University Hospital of Mirebalais (UHM) EMR Case Study

In response to the January 2010 earthquake, Partners In Health (PIH) in Haiti, known locally as Zanmi Lasante (ZL), expanded plans for a health center in Mirebalais, a small city in the Central Plateau of Haiti. The plan was broadened to a tertiary /teaching hospital where dignified and comprehensive care could be provided to patients along with training the next generations of nurses, doctors, specialists, and staff while working in support of the Ministry of Health's goal of universal treatment coverage.

In March 2013, PIH/ZL opened University Hospital in Mirebalais (Haiti) with an OpenMRS (EMR system) to manage patient and clinical workflow. As additional services were opened in the first 2 months (Radiology, Women's Health, Emergency, Surgery, Dental, et al), new features were added to the EMR. The EMR continues improving to meet the needs of this 300 bed hospital along with 1000 outpatient visits per day. Inception started in September 2012 and was based on an outpatient primary care OpenMRS system with point-of-care registration and data entry of diagnoses from paper forms (Feb 2012) at the Zanmi Lasante (ZL) Lacolline Health Center in Lascahobas, Haiti.

Timeline

The System

UHM EMR (2013): Minimal Viable Product (MVP)

- Identify and register all patients at UHM and Outpatient clinic.
- Point-of-care system for all users, leading to reduced data backlogs, higher quality data and improved access to data for patient care. This is accomplished through local servers which eliminate previous barriers due to internet access. UHM has 170 thin-clients which access the EMR using a web interface.
- Integration with PACS (Picture Archive and Communication System) so that digital radiology images (especially CAT scans) can be analyzed by Radiologist and results reported back to UHM clinicians. This is necessary since there are no radiologists at UHM.
- Point-of-care post-surgery note to capture details of the surgery (team, diagnoses, procedures, medications, and recommendations)

"Next we drove into the city of Mirebalais to see the new hospital run by PIH and the Haitian government. I was blown away. The hospital opened last summer and was built using money donated after the 2010 earthquake (people who were injured in the quake still need ongoing treatment). They spared no expense to make it a first-class facility. There's a machine for performing CAT scans. There's a sophisticated system for keeping medical records. The staff can send digital images to Harvard and get input from specialists there."

-- Bill Gates on March 4, 2014
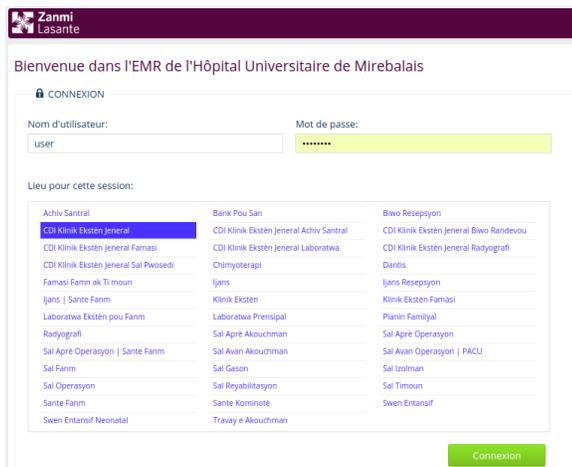
The UHM EMR system assists clinicians and patients at all points of the care continuum, from recording diagnosis to mapping treatment plans and retaining patients in our care. Through implementing upgrades, the goals are to identify and register all primary care patients, enable clinicians to enter patient data at the point-of-care, and eventually leverage these systems to provide comprehensive and complete data on all patients. This point-of-care system is used by clinicians and data archivists: Clinicians capture medical information; Archivists capture patient registration and workflow. The ZL EMR primary care functionality includes patient registration, check-in, vital signs, and primary care visit information.

UHM EMR (2018)

The same OpenMRS software is used at all ZL sites, but with various features available, based on the capabilities and workflow at the health facility. For example, the Radiology interface is only accessible at Mirebalais where there is a PACS system exchanging data with the EMR. Mental Health assessment is available on the EMR at all ZL health centers, but not every health facility has primary care (as of 11/2018).

- Registration and check-in
  - Demographic capture, payment, insurance, ID cards, fingerprinting, labels, and wristbands
- Clinical impressions with chief complaint (diagnosis), procedures, admission/discharge/transfer (ADT)
- Primary care visit (history, vaccinations, allergies, physical exam, diagnoses, and treatment plan)
- Non-communicable disease (NCD)
- Vital signs
- Radiology orders and results
- Lab orders and results
- Drug dispensing
- Post-surgery note
- Emergency triage
- Oncology and chemotherapy
- Pathology specimen tracking
- Mental health assessment
- Appointment and provider scheduling
- Document management (scans)
- Program enrollment and outcome (Zika study, NCD, HIV, Oncology)
- Provider management (CHW, supervisors, clinicians)
- Finished but not deployed
  - Maternal Child Health
  - Clinician-facing dashboard (General, HIV)
  - Death certificate

A clinical dashboard (Figure 2) provides a summary of most recent information (ie. vitals, diagnoses, condition list, visits, allergies, programs, relationships).
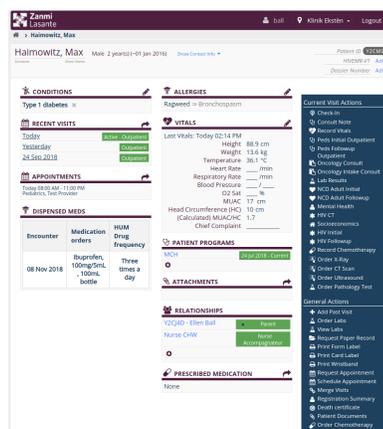
After a patient visit is started, the clinician selects the appropriate action (vitals, intake or followup). There are many sections in the various forms (Figure 3) -- but a summary is available for all the data captured in each section. A print copy can be added to the patient file.
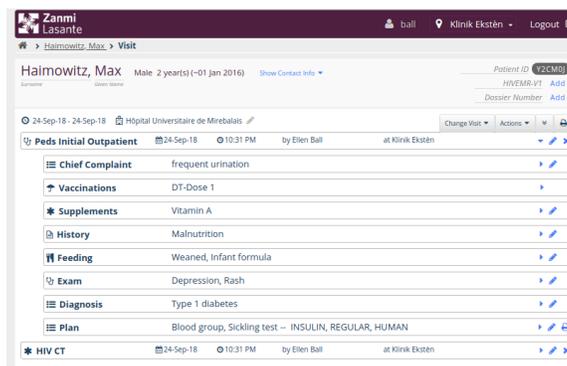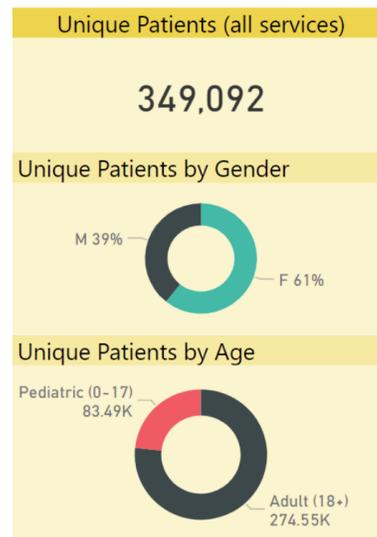

Figure 3: Visit

Figure 2: Clinician-facing dashboard

Reports

Data can be exported for various patient encounters (ie. registration, vitals, visit note, etc). The user customizes data output by date range. Some data is viewed directly by using the web browser and all data can be exported as csv/excel files. DHIS2 and PowerBI are used with data warehouses for managing data visualization and extraction.

OVERVIEW REPORTS
Daily Registrations
Daily Check-Ins
Daily Clinical Encounters
Daily Inpatient Stats
Monthly Inpatient Stats

MONITORING REPORTS
Weekly Monitoring Data
New Disease Episodes
Accounting Data
Visit Register
Morbidity Register
Chronic Maladies

DATA QUALITY REPORTS
Non-Coded Diagnoses

DATA EXPORTS
Complete Data
Dashboard Data
Visits Data
Patients Data
Billable Items
Encounters Data
Registrations
Check-In Data
Radiology Data
Surgery Data
Hospitalizations Data
Consultations Data
Diagnoses Data
Dispensing Data
Vitals Data
Lab Results Data
Oncology Data
NCD Data
Mental Health Data
ED Triage Data
Visit Note Data
Allergies Data
Pathology Data
Programs Overview Data
Zika Data
Users and Providers Data
Relationships Data
LQAS Diagnoses Data
All Patients List Data
Appointments Data

Unique Patients (all services)

349,092

Unique Patients by Gender

M 39%   F 61%

Unique Patients by Age

Pediatric (0–17) 83.49K

Adult (18+) 274.55K

Technical specifications

The UHM EMR is built with the OpenMRS Reference Application and Platform 2.x along with customized workflow, htmlforms, and reports. The ZL EMR is available in Haitian Kreyol, French, and English. The UHM concept dictionary has a curated list of diagnoses, procedures,and drugs. Most of these concepts are shared with the CIEL dictionary. Standard coding terminology is used:

Laboratory tests and radiology orders   LOINC

Procedure SNOMED

Diagnoses ICD10, SNOMED

Medications RxNORM

With local server hardware, reliable internet is not required. Internet is utilized when available for data backup and system maintenance. The infrastructure included internet, local area network, multiple power sources (solar, grid, generator, and battery backups), A/C, and HP rack server. The HP server is running VMware virtualization with Ubuntu 14.04 LTS 64-bit. 170 HP thin clients are distributed throughout the hospital and installed with Citrix software, Windows desktop, and Chrome browser. Laptops and tablets are also utilized.

Github: https://github.com/PIH

Modules:

addresshierarchy-2.11.0.omod

allergyui-1.8.1.omod

appframework-2.11.0.omod

appointmentscheduling-1.9.0.omod

appointmentschedulingui-1.7.0.omod

appui-1.8.0.omod

htmlformentry-3.7.0.omod

htmlformentryui-1.7.0.omod

htmlwidgets-1.9.0.omod

idgen-4.5.0.omod

importpatientfromws-1.0.omod

labtrackingapp-1.1.0-SNAPSHOT.omod

legacyui-1.3.3.omod

metadatadeploy-1.10.0.omod

pacsintegration-1.7.0.omod

paperrecord-1.3.0.omod

pihcore-1.0-SNAPSHOT.omod

printer-1.4.0.omod

providermanagement-2.10.0.omod

radiologyapp-1.4.0.omod

registrationapp-1.12.0.omod

registrationcore-1.8.0.omod

attachments-2.1.0-SNAPSHOT.omod

calculation-1.2.omod

coreapps-1.20.0-SNAPSHOT.omod

dispensing-1.0.omod

edtriageapp-1.1.0-SNAPSHOT.omod

emr-2.1.0.omod

emrapi-1.25.0-SNAPSHOT.omod

event-2.5.omod

haiticore-1.0.0.omod

metadatamapping-1.3.4.omod

metadatasharing-1.5.0.omod

mirebalais-1.2-SNAPSHOT.omod

mirebalaismetadata-1.0-SNAPSHOT.omod

mirebalaisreports-1.1-SNAPSHOT.omod

namephonetics-1.6.0.omod

orderentryui-1.1.0-SNAPSHOT.omod

owa-1.9.0.omod

reporting-1.16.0.omod

reportingrest-1.10.0.omod

reportingui-1.6.0.omod

serialization.xstream-0.2.14.omod

uicommons-2.7.0-SNAPSHOT.omod

uiframework-3.13.0.omod

uilibrary-2.0.6.omod

webservices.rest-2.23.0-SNAPSHOT.omod

Future

Based on experiences, additional EMRs will be deployed at other ZL Health Centers and Hospitals. In 2018 and beyond, the UHM EMR will include HIV and NCD. We upgraded to the latest OpenMRS Reference Application (2/2018). The cost and complication of ID cards is driving the need for alternative identification technology (ie. fingerprinting). DHIS2, data warehouse, and PowerBI are powerful technologies and increase productivity especially for the Monitoring & Evaluation team.   PIH and ZL continues to improve collaboration with the Haiti Ministry of Health (MSPP) and other important Haiti-based partners. Finally, PIH would like to have consistent EMR systems at all our ZL and other PIH health facilities.

Contributors

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References

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- Hôpital Universitaire de Mirebalais | Partnering with HP