**AAFP GLOBAL HEALTH SUMMIT**
*Primary Health Care and Family Medicine: Health Equity for All*

**Utilizing the Bahmni EHR System as a Mobile Solution for Local Patient Management**

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Florida State University
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## Our Team

- Medical
  - 4 Physicians
    - 3 Family Practice
    - 1 Emergency Medicine
  - 2 Physician Assistants
  - 1 Nurse
  - Students
    - 11 Medical Students
    - 2 Physician Assistant Students
- Support
  - 1 IT Specialist
  - 3-4 Spanish-English Translators

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## Objectives

- Understand Bahmni foundations and applications.

- Introduce system and core components necessary for Bahmni installation.

- Introduce Local Area Network(LAN) set up and purpose.

- Present patient workflow with Bahmni integration.

- Demo Bahmni patient profile creation and LAN connection

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## Purpose

- **Why a mobile EHR system?**
  - Increase efficiency and accuracy of patient information for better continuity of care
  - Improve patient treatment workflow
  - Improve future assessment

- **What are some challenges?**
  - Cost
  - Reliability
  - Security
  - Functionality
  - Mobility

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## Background

- **SIGH and FSU College of Medicine**
  - SIGH(Students Interested in Global Health is a student organization founded through Florida State University College of Medicine
  - Our goal is to provide medical students a global perspective on healthcare delivery in developing countries
  - Dr. Van Durme is the team leader and SIGH faculty advisor for SIGH
- **Los Cedros Community**
  - Underserved population located in Managua, Nicaragua's capital city

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## Software

- **Why OpenMRS & Bahmni?**
  - OpenMRS is an open-source, free, reliable, EHR system with a library of support and resources.
  - OpenMRS is flexible and customizable to better tailor the application to our specific needs.
  - Bahmni is a version of OpenMRS with a user-friendly interface as well as concise guides for installation and management.
  - Virtual Database integration

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## System Requirements

- **What is the minimum needed?**
- CPU - Quad core processor
- Memory - 8 GB RAM
- Hard disk – 150GB
- Google chrome browser for windows
- Safari browser for iOS

OpenMRS
MEDICAL RECORD SYSTEM

Bahmni

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## Bahmni Out of the Box

- Four Major Components
  - 1. Bahmni EHR & Clinical UI
    - What we primarily used
  - 2. Lab System (OpenELIS)
    - A component for ordering and processing lab orders
  - 3. ERP System – Billing and Inventory
    - Managing finances and medical expenses
  - 4. OpenMRS Configuration
    - System used to edit and manage Bahmni hierarchy such as user types and roles

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## Computer Hardware

- 1. Laptops (4-6 Total) + Chargers
  - Model: Lenovo Yoga 460, ThinkPad's
  - RAM: 4-8 GB
  - Hard Drives: 250GB

- 2. Chromebook (2 Total) + Chargers
  - RAM: 4-8 GB
  - Hard Drives: 16GB

- 3. USB Webcam
- 4. USB Router: used to cast local area network
- 5. Encrypted External Hard Drive
- 6. UPS backup power supply
- 7. 2 extra laptop batteries

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## Bahmni Customization
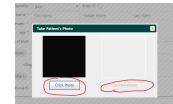
- **What is a JSON File?**
  - A JSON file transmits data between the web app and server
  - Allows the user to edit properties of the EHR and see updates instantly
  - Bahmni Sections changed
    - Registration
    - Clinical
    - Patient Dashboard

- **Additions**
  - Web Cam integration
    - Picture profiles to improve patient reliability
  - Batch files for quick launch
  - Database Backup scripts

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## Bahmni Installation Components

- Virtual Box
  - A software program that constructs a working PC inside your current operating system.

- Vagrant
  - Automates the process of constructing a virtual machine and installing respective software
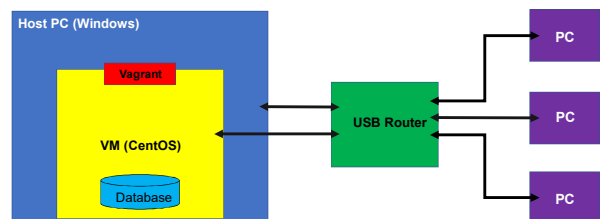
- Git
  - Software version control system

HashiCorp
Vagrant

Development Environments Made Easy

ORACLE VirtualBox    git

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## Bahmni Mobile EHR Block Diagram

Host PC (Windows)

Vagrant

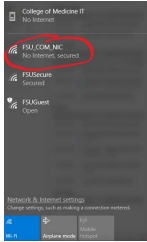VM (CentOS)

Database

USB Router

PC

PC

PC

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## Establishing Local Area Network(LAN) Connection

- What is a LAN connection?
  - A wireless access point created on a computer that allows other neighboring computers to connect to

- Why use a LAN connection?
  - Creates a reliable/secure communication line between computers
  - No more relying and searching for WIFI hotspots
  - Simple to set up
    - external USB wireless adapter for a more robust connection
    - Also can be set up in Windows 10 through Wifi hotspot tool



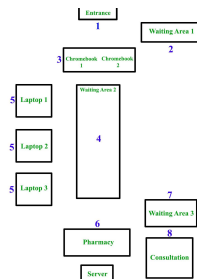13    AMERICAN ACADEMY OF FAMILY PHYSICIANS

## Treatment Workflow



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## Treatment Workflow

- 1. Patient enters clinic, given ticket # and daily visit slip
- 2. Patient area to rest and fill out paperwork
- 3. Patient is called to site 3 where patient information is entered into Bahmni EHR, photo taken, profile created
- 4. Patient then takes a seat at site 4 and awaits to be seen by a healthcare provider in site 5
- 5. Patient seen by healthcare provider and student where vitals are taken, chief complaint examined, appropriate assessment and plan completed
- 6. Patient then turns in daily visit slip to the pharmacy station for medical fill
- 7. Patient area to rest and wait for prescriptions to be filled
- 8. Once filled, patient will receive consultation by a healthcare provider about medication management.



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## Results

- **System launch**
  - March 5th: 134 patient profiles created
  - March 6th: 136 patient profiles created
  - Clinic hours were from 8 a.m. to 4 p.m.

- **What worked?**
  - Clinicians and students complimented the system as being easy to use and reliable
  - Patient profiles were a great addition, making it easier to properly identify and treat patients
  - System ran smoothly through all hours with no crashes
  - System was energy efficient, battery back up wasn't used
  - Backing up process ran smoothly

- **What needed to be improved?**
  - Minimizing unnecessary clicks
  - Functionality errors ex. Last Menstrual Period failing to accept 2018 year

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## Treatment Workflow



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## Future Plans and Setbacks

- Future plans
  - Resolve software bugs
  - Improve registration navigation
  - Implementing data reports and pharmacy database

- Setbacks
  - Beginning April 18th, 2018, protests began in opposition to injustices enacted by President Ortega
  - Protests and political unrest continue, canceling further trips until it's safe.



Alfredo Zungria/AP

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## Mobile EHR's in Other Areas

- Disaster Response
  - Mobile EHR's may be useful in times of a natural disasters
    - Areas without electricity or Wi-Fi
      - System is brought in to gather health information and status of the population
      - Information is then taken to a location where it can be adequately transferred to respective healthcare locations
  - Integrating patient health information USBs
    - At the end of a visit each patient is given a secure USB chip with a copy of their health information.

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## Additional Information & Acknowledgements

- Bahmni Installation Tutorial
  - https://www.youtube.com/watch?v=2wi7b3cW-xg
- Bahmni wiki
  - https://bahmni.atlassian.net/wiki/spaces/BAH/overview
- OpenMRS
  - https://openmrs.org/
- Git Website
  - https://git-scm.com/
- Vagrant Website
  - https://www.vagrantup.com/
- Virtual Box Website
  - https://www.virtualbox.org/

- Software Development
  - Gia McCue, Developer/DBA

- Network Development
  - Austin Wolcott, IT Manager

- Faculty Mentor
  - Martin Wood, Medical Library Director

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## Thank You



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