Implementation of affordable open-source EMR in resource-limited setting of SW Guatemala

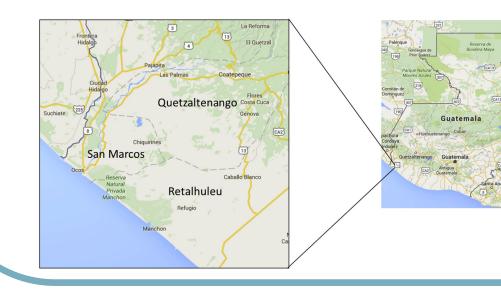
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	RESULTS		
Guatemala	Electronic Health Records (EHRs) in LMICs		Successes
 Persistently low Human Capital Index (HCI) <i>despite</i> one of highest economies in Central America Trifinio Region - shift from cattle ranching to agribusiness increased labor migration and significant growth in 	 Barriers to Implementation High hardware costs Unreliable power and internet Lack of system integration 	 Why use EMRs? Better coordination between care givers Data accessibility for public health 	 In one nonth OpenMRS replaced paper charting for clinical notes and vitals 450+ patient charts created 585+ encounters documented

population exacerbating disparities in healthcare access





Center for Human Development (CHD)

- Partnership between the University of Colorado Anschutz Medical Campus, Children's Hospital Colorado, and AgroAmerica
- Created **FunSalud** to operate CHD with a mission to improve public health in the region
- Clinic completed in 2014, provides essential medical services





Organizational

- Limited funding
- Few trained IT personnel
- Lack of focused leadership
- Socioenvironmental • Underdeveloped infrastructure • Lack of institutional support • Unique challenges with language and cultural context

Project Rationale

Despite the advantages of OS-EMRs, implementation in LMICs remains low with limited documentation on real-world deployment. This study documents the **on-site implementation** of OpenMRS at the CHD Clinic, highlighting challenges, workarounds, and lessons learned with aim to inform future EMR initiatives in similar resource-limited settings.

• Organization for time efficient delivery of

surveillance

care

Open-Source EMRs

- Offer free, modifiable software adaptable to specific clinical needs
- OpenMRS is a widely adopted OS-EMR designed for resourcelimited settings
- Challenges & Workarounds

Staff

reports

Technical Issues

• **Delays** in bug fixes and **module incompatibility** common with OS-EMRs (particularly OpenMRS)

• Rapid accessibility

continuity of care

records simultaneously

• Multiple providers able to access

• Enhanced treatment planning and

Lab Module Limitation

- No functional lab module **prevented full paperless transition**
- Workaround: Paper-based lab results compiled weekly instead of daily
- Lab results documented in clinical notes to improve accessibility and decision-making

System Maturity

• Implementation has not yet reached **HIMSS-EMRAM Stage 1** due to missing lab/pharmacy modules



Week		Activities	Purpose	Energy
Pre-Implementation Platform Buildout		 Built OpenMRS platform using Amazon Web Services Followed specifications in OpenMRS wiki for Reference Application 2.9.0 	Prepare the EMR system for deployment	Internet
				Devices
Weeks 1–2 Observation		 Observed existing workflows Customized OpenMRS software 	Align software with clinic-specific needs, iteratively debug and improve the system	Strat
		 Simulated mock patient encounters 		• Software
Week 3	ing	 Trained front desk staff, nurses, and physicians Conducted a soft roll-out using OpenMRS for limited encounters 	Familiarize staff with OpenMRS in a controlled setting	using AW • Several m on-site in
Training Soft Roll-Out				
Soft Koll-Out				 Role-spect Remote & troublesh

Required Infrastructure

solar panels, battery reservoir, generator

satellite for high reliability *OpenMRS is browser-based and requires continuous internet connectivity

desktop computers, laptops, tablets

Strategy of Implementation

Software Buildout

- ftware engineer developed OpenMRS ing AWS (Reference Application 2.9.0)
- veral months of development before -site implementation

Training & Onboarding

Stakeholder Engagement

- le-specific training
- mote & local support available for troubleshooting (software engineer, medical student)

DISCUSSION

Sustainability

Local Capacity Building:

- On-site administrators and clinic staff trained for system management, recruiting local talent
- Reducing reliance on external developers
- Technical SOPs created for future on-boarding

Future Directions

System Improvements:

- Potential adoption of **OpenELIS** for lab integration using HL7 FHIR standards
- HTML forms for ancillary services (ie. nutrition)

Interoperability Potential:

• System designed for integration with other open-source digital health tools

Quality Improvement & Data Utilization:

- Expanding data export & analysis for performance monitoring and patient outcome tracking
- Strengthening quality improvement initiatives Scalability & Global Health Impact:
 - Expansion to **satellite clinics** in neighboring plantations
 - Contributing to the **global body of knowledge** on EMR implementation in resource-limited settings



OpenMRS for all patient the EMR system while minimizing encounters Retained paper charts as risks during the a backup option transition

Seeking developer support for larger issues Remote and on-site support for acute troubleshooting

• Fully implemented

Build support systems for longterm maintenance while finding solutions to aid system maturity

Transition fully to

Sustainability & Long-Term Support

• Local staff trained for permanent positions

• All roles in staff involved in design, testing,

• Regular follow-ups to monitor performance

& adapt to evolving clinic needs

customization, and training

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Week 5 + **Continued Development**