Fostering interoperability for Data Exchange across Health Information Systems in Uganda

Group photo at the UgandaEMR stakeholders' meeting held in Mbarara on 27th June- 1st July 2022

By Nancy Karunganwa, Stephen Musoke Senkomago and Jonathan Mpango

Healthcare service provision in Uganda is growing rapidly and innovative digital approaches are getting into the limelight in a bid to improve the quality of patient's healthcare service at the different points of care within and outside the facilities. One of the innovative approaches undertaken by the Ministry of Health (MoH) is the use of Electronic Medical Record Systems (EMRs) to improve clinical documentation, access, sharing and interpretation of patient data.

The U.S. President's Emergency Plan for AIDS Relief (PEPFAR), one of MOH's development partners, supports

Focus group discussions on Data Quality improvement in UgandaEMR

the implementation of facility-based interoperable EMRs such as the UgandaEMR and ClinicMaster, among others through its above site implementing mechanisms; the Makerere University School of Public Health Monitoring and Evaluation Technical Support (MakSPH-METS) and Strategic Information Technical Support (SITES). The current implementation of UgandaEMR is in over 1,360 public health facilities as of June 2022.

MoH seeks to create an ecosystem of interoperable health information systems that exchange data through a secure data exchange platform. This provides an opportunity to deliver patient centered and value driven care that improves health outcomes while reducing costs. During the 2022 annual UgandaEMR Stakeholders' conference, themed "Data Use and Exchange in the New Normal", held between June 27 to July 1, 2022 at Lake View Hotel Mbarara, several digital health stakeholders showcased a variety of digital health innovations that exchange standardized data between UgandaEMR and other Health Information Systems (HIS) systems used across the health sector. Among the innovations showcased included:-

The Viral Load (VL) exchange: VL test requests and results are exchanged between facility-based EMRs (UgandaEMR and ClinicMaster) and the VL information systems housed at the MoH Central Public Health Laboratories (CPHL). In this use case, the laboratory requests are pushed from the facility-based EMR to the VL information systems through a secure Health Information Exchange (HIE) mediator. Upon successful processing of the laboratory requests, the facility-based EMR pulls back the results from the VL information systems electronically. This HIE innovation has immensely reduced test turn around time from weeks to days.

The EMR-DHIS2 (NextGen reporting) exchange: Enables aggregated data from facility-based EMR to be exchanged with the national electronic health data reporting system (DHIS2). This innovation has also been deployed to facilitate exchange of aggregate data from the facility-based EMR to the PEPFAR In-Country Reporting System (PIRS) This integration allows a facility to generate an aggregate report, preview it then automatically submit it into the DHIS2 system thus reducing the amount of work required to manually enter the reports in DHiS2 by the district Biostatisticians and facility health information assistants.

HIV recency testing and case based surveillance: De-identified patient level data is sent from the facility EMR to a central database, where it is cleaned, and transformed and visualized on a dashboard. The lessons learned from this exchange implementation are being leveraged by the National Integrated Surveillance (NIS) System that is under development by MoH.

EMR usage statistics exchange: As the rollout of UgandaEMR continues to increase through the implementation model of working with comprehensive implementing partners, there is a need to track the progress of new site setup, upgrade of existing sites and migration to Point of Care (PoC). This is addressed through the implementation of theUgandaEMR Analytics dashboard whose data is submitted routinely from the facility-based EMR.

EMR- electronic TB Case Based Surveillance System (eCBSS) exchange: This integration is a 2-way sync of patient level data between the two systems, UgandaEMR at health facility and eCBSS deployed and managed centrally. The EMR submits electronically aggregated TB reports to the eCBSS system which enables managers and decision makers at national level to make evidence-based decisions.

The key challenges to nationwide rollout and adoption of these integrations include availability and cost of internet connectivity which affects data exchange; power outages that affect use of the EMR systems; human resource capacity to capture transactions within the systems that are shared, and security of the hardware systems.

The discussions at the stakeholders conference were focused on charting a way forward to empower the Community of Practice to drive the EMRs to a tipping point to becoming a cornerstone to achieving the national 95-95-95 targets for HIV epidemic control by 2030.

METS applauded for supporting the Mid-Term Review of HMIS Tools

In 2019 the Ministry of Health comprehensively revised the Health Management Information System (HMIS) in a bid to harmonize data needs of various stakeholders.

By: Nancy Karunganwa and Herbert Mulira

At the beginning of 2020, the Ministry of Health (MoH), with support from PEPFAR, revised and rolled out the HIV HMIS forms (version 2019) through national, regional and district staff training including on-site mentorships on the revised HMIS tools. HMIS is a system which records, stores, processes and generates timely and accurate data that is used to improve decision-making at various levels within the health sector.

HMIS data is used to monitor health sector policies, guidelines and implementation. The HMIS helps to ensure routine documentation and identification of warning signals from evaluation of indicators. Production of high quality statistics is dependent on assessment of data quality and actions taken to improve it. HMIS data and indicators are reviewed every five years with mid-term review taking place every two and half years.

MoH with support from METS organized a 14-day retreat from 4 - 15 July 2022 at the Source of the Nile Hotel in Jinja. Several key stakeholders participated with over 130 representatives from the Ministry of Health/AIDS Control Program, Centers for Disease Control (CDC), USAID, METS, SITES, Uganda Cancer Institute, National Tuberculosis and Leprosy Program (NTLP), National Drug Authority, Regional Referral Hospitals, ARC, PATH, PEPFAR Implementing Partners such as Baylor Uganda, Rakai Health Sciences Program, TASO, Mildmay among others.

METS provided technical support in the thematic area working groups of HIV Testing Services (HTS), PMTCT/EID, Care and Treatment, Safe Male Circumcision (VMMC), Supply Chain management and Laboratory, KP/PP/PrEP and Tuberculosis (TB) .

Isaac Sebuliba reviewing changes under KP/PP/PrEP

Focus group discussion on HIV testing services- ART card revisions

The activity started with understanding the existing primary and secondary HMIS Tools and indicators, seven (7) Technical Working Groups were created to review and propose changes in existing tools and as well introduce new HMIS Tools in order to address the existing data demands in the various program areas.

Each group was also assigned a designer who effected the proposed changes in the tools for the groups to visualize the impact of the suggested changes.

The group activities were presented to a plenary consisting of all the participants for feedback and input, as well as discussion on the way forward on the tools. To note, a number of tools required additional consultation on the proposed changes.

The Program Manager, AIDS Control Program, who was represented by the HIV Prevention Coordinator, Dr. Peter Mudiope, highlighted the need to learn from the challenges experienced in the previous HMIS reviews and formulate strategies to mitigate these challenges to avoid a recurrence. He further emphasized the increasing demand for quality data to support making of informed decisions in HIV programming.

He re-echoed the commitment of the Ministry of Health to support the review from the beginning to the end even with the existing competing activities.

The PEPFAR Coordination Office was represented by Rachel Kwezi. In her remarks she thanked METS for supporting the retreat and applauded CDC, USAID and other partners for the work they were tirelessly putting-in towards ending AIDS by 2030. She encouraged healthy discussions and cautioned on the need to have all data requirements taken care of.

The retreat resulted in reviews of all existing primary and secondary HMIS tools and agreed on amendments in the 7 Program Areas. These amendments addressed identified gaps in data capture and reporting. Participants agreed on a roadmap for completion of the review of the mid term HMIS review including the piloting of the proposed tools as well as the final roll out of the revised tools. Additionally, the retreat also identified challenges that may affect successful completion of the HMIS Mid-Term review and possible solutions to address these challenges.

As next steps, MOH-ACP team will follow-up with the seven-program area working groups to address some of the issues that were left pending to ensure that the revised tools are finalized in time for pilot testing.

Health Care workers will continue using the old tools until the revised tools are approved, trainings carried out and revised HMIS Tools implemented. Based on the agreed upon road map, the revised HMIS tools are likely to be implemented starting from July 2023.

UgandaEMR an Open Source supporting Sustainable Development Goals (SDGs)

The Response Innovation Lab, in partnership with URIDU organized an innovation and networking event focusing on Open Source as a contribution towards SDGs focusing on Health, Education and Equity. This event was held on the 6th July 2022 at Fairway Hotel Kampala.

Discussions focused on use of Open Source and its contribution; possibilities of integration to optimize resources and access; scalability of it to across all health care points, building on top of UgandaEMR to meet the needs of public and private health care providers.

The event brought together different stakeholders to share experiences, showcase successful projects, present opportunities for collaboration and launch a *"Contributhon"*. This is an event that gives participants an opportunity to volunteer as "contributors" (both developers and non-developers) to the innovations on UgandaEMR, Word of Mouth (WOM.fm) and Curious Learning.

UgandaEMR was selected because it operates on Open Source and is contributing to improve health care delivery with a national coverage of over 1384 health facilities in Uganda.

Three teams volunteered for the UgandaEMR Contributhon and were tasked to create Outpatients Department Forms using the existing Ministry of Health's HMIS OPD 002 OUTPATIENT REGISTER, HMIS OPD 003 REFERRAL NOTE and HMIS OPD 001 MEDICAL FORM5 in the UgandaEMR upcoming version that will be built on React Based platform. The winners' contribution will be

Samuel Lubwama demonstrating UgandaEMR at the OpenSource Initiative towards attaining SDGs

adopted in the UgandaEMR to replace or build on the already existing one on the front and back-end interfaces. The teams will be mentored by the METS Software Developers' team led by Samuel Lubwama.

Captured moments at the event

Using Single Page Application (SPA) in UgandaEMR to improve service delivery at Family Health clinic

Developers during the second boot camp held on 30th May - 2nd June in Jinja

By Solomom Ssevvume, Musa Mwanje and Nancy Karunganwa

Makerere University School of Public Health Monitoring and Evaluation Technical Support Programs (MakSPH-METS) in partnership with the stakeholders organized "Bootcamps" to develop and improve features in the UgandaEMR to cater to the needs of users while improving Family Health services delivery at public Health Facilities across the country.

Currently, UgandaEMR is more available in the ART clinics, and there is a need to extend its usage to other service points. METS in collaboration with the Ministry of Health and Implementing Partners discussed areas to expand the functionality of UgandaEMR beyond HIV/ART services and this included the need to create a module for Family Health (Maternal & Child Health, Family Planning, Nutrition and Immunization).

METS organized two Bootcamps aimed at designing and developing a module for Family Health services into UgandaEMR. This was done using OpenMRS Single Page Applications (SPA). SPA is an efficient and easy-to-use technology for both the developers and users compared to the traditional technology that is currently used in all OpenMRS implementations.
The utilization of these new technologies provides shorter delivery time-lines given that clinical forms can be easily created while allowing for better performance and resource utilization for the users.

Creating an efficient system makes it easy for users to adopt the new innovations in UgandaEMR. This will improve the patient flow, reporting and records management for services under Family Health at the facilities.
Several participants from other Implementing Partners were in attendance, these were representatives from SITES, DATA

Care Uganda, HISTAC as well as the general UgandaEMR Community.

Speaking at the Bootcamps, Edward Bichetero, the Senior Technical Officer (S.T.O) for Data Science and Informatics at METS emphasized the need for collaborative engagements between METS and all other stakeholders in the Health Informatics space especially during the process of system development. "It is not enough to simply provide a finished product to our users, they need to be part of the process, from requirements gathering to implementation", Edward said.

At the end of the Bootcamps, the developers were able to achieve notable milestones;

- MCH (Maternal and child health) Registers completed and integrated into the latest version of UgandaEMR
- Added 3 more forms under Family Health Module (Child Health and Family Planning registers)
- Created a design document draft for the requirements to be used in the development of SPA react based interface. SPA is single page application module embedded into OpenMRS
- Completed the process of packaging UgandaEMR in OpenMRS 3.x frontend, ensuring that all the data entry tools/ forms are saving properly
- Completed the migration of UgandaEMR concept management to OpenMRS

Discussions on next steps include the validation of clinical workflows in the new version of UgandaEMR. This will focus on gathering requirements from the different facilities tailored to their needs/workflow under the family health clinic.

The METS team will fast track the systems development process to ensure that the product is tested and deployed at public health facilities catering for both retrospective and Point of Care approaches.

Discussion on packaging and deployment of UgandaEMR

Lessons Learnt from Case Based Surveillance Pilot

By: Edgar Kansime, Godfrey Timbihurira and Nancy Karunganwa

The World Health Organization (WHO) recommends that countries with a severe, heterogeneous, and generalized HIV/AIDS epidemic should follow individuals uniquely across time and place. This is known as HIV Case-Based Surveillance (CBS).
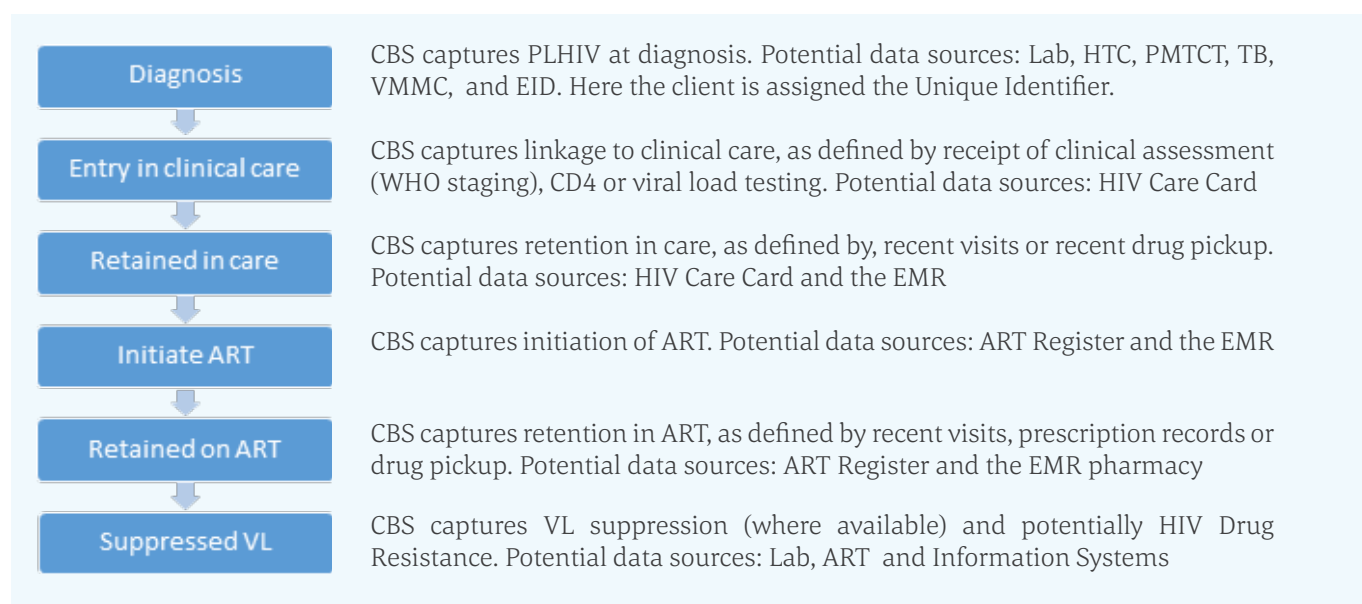
CBS aims at 1) improving individual patient monitoring and tracking, leading to improved care; 2) improving monitoring of the care-cascade and sentinel events at a programmatic level.

Uganda relies on aggregated data collected through the Health Management Information System (HMIS), periodic surveys, epidemiological estimation, modelling, and ante-natal clinic (ANC) sentinel surveillance to track the HIV/AIDS epidemic. Whereas these methods provide estimates of progress against national and global indicators, they do not use unique identifiers hence are prone to duplication of counted numbers and cannot track individuals along the care cascade across different health facilities. CBS provides an opportunity to uniquely identify and longitudinally follow up patients within and across facilities. The surveillance is enabled by a central data base for all HIV patient level data. CBS is uniquely positioned to fully describe the clinical cascade from diagnosis to viral suppression (Figure 1) and measure progress towards the UNAIDS 95/95/95 targets.

Figure 1: HIV Clinical cascade

Diagnosis — CBS captures PLHIV at diagnosis. Potential data sources: Lab, HTC, PMTCT, TB, VMMC, and EID. Here the client is assigned the Unique Identifier.

Entry in clinical care — CBS captures linkage to clinical care, as defined by receipt of clinical assessment (WHO staging), CD4 or viral load testing. Potential data sources: HIV Care Card

Retained in care — CBS captures retention in care, as defined by, recent visits or recent drug pickup. Potential data sources: HIV Care Card and the EMR

Initiate ART — CBS captures initiation of ART. Potential data sources: ART Register and the EMR

Retained on ART — CBS captures retention in ART, as defined by recent visits, prescription records or drug pickup. Potential data sources: ART Register and the EMR pharmacy

Suppressed VL — CBS captures VL suppression (where available) and potentially HIV Drug Resistance. Potential data sources: Lab, ART and Information Systems

The Makerere University School of Public Health (MakSPH), with funding from CDC piloted CBS to inform potential national scale-up.

This pilot was implemented in partnership with MoH, UCSF and the regional implementing partners. The CBS Pilot was implemented at high volume Health facilities in the districts of Kabarole, Bunyangabu, Kikuube and Hoima from 2016. The selection of pilot districts was informed by the high HIV prevalence rates in the selected districts at the time.

METS built the capacities of pilot health facilities to implement CBS through the following activities: UgandaEMR migration, upgrade and installation; Training of data clerks; Provision and installation of solar power; Securing data rooms and procurement, installation and training on biometric identification; Provision of internet to enable data transmission.

Several lessons were taken from the scale up;

Acceptability of Unique Identifiers (biometrics and National IDs): Although both the biometrics and National identification Number (NIN) can be used as unique identifiers, biometrics are more reliable. There was over 90% acceptability of biometric usage and about 50% usage with the NIN. The low NIN usage was attributed to the low coverage

of National IDs in the population; Lack of National IDs amongst children < 18 years; clients not coming with their National IDs as well as errors in typing the NIN.

Duplication of patient records: There was evidence of duplicated client records at the health facilities. For example; 2.7% of the records in Kabarole district were found to be duplicates

Kabarole District: Duplicates at facility level (2018)

	Total on ART	Registered by Fingerprint	Duplicate records found	Percentage Duplicate
Fort-Portal RRH	8017	5652	72	1.3
Virika Hospital	3277	1961	42	2.1
Kabarole Hospital	2295	1508	52	3.4
Kibiito HCIV	1836	1394	35	2.5
Yerya HCIII	1026	630	31	4.9
Kataraka HCIV	880	505	59	11.7
Bukuku HCIV	1310	643	19	3.0
Mugusu HCIII	827	395	29	7.3
Total	**19433**	**12688**	**339**	**2.7**

Infrastructure investment is feasible: The infrastructure needed for CBS is feasible and affordable but requires cost for regular maintenance and replacement.

Internet accessibility: Internet not being accessible within certain areas in the facility where it was needed such as the data room where the server is hosted; poor and fluctuating internet coverage in some of the facilities; use of internet for non-CBS activities leading to high cost; internet devices

(dongles/routers) getting lost.

Human Resource: Data entry into EMR including backlog data is very critical for CBS implementation. It is therefore important to recruit staff dedicated for data entry and Biometrics capture at the health facilities

The limited Electronic Medical records (EMR) coverage: EMR was largely functional in the HIV Clinic & data rooms but did not cover Laboratory, Maternal and Child Health

departments. These places must be considered.

The pilot provided an understanding of the investment and infrastructure requirements for setting up and maintaining CBS system as well as providing information required to develop national guidelines and policies to guide CBS Implementation. These lessons will be implemented during the scale up to an estimated 500 sites in the next one year.

Annual Supply Chain Week

The Annual Supply Chain Week is an event organized by the Ministry of Health in collaboration with Management Sciences for Health (MSH)

Naseef Mayanja demonstrating the role of the Real-Time ARV Stock Status (RASS) system in improving supply chain in the health sector in Uganda.

The Annual Health Supply Chain Week was a platform to showcase digitization innovations in the Health Supply Chain system. The digitization process is essential for improving performance, efficiency and strengthening data driven decision making across the health supply chain system.

The event was part of the several activities under the theme 'Digitizing the Health Supply Chain, a key component in implementing the 10-year National Health Supply chain roadmap.

The Annual Health Supply Chain week is an important opportunity to build awareness and highlight the progress and challenges in improving access to quality essential medicines in Uganda.

METS showcased progress on the Real-Time ARV Stock Status (RASS), a national early warning system for reporting and tracking the consumption of HIV, TB, Rapid Test Kits, COVID-19 vaccines, and Family Planning commodities with the main objective of improving health service delivery.

The RASS reporting system and accompanying mobile app provides visual cues that enable district biostatisticians and facility in-charges to anticipate stockouts and simplifies the process of stock redistribution within the district thus eliminating stockouts of supported commodities. https://dhis.mets.or.ug

Pictorial

Dr. Alice Namale, the Director METS Program attended the second Global Health Security Conference (GHS 2022) that was held in Singapore June 28th to July 1, 2022. At the conference, she shared insights on factors that contributed to Uganda's exemplary performance in the COVID-19 pandemic response.

TASO Mbale staff practicing how to use UgandaEMR mobile app which is an extension of UgandaEMR used to serve the community arm of health care. Clinicians go to the community with the app for records data entry

Ministry of Health (MoH) implements the Integrated Disease Surveillance and Response and organized a site visit at Junja Referral Hospital. The objective was to review the current surveillance activities, including Acute Febrile Illness (AFI), and Severe Acute Respiratory Illness/Influenza Like Illness, assess patient flow and site readiness.

Solomon Ssevvume takes participants through the Family Health Tools used at the facilities during the UgandaEMR Bootcamp held on 30th May 2022 aimed at improving service delivery at Family Health clinic