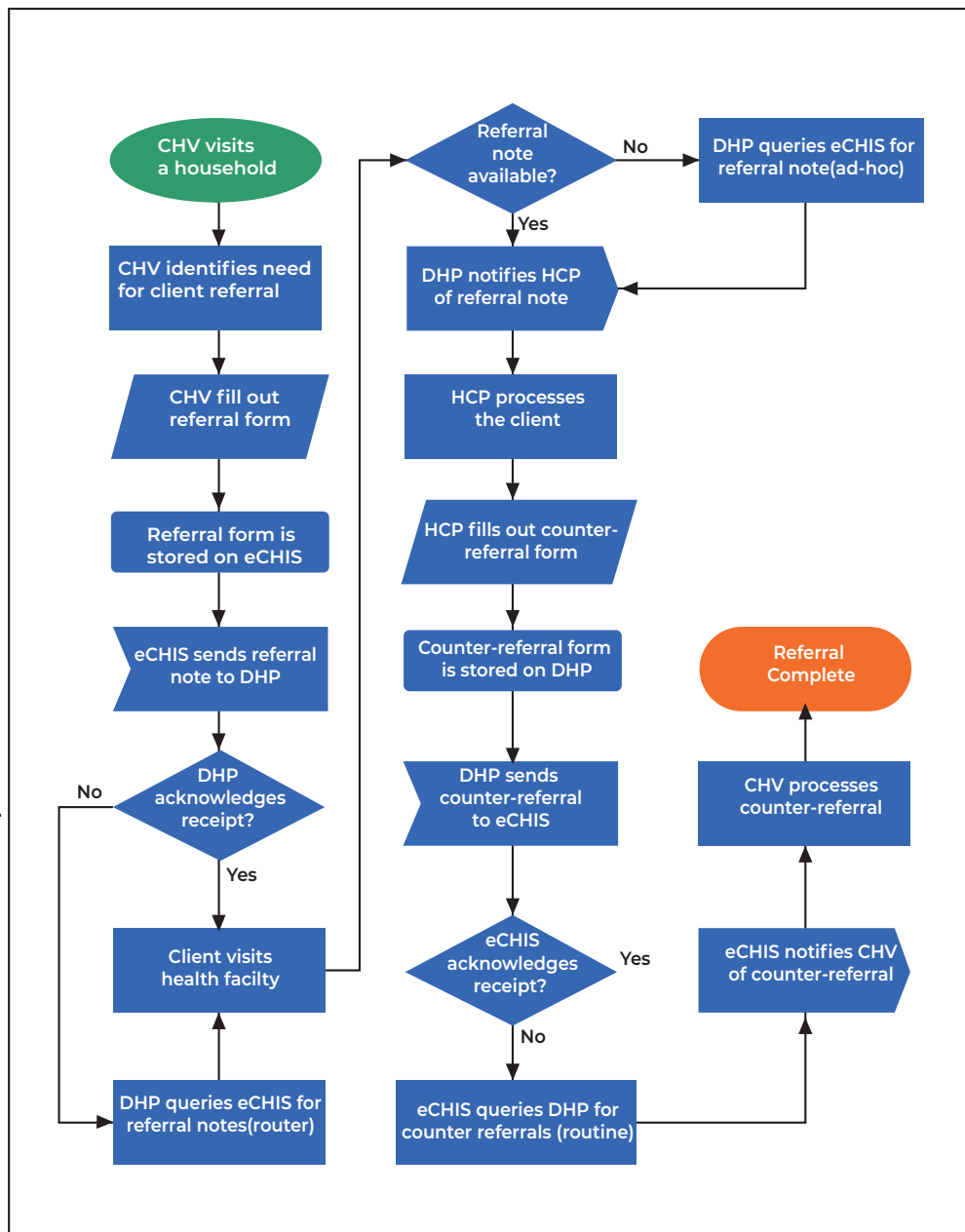
When a healthcare provider processes a client, who was referred to the health facility from the community, he or she is expected to issue a counter-referral. A counter-referral may simply be a note to say that the client honoured the referral, or a more substantive response such as an explicit instruction for the




client to be offered psychosocial support at the community level. The utility of a counter referral is to either; (a) notify the CHV to stop following up a client who has honoured his referral or (b) instruct the CHV to further follow up the client to execute specific orders from the healthcare provider.

3.2.1.2 Workflow

The flowchart below summarizes the process of performing a complete community-to-facility client referral. Each node represents a distinct step in the process and is explained below the diagram



A flowchart depicting a complete community-to-facility referral

- 
1. **CHV visits a household:** A CHV makes a routine or *ad hoc* visit to a household. During the visit, the CHV offers the normal community health services.
 2. **CHV identifies the need for client referral:** The CHV identifies the need for client referral e.g., by screening for pneumonia signs and symptoms.
 3. **CHV fills out referral form:** To initiate a referral, the CHV fills out a digital referral form on the eCHIS.
 4. **Referral form is stored on the eCHIS:** Before sending a referral note to the health facility, the eCHIS stores a copy of the referral form for future reference.
 5. **eCHIS sends a referral note to DHP:** The eCHIS then *pushes* the referral note to the client's link health facility through the DHP.
 6. **DHP acknowledges receipt:** If DHP receives the referral note from the eCHIS, it immediately acknowledges receipt.
 7. **DHP queries eCHIS for referral notes (routine):** The DHP periodically queries for/*pulls* any unacknowledged referral notes from the eCHIS.
 8. **Client visits health facility:** The client eventually visits the health facility either to honour their referral or simply as a normal visit.
 9. **Referral note available:** The DHP checks whether it has an unprocessed referral note for the client.
 10. **DHP queries eCHIS for referral note (ad hoc):** If an unprocessed referral note is not available, the DHP attempts to query the eCHIS in case one is available.
 11. **DHP notifies HCP of referral note:** If a referral note is available, either from a previous push or from the *ad hoc* pull, the DHP notifies the HCP.
 12. **HCP processes the client:** The HCP processes the client e.g., by clerking the client, ordering investigations, performing diagnosis and prescribing medication.
 13. **HCP fills out a counter-referral form:** The HCP issues a counter-referral to either indicate that the client has been processed or to request community-level follow up.
 14. **Counter-referral form is stored on DHP:** Before sending the counter-referral back to the community, the DHP stores a copy for future reference.
 15. **DHP sends a counter-referral form to eCHIS:** The DHP then *pushes* the counter-referral to the client's CHU through the eCHIS.
 16. **eCHIS acknowledges receipt:** If eCHIS receives the referral note from the DHP, it immediately acknowledges receipt.
 17. **eCHIS queries DHP for counter-referrals (routine):** The eCHIS periodically queries for/*pulls* any unacknowledged counter-referrals from the DHP.
 18. **eCHIS notifies CHV of counter-referral:** The eCHIS notifies the relevant CHV of the counter-referral received from the health facility.
 19. **CHV processes counter referral:** The CHV accesses the counter-referral and processes it as necessary e.g., by executing the HCP's instructions.
 20. **Referral complete:** The community-to-facility referral and counter-referral loop is completed and the referral is marked as completed.



3.2.1.3 Data Structures

Upon the referral of a client from the community to a health facility, the eCHIS generates a JSON message in the following format:

```
{
  "SHId": "sdfds",
  "DHPIId": "85",
  "Date": "2021/03/25 16:00:30",
  "FirstName": "John",
  "MiddleName": "Smith",
  "LastName": "Doe",
  "Sex": "male",
  "DateOfBirth": "2020/01/05 00:00:00",
  "Phone": "0710981830",
  "Chuld": "089933",
  "ReferralReason": "Diarrhoea",
  "Treatment": "ORS",
  "comments": "Kindly attend to the patient",
  "ChvId": "0sdfs",
  "ChvName": "Onyango Ouma",
  "ChvPhone": "0711223344"
}
```

Upon the issuance of a counter-referral of a client from the health facility back to the community, the DHP generates a JSON message in the following format:

```
{
  "OfficerName": "Bernard Onyancha",
  "OfficerNumber": "+254710900100",
  "ChvId": "9903ED01",
  "DHPIId": "0011A",
  "ReferralNotes": "Tuberculosis confirmed",
  "DateOfVisit": "2021/03/09 00:00:00",
  "CallMadeToChv": "Yes"
}
```

3.2.1.4 APIs

Service APIs	
URL	Payload
dhp_url	JSON (Referral, see data structure above)
echis_url	JSON (Counter- referral, see data structure above)

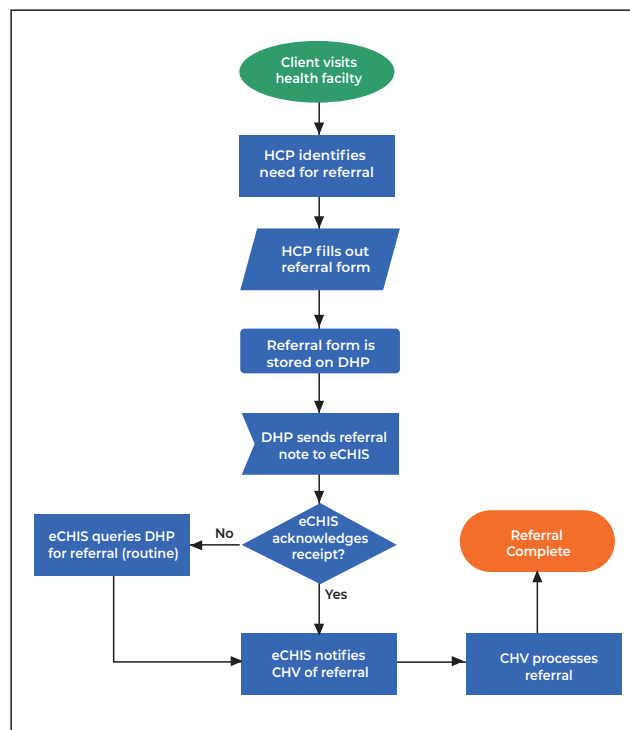
3.2.2 Health Facility to Community Referral

3.2.2.1 Description

A facility-to-community referral occurs when a healthcare provider identifies a client who needs to be sent to a CHV for one or more promotive and preventive healthcare services that are rendered at the community level. Reasons for a referral may include a client's need for home-based care, psychosocial support, counselling, drug adherence supervision among others. The healthcare provider is trained to identify referral cases. The role of the eCHIS is to facilitate the referral process once the need for a referral has been identified. In order for a referral to be digitally sent from a health facility, the health facility must be running an EHR. For the purposes of this description, DHP is assumed to be the default EHR. However, the process is applicable to other EHR implementations. Unlike a community-to-facility referral which may be honoured by the client at a clinic different from their link facility, facility-to-community referrals are necessarily processed at a client's CHU. Also, facility-to-community referrals are different from community-to-facility counter-referrals in that they necessarily contain substantive instructions to the CHV. Community-to-facility counter-referrals, on the other hand, may either contain substantive instructions to the CHV, or simply note that the client honoured their appointment and therefore do not need to be followed up for it at the community level.

3.2.2.2 Workflow

The flowchart below summarizes the process of performing a complete facility-to-community client referral. Each node represents a distinct step in the process and is explained below the diagram.



A flowchart depicting a complete facility-to-community referral



1. **Client visits health facility:** A client makes a visit to a health facility. During the visit, the client receives the normal services offered at a health facility.
2. **HCP identifies need for community referral:** In the course of service provision to the client, the HCP identifies a need for community referral e.g. for psychosocial support.
3. **HCP fills out a referral form:** To initiate a referral, the HCP fills out a digital referral form on the DHP.
4. **Referral form is stored on DHP:** Before sending a referral note to the community, the DHP stores a copy of the referral form for future reference.
5. **DHP sends a referral note to eCHIS:** The DHP then *pushes* the referral note to the client’s Community Area through the DHP.
6. **eCHIS acknowledges receipt:** If eCHIS receives the referral note from the DHP, it immediately acknowledges receipt.
7. **eCHIS queries DHP for referral (routine):** The eCHIS periodically queries for/*pulls* any unacknowledged referral notes from the DHP.
8. **eCHIS notifies CHV of referral:** If a referral note is available, either from a previous push or from the *ad hoc* pull, the eCHIS notifies the CHV.
9. **CHV processes referral:** The CHV processes the client e.g. by developing a care plan according to referral instructions.
10. **Referral complete:** The facility-to-community referral loop comes to an end and the referral is marked as completed.

3.2.2.3 Data Structures

Upon the referral of a client from a health facility to the community, the DHP generates a JSON message in the following format:

```

{
  "DateOfVisit": "2021/02/27 45:10:02",
  "ClinicianName": "Everlyne Wanja",
  "DHPId": 9903,
  "Sex": "Male",
  "DateOfBirth": "1997/06/29 00:00:00",
  "CommunityHealthUnit": "0002",
  "ReasonsForReferral": "Counselling",
  "ReferralNotes": "Provide psychosocial support"
}

```

3.2.2.4 APIs

Service APIs	
URL	Parameters
echis_url	JSON (Facility referral, see data structure above)



3.3 Interoperability For Commodity Supply Chain Management

3.3.1 Description

At the community level, the CHA is responsible for requisitioning community service commodities from the link health facility. The CHA then distributes the commodities to CHVs for dispensing to households as needed. Commodities at the health facility will be managed using the DHP. As such, it will be the responsibility of the DHP to coordinate the supply and management of commodities from KEMSA and other suppliers. The role of the eCHIS in commodity supply chain management, therefore, begins at the health facility level and downwards to the community level where the commodities are dispensed to clients. The CHA will rely on the data in the eCHIS and coordinate with individual CHVs to determine when to reorder commodity supplies. For this reason, the eCHIS will also be responsible for tracking commodity issuance to CHVs as well as commodity dispensing from CHVs to clients. In so doing, the eCHIS will maintain a running log of what commodities are in what state i.e., requisitioned, issued, dispensed etc.

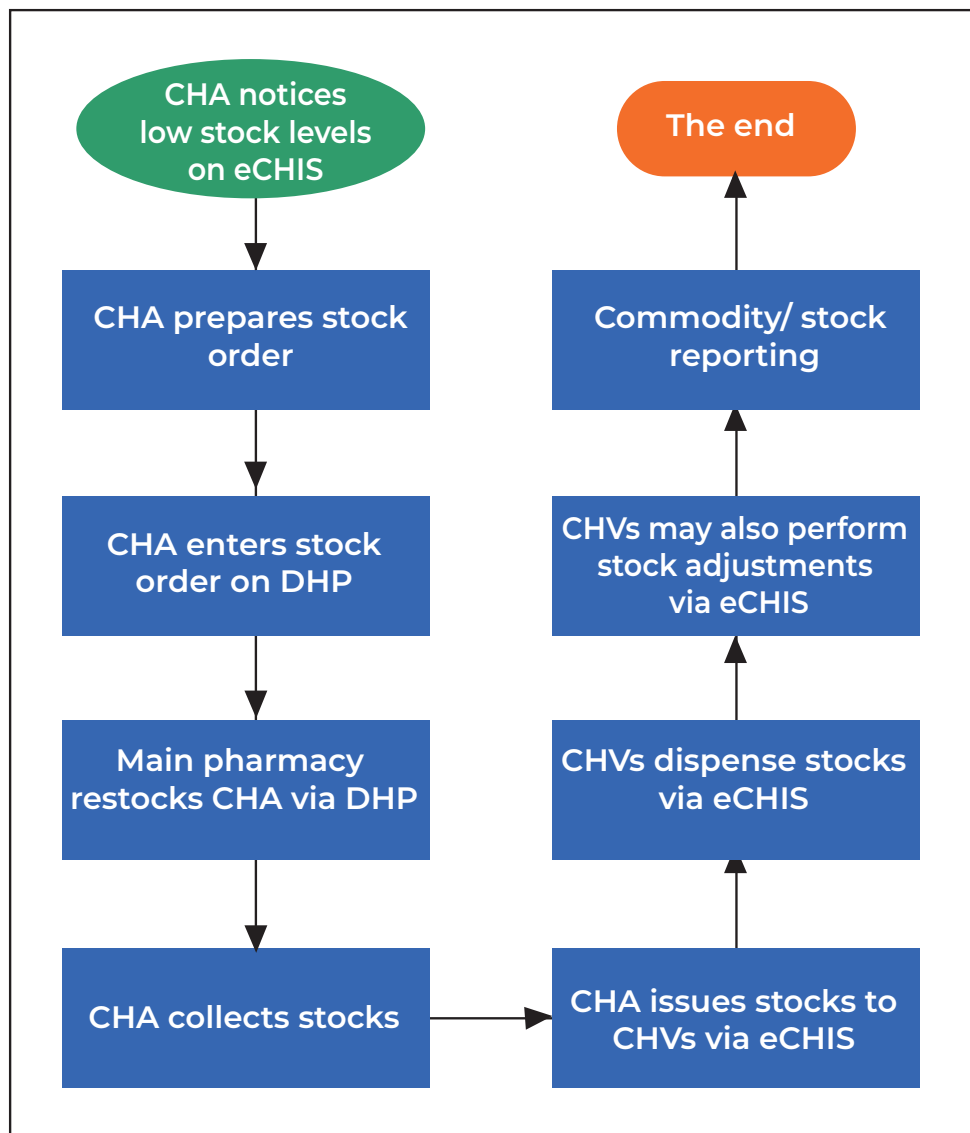
The process of commodity supply chain management at the community level therefore entails the following steps:

1. The CHA determines the need for commodity restock and logs a resupply request with the pharmacy at the health facility.
2. The pharmacy at the health facility processes the resupply request and issues to the CHA the commodities requested.
3. The CHA issues the commodities obtained from the health facility pharmacy to individual CHVs.
4. The CHVs dispense the commodities obtained from the CHA in the normal course of delivering community health services.
5. The CHA monitors stock movements from themselves to CHVs and from CHVs to clients and uses this information to make the next resupply request.

The procedures described above may take place on either the eCHIS or on the DHP depending on the specific needs to be fulfilled. In some cases, the eCHIS and the DHP have to interoperate. The workflow section below describes the design details of the interoperability use cases where the eCHIS and DHP need to share data to facilitate commodity supply chain management.

3.3.2 Workflow

The flowchart below summarizes the process by which a CHA requisitions commodities from the link health facility. Each node represents a distinct step in the process and is explained below the diagram.



A flowchart depicting the process of requisitioning commodities from the health facility by the CHA.

1. **CHA notices low stock levels on eCHIS:** The CHA routinely reviews stock reports on the eCHIS to identify a low stock condition based on stock movement within the eCHIS.
2. **CHA prepares stock order:** To initiate commodity resupply, the CHA prepares a stock order indicating the commodities and quantities to be ordered.
3. **CHA enters stock order on DHP:** The CHA enters the stock order in the DHIS to initiate the restocking process at the main pharmacy at the link facility.
4. **Main pharmacy restocks the CHA via DHP:** The main pharmacy processes the order and restocks the CHA (treated as a “mini-pharmacy” at the health facility).
5. **CHA collects stocks:** The CHA arranges to collect the commodities for issuance to CHVs at the community level.

6. **CHA issues stocks to CHVs via eCHIS:** The CHA can see the stock levels for various CHVs on the eCHIS. The CHA issues commodities to CHVs accordingly.
7. **CHVs dispense stocks via eCHIS:** The CHVs dispense stocks in the community as needed using the eCHIS to track stock movements.
8. **CHVs may perform stock adjustments via eCHIS:** eCHIS allows CHVs to perform stock adjustments as necessary e.g. to account for expiry or losses.
9. **Commodity Stock Reporting:** The stock ordering, issuance, dispensing and adjustment data is used to inform commodity management reports.

3.3.3 Data structures

A commodity requisition by the CHA is sent to the DHP as a JSON message in the following format:

```
{ "Date": "2021/03/25 16:00:30",
  "Chuld": "089933",
  "comments": "Please expedite",
  "Chvld": "0sdfs",
  "ChvName": "Onyango Ouma",
  "ChvPhone": "0711223344",
  "CommodityList": [{
    "CommodityId": 1001,
    "CommodityName": "ORS",
    "CommodityQuantity": "200",
    "QuantityUnits": "Sachets"
  },
  {
    "CommodityId": 1016,
    "CommodityName": "Paracetamol",
    "CommodityQuantity": "80",
    "QuantityUnits": "Blister packs"
  }
]
```

A commodity resupply offer by the health facility pharmacist is sent to the eCHIS as a JSON message in the following format:

```
{
  "Date": "2021/03/25 16:00:30",
  "FacilityId": "2798"
  "Chuld": "089933",
  "comments": "Not enough ORS",
  "Chvld": "0sdfs",
  "ChvName": "Onyango Ouma",
  "ChvPhone": "0711223344",
  "CommodityList": [{
    "CommodityId": 1001,
    "CommodityName": "ORS",
```



```

    "CommodityQuantity": "180",
    "QuantityUnits": "Sachets"
  },
  {
    "CommodityId": 1016,
    "CommodityName": "Paracetamol",
    "CommodityQuantity": "80",
    "QuantityUnits": "Blister packs"
  }
]
}

```

3.3.4 APIs

Service APIs	
URL	Parameters
DHP_url	JSON (Requisition, see data structure above)
eCHIS_url	JSON (Offer, see data structure above)

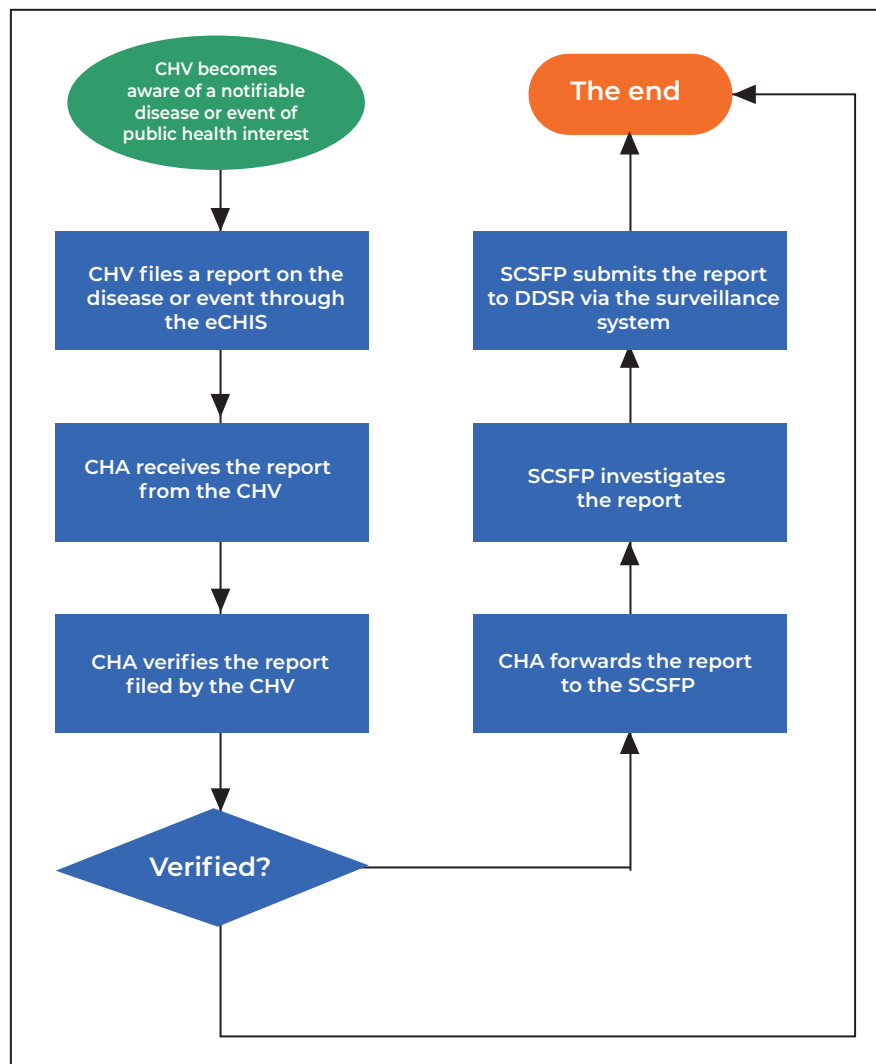
3.4 Community-Based Surveillance

3.4.1 Description

Community-Based Surveillance covers the reporting of notifiable diseases and public health events of interest identified in the community to the Sub-County Disease Surveillance Focal Person (SCSFP). The Sub-County Disease Surveillance Focal Person is then responsible for submitting verified reports to the Division of Disease Surveillance and Reporting at the national level for action.

3.4.2 Workflow

The flowchart below summarizes the process by which a CHV files a surveillance report, gets it verified by the CHA, who then reports it to the Sub-County Disease Surveillance Focal Person for investigation and reporting to the Division of Disease Surveillance and Reporting at the national level. Each node represents a distinct step in the process as explained below the diagram.



A flowchart depicting the process of filing a surveillance report from the community to DDSR.

- 1. CHV becomes aware of a notifiable disease or event of public health interest:** The CHV discovers a notifiable disease through direct observation or a tip off from the community.
- 2. CHV files a report on the disease or event through the eCHIS:** The CHV enters the nature and time of the event in the eCHIS.
- 3. CHA receives the report from the CHV:** The CHA views all reported events from his or her CU on a dashboard on the eCHIS.
- 4. CHA verification outcome:** The CHA verifies each case reported by the CHV by calling or visiting the affected area/CU.
- 5. CHA forwards the report to the SCSFP:** If the CHA verifies the report to be credible, he or she sends it to the SCSFP via phone call or email.
- 6. SCSFP investigates the report:** The SCSFP further investigates the case.
- 7. SCSFP submits the report to DDSR via the Surveillance System:** If the case is found to be valid, the SCSFP submits it to the DDSR through the Surveillance System.

ANNEXES

eCHIS In-Depth Evaluation Report

March 2021



1. Introduction

1.1 Background

The Ministry of Health (MOH) is committed to the digitization of healthcare across the Kenya Essential Package for Health (KEPH) levels. This includes Level 1 which is realized through frontline Community Health Extension Workers (CHEWs) at the household level. The journey of adopting the electronic Community Health Information System (eCHIS) began with the development of a National Community Health Digitization Strategy. As part of that process, a comprehensive landscape assessment was undertaken to identify, document and describe the available digital technologies used for community health within the country. Among the recommendations of the landscape assessment report was to conduct a more detailed evaluation of the features and implementation scope of the community health digital solutions it identified as a way to validate and augment the information gathered from system implementers.

The second phase of the digitization of community health service delivery is focused on the development, testing and piloting of the eCHIS prototype in selected counties. Towards this goal, the MOH and its partners held a workshop to firm-up and kick off the activities of Phase II. The eCHIS Technical Working Group (TWG) resolved to take advantage of this workshop to develop and demonstrate in-depth criteria for reviewing existing CHIS. This report covers the development, execution and results of that evaluation criteria.

1.2 Objectives

The objective of the CHIS in-depth evaluation was to:

1. Develop common criteria for evaluating and identifying gaps in existing Community Health Information Systems.
2. Demonstrate the application of the criteria by evaluating CHIS with representation at the Phase II Workshop.



2. Methodology

2.1 Criteria Development

A team of technology experts drawn from the Ministry of Health and its development partners was invited to propose a criteria for the evaluation of existing digital health interventions for community health. The criteria was reviewed and agreed upon by a wider group, with representation from the areas of community health, monitoring and evaluation, and training and capacity building. Membership for the wider review group was also drawn from the Ministry of Health and its partners. The resulting evaluation criteria broadly covered the functional and non-functional requirements of Community Health Information Systems articulated in the Software Requirements Specification. Under each category, specific areas of focus were selected to represent various CHIS functionalities. These included household enrolment, service delivery, supply chain management, surveillance, among others. Under each area of focus, a set of procedures was defined to ascertain the availability of specific system features. The procedures were codified in the form of a checklist (Annex A). A simple Pass/Fail rating rather than a point scale was chosen in order to minimize evaluator bias. A Pass simply means that a particular feature is available “in some form” and “to some degree”. It does not rate the “quality” of the functionality. On the other hand, a Fail means that the feature is not available altogether.

2.2 Criteria Application

Participants resolved to demonstrate the utility of the CHIS evaluation criteria by applying it to all CHIS with representation at the Phase II workshop. Evaluators were asked to apply each procedure in the checklist to individual CHIS and assign it a Pass or a Fail depending on whether the procedure could be successfully executed. Verification of each procedure through an actual demonstration was strongly encouraged. Where such a demonstration was not possible, evaluators could still assign a Pass provided the CHIS developer or implementer reported that the procedure could, in fact, be executed successfully. In any case, evaluators were required to indicate whether or not a given procedure was demonstrated, or simply scored based on second-hand information.

Each procedure in the evaluation criteria consisted of a description as well as the result expected to warrant a Pass or a Fail. In addition to scoring each procedure, evaluators were also asked to indicate whether the procedure was actually demonstrated or simply reported. The examples below show how procedures were defined and applied.

Procedure Definition	
Procedure	Enrol a new household onto the system based on the MOH 513 form.
Result	Pass if a new household is successfully enrolled and Fail if a new household cannot be successfully enrolled.
Demo	Yes if the functionality is <i>demonstrated</i> and No if the functionality is simply reported but not <i>demonstrated</i> .

Procedure Application (CHIS X)			
Procedure	Pass/Fail	Demo	Comment
Enrol a new household onto the system based on the MOH 513 form.	Pass	Yes	None
Reactivate a deactivated household	Pass	No	None
Re-assign a client to a different household	Fail	No	None

The populated sample checklist above implies that:

1. CHIS X is able to enrol a new household based on the MOH 513 form, and this was verified through a demonstration.
2. CHIS X is able to reactivate a deactivated household. However, this was simply reported but not verified through a demonstration.
3. CHIS X is not able to reassign a client to a different household i.e. this feature is not available on the system.

The checklist was applied to a total of 5 CHIS namely; CHT, CommCare, cStock, MJali and SmartHealth. The evaluation was conducted by teams of between 5 and 8 individuals, with representation from the Ministry of Health and partner organizations (Annex B).

2.3 Scoring

In order to be able to compare gaps between the different CHIS evaluated, a percentage score was computed for each area of focus in the criteria. This was calculated as the total number of Passes achieved divided by the total number of possible Passes for that area multiplied by 100. For instance, there were 10 distinct procedures defined under Household Enrolment. Therefore, for a CHIS that achieved 9 out of 10 Passes, the percentage score was computed as $9/10 \times 100 = 90\%$. Scores were calculated for each area of focus for both functional and non-functional categories. The scores were then averaged to compute a single score for each category. The scores from each category were then averaged to yield a single final score. The next chapter covers the results of this scoring procedure.

3. Results And Discussion

The tables below summarise the results of the in-depth CHIS evaluation and the associated scores. The full set of scoring results is available as Annex C in this report. In interpreting these results, it is important to bear in mind that the percentage score in any focus area represents the proportion of test procedures that were either executed successfully or that were reported to be possible to execute successfully.

3.1 Functional Specifications

3.1.1 Results

Focus Area/ System	CHT	Com- mCare	cStock	MJali	SmartHealth
Household Enrolment	100%	90%	0%	50%	100%
User Management	80%	90%	90%	90%	80%
Service Delivery	71%	71%	0%	7%	93%
Supply Chain	11%	11%	56%	0%	56%
Surveillance	80%	20%	0%	20%	100%
Messaging	100%	80%	20%	0%	100%
Reporting	100%	100%	0%	40%	100%
Offline Capability	100%	100%	100%	100%	100%
AVERAGE SCORE	80%	70%	33%	38%	91%

3.1.2 Discussion

Focus Area	Discussion
Household Enrolment	Household enrolment is a well-supported area of functionality for both CHT and SmartHealth, with both successfully demonstrating the successful execution of all test procedures. CommCare also has strong support for this area of functionality but fell short of demonstrating the ability to reassign clients to new households. Mjali has basic support for household enrolment but was not able to demonstrate a number of critical features in this area. cStock offers no support for household enrolment as it is intended exclusively as a digital solution for commodity supply chain management.

User Management User management is supported to a significant degree by all CHIS implementations evaluated. However, critical gaps were identified, particularly in terms of enabling CHVs to manage their own user accounts. This includes performing actions such as password changes or resets. 3 out of the 5 systems evaluated also do not require CHVs to change their passwords upon first login, which can raise potential security and accountability problems as passwords are not fully private.

Service Delivery Service delivery is a broad and complex area of functionality. The procedures defined to evaluate this area sought to check the degree of flexibility available in various CHIS for defining new workflows, data collection forms and data validations. SmartHealth showed the widest scope of features which included creating and updating workflows to support new and existing community health programs as well as facilitating CHV supervision. CHT and CommCare were also reasonably strong in this area, but suffered minor weaknesses such as the inability to push updates to CHVs and embed help content within the app. MJali was not able to demonstrate the majority of procedures in this area and cStock, as a dedicated supply chain management tool, simply does not support any service delivery capabilities.

Commodity Supply Chain Management This was the weakest area of functionality among all 5 CHIS evaluated. cStock demonstrated significant strength in this area with support for 5 of the 9 procedures defined for this section. However, it still fell short in the areas of commodity dispensing, adjustments and returns. SmartHealth was also able to show all the functionality in cStock except for commodity ordering. Both CHT and CommCare demonstrated basic support for commodity dispensing. It is important to note, however, that except for cStock much of the functionality demonstrated in this area was implemented through simple data collection forms. As such there is a need to upgrade this capability into a more sophisticated and useful inventory management system.

Surveillance Surveillance is a fairly well supported area of functionality by both SmartHealth and CHT. CommCare and Mjali also have rudimentary support for this area of functionality, specifically in terms of allowing CHVs to record cases of notifiable disease and report public health events respectively.





Messaging	This area of functionality relates to the ability of the system to send text or other messages to clients. CHT and SmartHealth have strong messaging capabilities with both passing all the test procedures defined for this area. CommCare also supports most core messaging functionality except structured messages based on preconfigured workflows. cStock supports only broadcast messages while MJali does not offer any messaging capabilities.
Reporting	Flexible reporting is well supported across the board, with CHT, CommCare and SmartHealth scoring 100% in all test procedures for this area. cStock did not support any of the reporting test procedures defined in the checklist. However, its backend is based on DHIS2 and therefore capable of being extended to accommodate emerging reporting needs. MJali also has reporting capability but this only covers client-based reports. MJali reporting functionality does not allow for the generation of CHV-based reports.

3.2 Non-Functional Specifications

3.2.1 Results

Focus Area/System	CHT	Com-mCare	cStock	MJali	SmartHealth
Code Licensing	100%	100%	0%	100%	100%
Audit Trail	100%	100%	100%	0%	100%
Security	100%	20%	100%	40%	100%
Backup/Disaster Recovery	100%	67%	100%	0%	100%
Interoperability	50%	50%	50%	0%	50%
Performance/ Scalability	100%	0%	0%	0%	100%
AVERAGE SCORE	92%	56%	58%	23%	92%

3.2.2 Discussion

Focus Area	Discussion
Code Licensing	All CHIS evaluated are open source except cStock. However, it was intimated that cStock source code can be made available to the MOH on demand.



Offline Capability	All 5 CHIS evaluated support offline capability and can be used in the field with or without active internet connectivity.
Audit Trail	CHT, CommCare, cStock and Smart Health all reported audit trail capability.
Security	CHT, cStock and Smart Health passed all the test procedures under the security category. Some of CommCare's security features could not be established as the responding implementer is not responsible for hosting the system. MJali lacks some critical security features such as password salting and hashing, SSL and PKI.
Backup and Disaster Recovery	Backup and disaster recovery procedures were found to be robust for CHT, cStock and Smart Health. CommCare also has some backup and disaster recovery capabilities. However, not all of them could be evaluated since the implementer does not host the system directly.
Interoperability	Support for interoperability is scanty, with none of the systems passing more than half the test procedures for this area.
Performance and Scalability	Only CHT and Smart Health reported having established procedures and tools for performance and stress testing.

3.3 Overall Scores

Category/System	CHT	CommCare	cStock	MJali	SmartHealth
Functional Specifications	80%	70%	33%	38%	91%
Non-functional Specifications	92%	56%	58%	23%	92%
AVERAGE SCORE	86%	63%	46%	31%	91%



4. Limitations

This evaluation report is subject to the following limitations.

1. The report covers the results of the CHIS whose implementers were represented in the eCHIS Phase II workshop.
2. The evaluation criteria covers the presence or absence of features, not the quality of their implementation.
3. The evaluation criteria does not cover all possible functional and non-functional requirements.
4. Not everything covered in the evaluation criteria was possible to demonstrate. This was mainly because of the lack of necessary permissions, time or capacity.
5. Although all features (available or missing) were treated the same for the purposes of the scoring, in reality some features are more mission-critical than others.
6. Where the score for a procedure was left blank, a Fail was assigned since it could not be established whether the procedure could have been successfully executed.





5. Recommendations

1. The results of this in-depth evaluation can augment the findings of the landscape assessment and support the MOH in identifying key gaps in existing CHIS.
2. The eCHIS implementation team can reach out to individual CHIS implementers and based on their area of strength identify and adopt key success factors as necessary.
3. The evaluation criteria described in this document can form the basis for a future CHIS certification framework.



6. Annexes

6.1 ANNEX A: EVALUATION CHECKLIST

PROCEDURE	EXPECTED RESULT Pass/Fail	Pass/Fail	Demo	Comments
1. FUNCTIONAL SPECIFICATIONS				
1.1 HOUSEHOLD ENROLLMENT				
Enrol a new household onto the system (MOH 513)	New household successfully enrolled			
Update an existing household (MOH 513)	Household successfully updated			
Deactivate an existing household	Household successfully deactivated			
Reactivate a deactivated household	Household successfully reactivated			
Re-assign household to a different CHU	Household successfully re-assigned to a new CHU			
Enrol client into a household	Client successfully enrolled into a household			
Update client data within a household - Change first and last name	Client data successfully updated			
Deactivate client within a household	Client no longer available for CH services			
Reactivate client within a household	Client becomes available for CH services			
Re-assign a client to a different household	Client available for CH service provision under a different household			

1.2 USER MANAGEMENT

* Create an organizational hierarchy within the system (National > County > Sub-county > Ward > Facility > CHU > Cluster)

Organizational hierarchy successfully created

Create a user role based on pre-defined privileges

User role created with the selected system privileges

Update an existing user role based on pre-defined privileges

User role updated with the selected system privileges

Delete/remove an existing user role

User role deleted

Create a user (username, default password, telephone number, email address, first name, last name, designation)

User account created with the specified details

Assign a user to any level within the organizational hierarchy

User assigned to a level in the organizational hierarchy e.g. CHU

Assign one or more roles to a user

Roles assigned to the user. User inherits the privileges defined in the assigned role.

New user logs into the eCHIS for the first time

eCHIS requires the new user to change his/her password

User resets his/her password

eCHIS allows the user to securely change his/her password



Disable a user account	User account disabled but continues to exist in the system. The user can no longer log into the system.
------------------------	---

1.3 SERVICE DELIVERY

Create a new workflow (with the associated data collection form/validations/skip logic etc.)	New data collection workflow defined with a form, skip logic and data validation
Update an existing workflow (with the associated data collection form/validations/skip logic etc.)	Existing workflow updated new/modified variables, skip logic and data validation
Deactivate an existing workflow (with the associated data collection form/validations/skip logic etc.)	Existing workflow deactivated. It is no longer available for use/data entry.
Reactivate a deactivated workflow (with the associated data collection form/validations/skip logic etc.)	Existing workflow reactivated. It becomes available for use/data entry again.
Workflow eligibility is configurable by client characteristics	User can configure a workflow so that only clients with particular characteristics are eligible
Workflow created or updated	CHV receives a notification and can update his/her copy of the workflow



CHV activates a workflow for a household member for whom it does not apply	CHV is restricted from activating a workflow for a household member for whom it does not apply
Create supervision checklists to be filled when CHAs visit CHVs on supervisory visits	Supervision checklist successfully created.
Update supervision checklists to be filled when CHAs visit CHVs on supervisory visits	Supervision checklist successfully updated.
Deactivate supervision checklists to be filled when CHAs visit CHVs on supervisory visits	Supervision checklist successfully deactivated. No longer available for use.
Reactivate supervision checklists to be filled when CHAs visit CHVs on supervisory visits	Supervision checklist successfully reactivated. Becomes available for use again.
Supervisory checklist created or updated	CHV receives a notification and can update his/her copy of the workflow
Link to the MOH virtual academy	eCHIS users can go directly from the app to the MOH virtual academy
Access user guide within the eCHIS	Users can access an in-built user guide within the system
1.4 COMMODITY SUPPLY CHAIN MANAGEMENT	
Raise an order	Order is raised and electronically submitted





Receive stock	Receive stock within the eCHIS and allocate it to individual CHU/CHAs
Restock (CHA-CHV)	
Dispensing stock (CHV-HH)	CHV can dispense commodities through the CHIS
Disposal of stock (expiry, damage etc.)	CHV can designate expired or damaged commodities
Monitor stock levels (CHA)	CHAs can monitor their stock levels
Monitor stock levels (CHV)	CHVs can monitor their stock levels
Return stock (CHV-CHA)	CHVs can return stock to CHA upon request
Return stock (CHA-Facility)	CHA can return stock to facility upon request
1.5 SURVEILLANCE	
CHV notifies cases of notifiable diseases/ conditions through the eCHIS to the CHA	CHP can notify cases to the CHA via the CHIS
CHV reports PH events through the eCHIS to the CHA	CHV can report PH events to CHA via CHIS
CHA can run through a workflow to validate reports of PH events	CHA can invoke workflow to validate PH even reports
eCHIS has outbound API to send information to a dedicated surveillance system	CHIS can send PH and disease notifications to surveillance system
SCDSC can get notifications on PH events reported and validate	



1.6 MESSAGING

eCHIS allows user to configure and broadcast messages to CHVs at any level in the organizational hierarchy

eCHIS automatically sends targeted messages to clients based on their specific characteristics e.g. defaulting a clinic visit

eCHIS allows user to configure and broadcast messages to clients at any level in the organizational hierarchy

eCHIS should allow for the scheduling of untargeted client messages

eCHIS should be able to send structured messages to clients and through a pre-configured workflow facilitate live interaction

1.7 REPORTING

Configure and run a client list report based on client attributes (bound to a definite period)

Filter a client list report based on client attributes and organizational hierarchy levels



Configure and run a CHV list report based on CHV attributes (bound to a definite period)

Filter a CHV list report based on CH V attributes and organizational hierarchy levels

Configure and run a client summary based on aggregation functions on client attributes (bound to a definite period)

Disaggregate a client summary based on client attributes and organizational hierarchy levels

Collate selected client summaries into a single service statistic report

Configure and run a CHV summary based on aggregation functions on CHV attributes (bound to a definite period)

Disaggregate a CHV summary based on CHV attributes and organizational hierarchy levels

Collate selected CHV summaries into a single service statistic report

Test for ability to work in conditions with slow or no connectivity (offline data collection)



2. NON-FUNCTIONAL SPECIFICATIONS

2.1 Offline Support

Test for ability to work in conditions with no connectivity (offline data collection)	System works offline internet connectivity
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2.2 SOURCE CODE LICENSING

Access source code from a public repo Source code is	Source code is accessible in a public repository
---	--

2.3 AUDIT TRAIL

Audit trail available	System administrator can access audit log showing the who, what and when of actions taken on the system
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2.4 SECURITY

User passwords are salted and hashed	User passwords are salted and hashed in the database
--------------------------------------	--

Data in transit is encrypted using 256-bit encryption(TLS/SSL)	HTTP connection is encrypted with a valid SSL certificate (HTTPS)
--	---

Access to system server is secured using PKI	Logging into the system server is secured using PKI
--	---

Server is behind a hardware/software firewall	The server is secured behind a firewall
---	---

Database is secured by username and password	A username and password is required to access the database
--	--

2.5 BACKUPS AND DISASTER RECOVERY

Ability to do scheduled and maintain backups	System maintains scheduled backups
--	------------------------------------



There should be the ability to restore	System demonstrates restore backups
The system should provide for redundancy and failover	System has in-built redundancy and failover mechanisms
2.6 INTEROPERABILITY	
Data standard to support data exchange - HL7 and related	
Integration with DHIS2	System can send standard MOH reports to DHIS2
2.7 PERFORMANCE AND SCALABILITY	
Established procedures and tools for performance and stress testing	There are established procedures and tools for performance testing

6.2 Annex B: Evaluation Teams

	CHT	SMART HEALTH	MJALI	COMM CARE	C-STOCK
1.	Derrick	Robert	George	Daniella	Danielson
2.	Simon	Emmanuel	Aloice	Francis	Sophie
3.	Michael	Korir K	Dorothy	Gitahi	Rose
4.	Georgine	Aisha	Linet	Priscilla	Enock
5.	Josephine	Benjamin	Samuel	Ayub	Joyline
6.	Joshua		George O	Eric N	Wesley
7.	Wanyungu			Ken	Teresa
8.	Carol				Diane

6.3 Annex C: Evaluation Score Sheet

FEATURE/ CHIS	CHT	CommCare	CStock	MJali	SmartHealth
Household Enrolment	100.00%	90.00%	0.00%	50.00%	100.00%
Enrol a new household onto the system (MOH 513)	1	1	0	1	1
Update an existing household (MOH 513)	1	1	0	1	1
Deactivate an existing household	1	1	0	0	1
Reactivate a deactivated household	1	1	0	0	1
Re-assign household to a different CHU	1	1	0	0	1
Enrol client into a household	1	1	0	1	1
Update client data within a household - Change first and last name	1	1	0	1	1
Deactivate client within a household	1	1	0	1	1
Reactivate client within a household	1	1	0	0	1
Re-assign a client to a different household	1	0	0	0	1



User Management	80.00%	90.00%	90.00%	90.00%	80.00%
Create an organizational hierarchy within the system (National > County > Sub-county > Ward > Facility > CHU > Cluster)	1	1	1	1	1
Update an existing user role based on pre-defined privileges	1	1	1	1	1
Update an existing user role based on pre-defined privileges	1	1	1	1	1
Delete/remove an existing user role	1	1	1	1	1
Create a user (username, default password, telephone number, email address, first name, last name, designation)	1	1	1	1	1
Assign a user to any level within the organizational hierarchy	1	1	1	1	0
Assign one or more roles to a user	1	1	1	1	1
New user logs into the eCHIS for the first time	1	0	0	0	1



User resets his/ her password	0	1	1	1	1
Disable a user account	0	1	1	1	0
Service Delivery	71.43%	71.43%	0.00%	7.14%	92.86%
Create a new workflow (with the associated data collection form/ validations/skip logic etc.)	1	1	0	1	1
Update an existing workflow (with the associated data collection form/ validations/skip logic etc.)	1	1	0	0	1
Deactivate an existing workflow (with the associated data collection form/ validations/skip logic etc.)	1	1	0	0	1
Reactivate a deactivated workflow (with the associated data collection form/validations/ skip logic etc.)	1	1	0	0	1
Workflow eligibility is configurable by client characteristics	1	1	0	0	1
Workflow created or updated	0	0	0	0	1





CHV activates a workflow for a household member for whom it does not apply	1	1	0	0	1
Create supervision checklists to be filled when CHAs visit CHVs on supervisory visits	1	1	0	0	1
Update supervision checklists to be filled when CHAs visit CHVs on supervisory visits	1	1	0	0	1
Deactivate supervision checklists to be filled when CHAs visit CHVs on supervisory visits	1	1	0	0	1
Reactivate supervision checklists to be filled when CHAs visit CHVs on supervisory visits	1	1	0	0	1
Supervisory checklist created or updated	0	0	0	0	1
Link to the MOH virtual academy	0	0	0	0	0
Access user guide within the eCHIS	0	0	0	0	1
Commodity Supply Chain Management	11.11%	11.11%	55.56%	0.00%	55.56%
Raise an order	0	0	1	0	0
Receive stock	0	0	1	0	1



Restock (CHA-CHV)	0	0	1	0	1
Dispensing stock (CHV-HH)	1	1	0	0	1
Disposal of stock (expiry, damage etc.)	0	0	0	0	1
Monitor stock levels (CHA)	0	0	1	0	1
Monitor stock levels (CHV)	0	0	1	0	0
Return stock (CHV-CHA)	0	0	0	0	0
Return stock (CHA-Facility)	0	0	0	0	0
Surveillance	80.00%	20.00%	0.00%	20.00%	100.00%
CHV notifies cases of notifiable diseases/ conditions through the eCHIS to the CHA	1	1	0	0	1
CHV reports PH events through the eCHIS to the CHA	1	0	0	1	1
CHA can run through a workflow to validate reports of PH events	1	0	0	0	1
eCHIS has outbound API to send information to a dedicated surveillance system	0	0	0	0	1





SCDSC can get notifications on PH events reported and validate	1	0	0	0	1
Messaging	100.00%	80.00%	20.00%	0.00%	100.00%
eCHIS allows user to configure and broadcast messages to CHVs at any level in the organizational hierarchy	1	1	1	0	1
eCHIS automatically sends targeted messages to clients based on their specific characteristics e.g. defaulting a clinic visit	1	1	0	0	1
eCHIS allows user to configure and broadcast messages to clients at any level in the organizational hierarchy	1	1	0	0	1
eCHIS should allow for the scheduling of untargeted client messages	1	1	0	0	1



eCHIS should be able to send structured messages to clients and through a pre-configured workflow facilitate live interaction	1	0	0	0	1
Reporting	100.00%	100.00%	0.00%	40.00%	100.00%
Configure and run a client list report based on client attributes (bound to a definite period)	1	1	0	1	1
Filter a client list report based on client attributes and organizational hierarchy levels	1	1	0	1	1
Configure and run a CHV list report based on CHV attributes (bound to a definite period)	1	1	0	0	1
Filter a CHV list report based on CHV attributes and organizational hierarchy levels	1	1	0	1	1
Configure and run a client summary based on aggregation functions on client attributes (bound to a definite period)	1	1	0	1	1





Disaggregate a client summary based on client attributes and organizational hierarchy levels	1	1	0	0	1
Collate selected client summaries into a single service statistic report	1	1	0	0	1
Configure and run a CHV summary based on aggregation functions on CHV attributes (bound to a definite period)	1	1	0	0	1
Disaggregate a CHV summary based on CHV attributes and organizational hierarchy levels	1	1	0	0	1
Collate selected CHV summaries into a single service statistic report	1	1	0	0	1
Offline Support	1	1	1	1	1
Test for ability to work in conditions with slow or no connectivity (offline data collection)	1	1	1	1	1
AVERAGE SCORE: FUNCTIONAL	80.32%	70.32%	33.19%	38.39%	91.05%
Source Code Licensing	100%	100%	0%	100%	100%



Access source code from a public repository	1	1	0	1	1
Audit trail	100%	100%	100%	0%	100%
Audit trail available	1	1	1	0	1
Security	100%	20%	100%	40%	100%
User passwords are salted and hashed	1	0	1	0	1
Data in transit is encrypted using 256 bit encryption(TLS/SSL)	1	1	1	0	1
Access to system server is secured using PKI	1	0	1	0	1
Server is behind a hardware/software firewall	1	0	1	1	1
Database is secured by username and password	1	0	1	1	1
Backup and Disaster Recovery	100.00%	66.67%	100.00%	0.00%	100.00%
Ability to do schedule and maintain backups	1	1	1	0	1
Ability to restore backups	1	1	1	0	1
The system should provide for redundancy and failover	1	0	1	0	1
Interoperability	50.00%	50.00%	50.00%	0.00%	50.00%
Data standard to support data exchange - HL7 and related	0	1	0	0	0
Integration with DHIS2	1	0	1	0	1





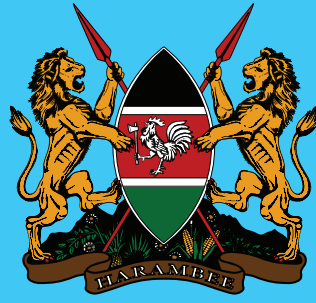
Performance and Scalability	100.00%	0.00%	0.00%	0.00%	100.00%
There are established procedures and tools for performance and stress testing	1	0	0	0	1
AVERAGE SCORE: NONFUNCTIONAL	91.67%	56.11%	58.33%	23.33%	91.67%
AVERAGE SCORE	85.18%	64.23%	43.97%	31.94%	91.32%



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36	Kevin Korir	Living Goods
37	Robert Ouko	Living Goods
38	Danielson Kennedy	In-Supply Health
39	Rachael Wanjiru	Living Goods
40	Dorothy Anjuri	Red Cross Kenya Society
41	Emmanuel Nyachoke	Living Goods
42	Georgine Mbeki	Living Goods
43	Lesley Githinji	Living Goods
44	Michael Korir	Medic Mobile
45	Simon Mbae	Medic Mobile
46	George Oele	AMREF
47	Aloise Gikunda	AMREF
48	Danielle Ressler	LWALA



MINISTRY OF HEALTH

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