

# Deploying Innovative Mobile-based Telemedicine Systems using Open Source tools in Resource-poor Areas of the Philippines

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# Outline

- **The Problem**
- **The Solution: What is SANA?**
- **Components**
- **Philippine Pilot Implementation**
- **Conclusion**



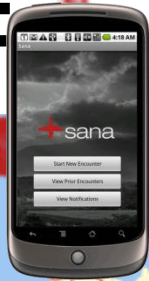
## The Philippine Situation

- **100 Million Filipinos**
- **51% live in the countryside**
- **1 Doctor per 10,000 population**
- **5 out of ten Filipinos die without getting any medical attention**



# The Problem

Case:



- School Teacher in Batanes
- Has 75 year old father with incessant cough
- Flown to Manila for diagnosis
- Had to sell farm animals and farmland to pay for transport and medical costs
- Pushed into poverty



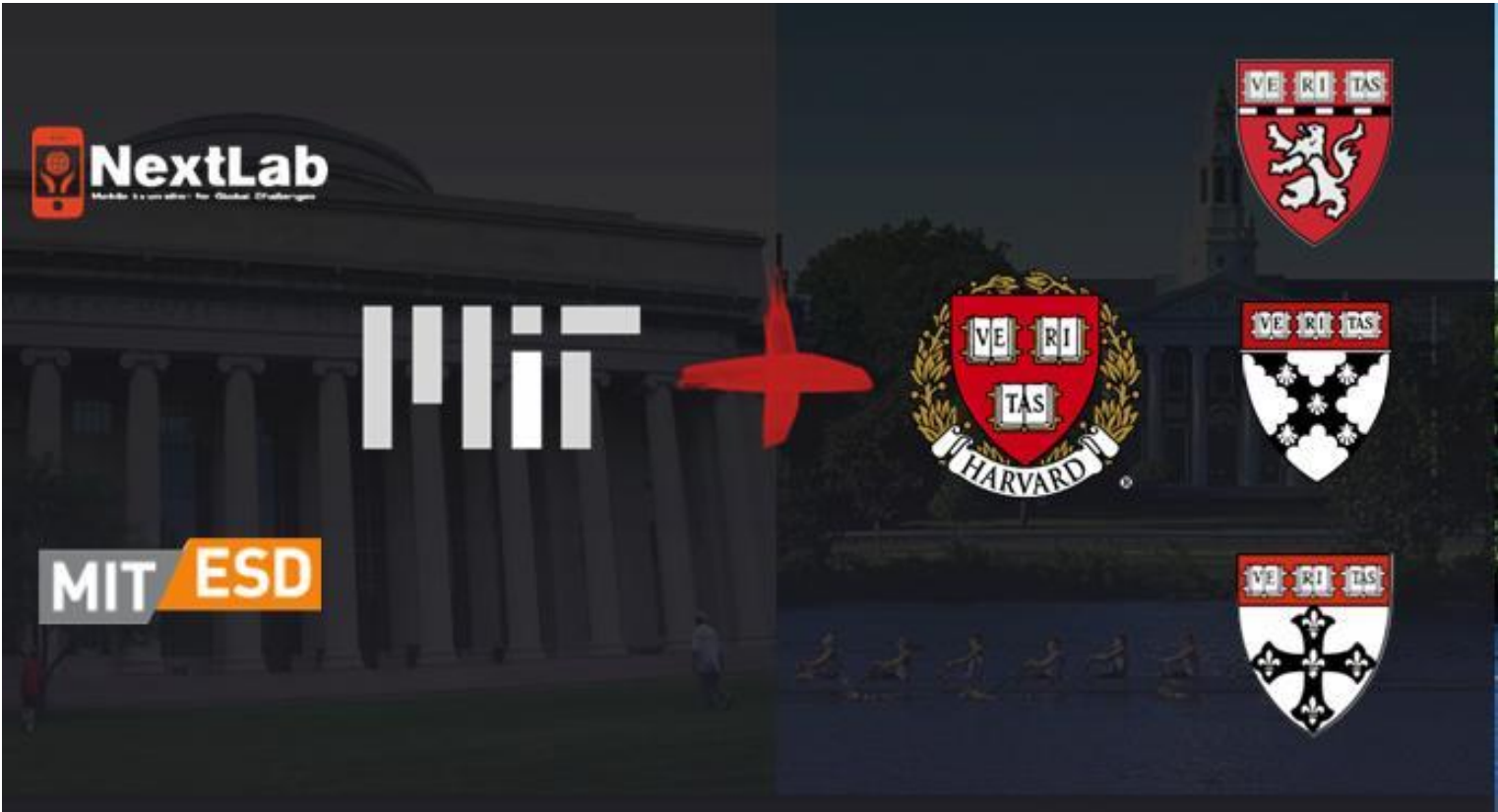
# What is SANA?

In Italian the word Sana  
means "Healthy"  
In Filipino the word Sana  
means " Hope"



# What is SANA?

SANA is a joint project of  
Massachusetts Institute of Technology  
and the Harvard School of Public Health



## Previous Mobile Telemedicine Systems:

- Text based Telemedicine systems 160 characters
- Other systems: bulky, expensive, not portable



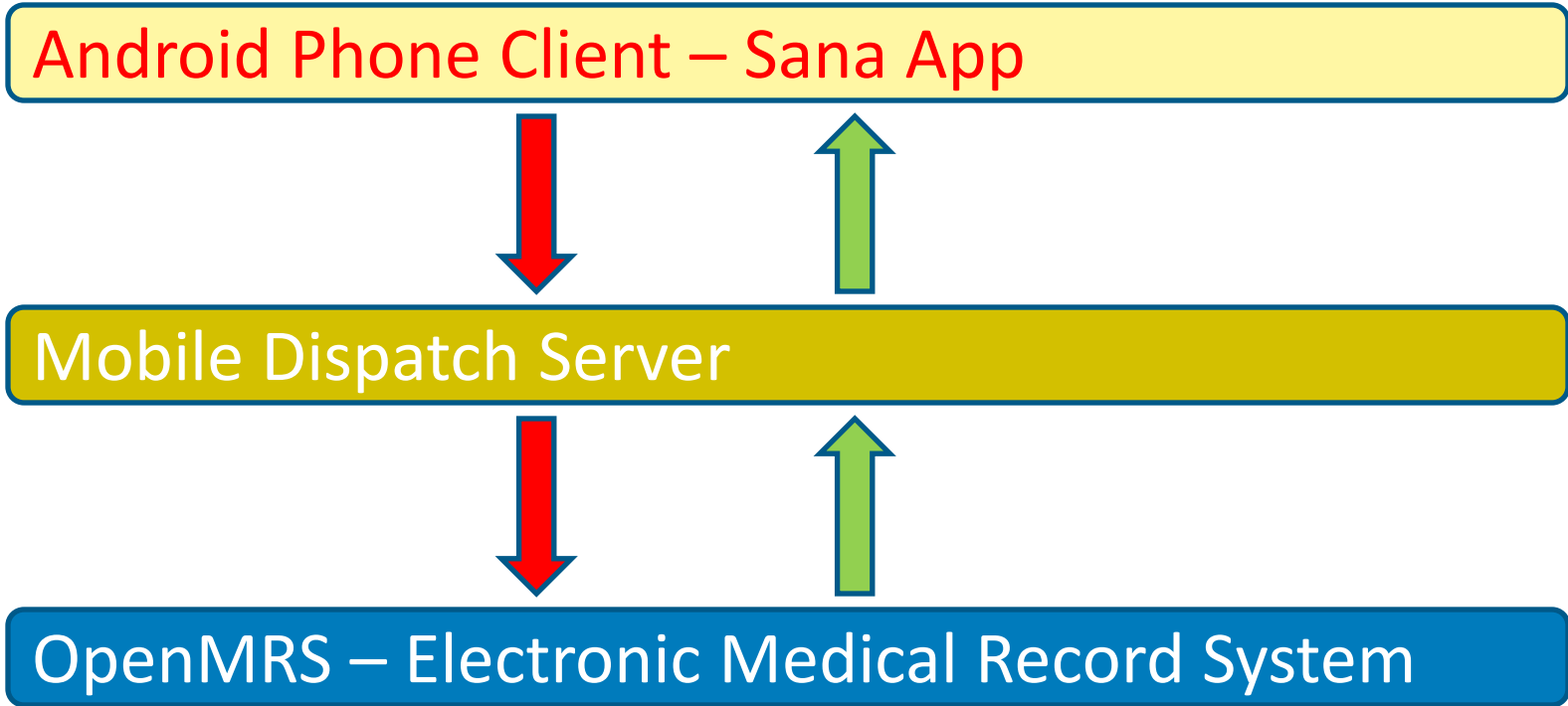
# What is SANA?

SANA is a universal, mobile, clinical information platform





# Components of SANA



# Android Phone Client – Sana App

Create customized procedures

Portable medical devices

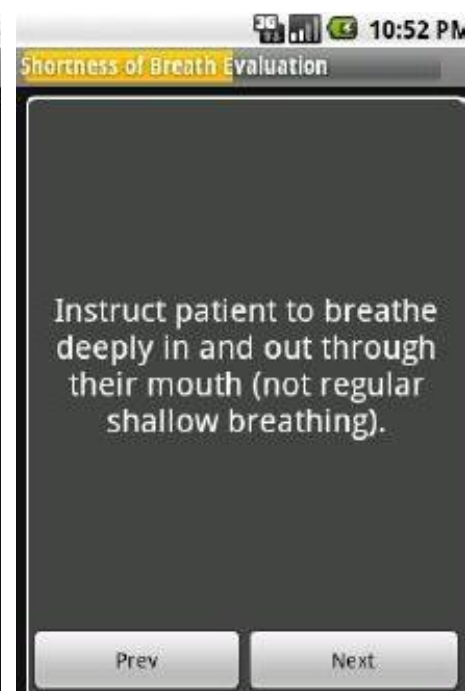
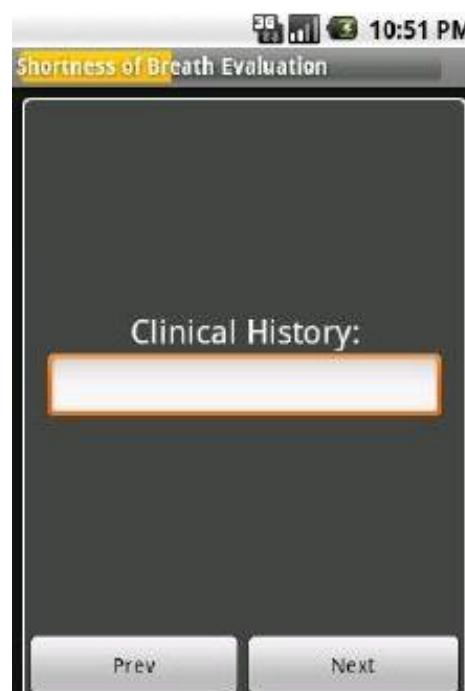
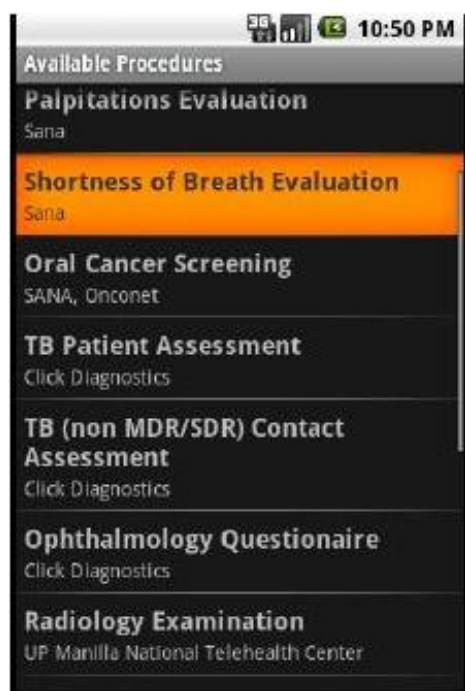
Binary Data Capture  
(images, audio, others)

Off-line data collection

Multiple methods of transmission



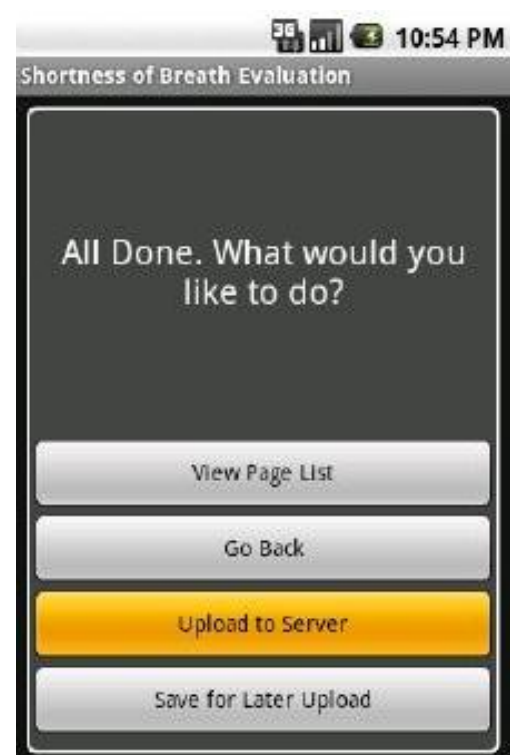
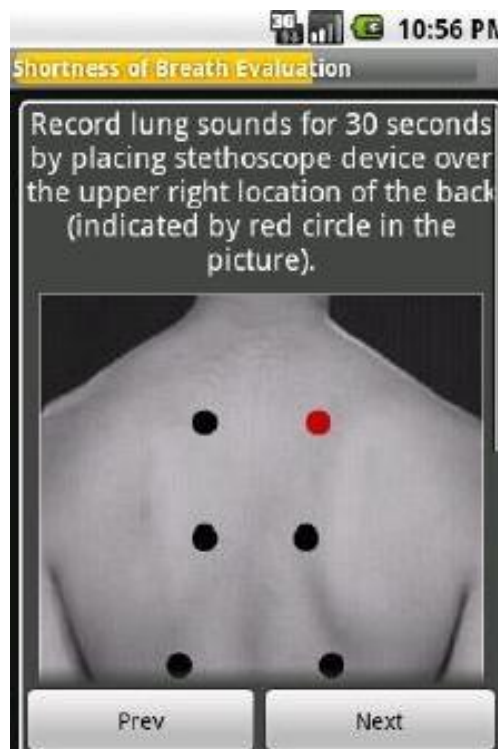
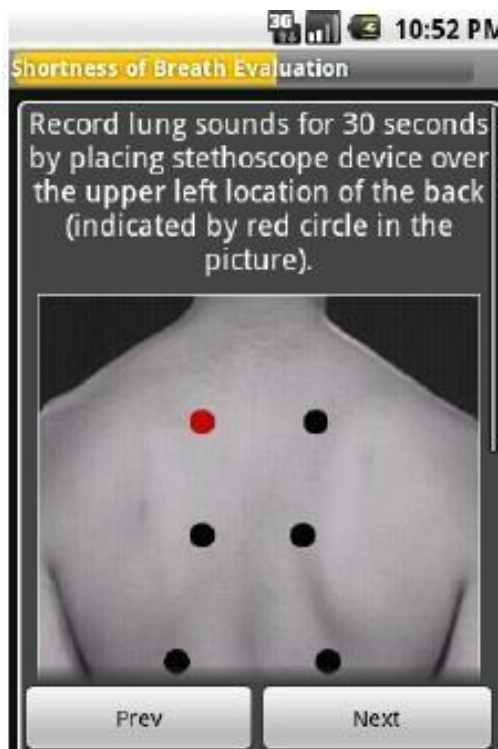
# Android Phone Client – Sana App



## Shortness of Breath Evaluation



# Android Phone Client – Sana App



## Shortness of Breath Evaluation

# What is the Mobile Dispatch Server?



Bridge

Synchronization

Packetization

SMS Server



# What is OpenMRS?

Open Source  
started 2006  
(South Africa)

Open Standards  
HL7, LOINC, ICF

Central Concept  
Dictionary

Complex Data:  
Binary data



# OpenMRS



# OPENMRS

MEDICAL RECORD SYSTEM

Hello, Super. Welcome to Openmrs.



# OpenMRS

## Sana Queue

[Pending Cases](#) | [Deferred Cases](#) | [Closed Cases](#)

### Patient Cases

Status	Patient ID	Patient Name	Age	Sex	Procedure	Date Taken	Contact Number	Media Summary
In Progress	313	<a href="#">Diaresco, Ma.Gemma</a>	43	F	<a href="#">Hypertension Screening</a>	12/01/2011 01:45	5555555555	
In Progress	312	<a href="#">Jimenez, Jarvis</a>	26	M	<a href="#">Hypertension Screening</a>	12/01/2011 01:15	09204053730	
In Progress	1001	<a href="#">Bb, Aa</a>	26	M	<a href="#">Hypertension Screening</a>	12/01/2011 01:15	09204053730	
In	311	<a href="#">Mendoza, Nora</a>	60	F	<a href="#">Hypertension</a>	12/01/2011	09204053730	





# OpenMRS



Currently logged in as Super batman User | [Log out](#) | [My Profile](#) | [Help](#)

[Home](#) | [Find/Create Patient](#) | [Dictionary](#) | [Sana](#) | [Cohort Builder](#) | [Administration](#)

**Diaresco, Ma.Gemma (ID# 313) 43**  
F

**Status: In Progress**

### Patient Visit Q&A Responses

**Date of Encounter:**  
2011-12-01

**Enter Patient's Temperature in Celsius:**  
36.8

**Is there a history of high blood pressure in the patient's family?**  
Yes

**Enter Patient's Address:**  
#10 Airforce Rd.Taguig City

**Sticks per day**  
0.0

**Is the patient taking any medications for Hypertension?**  
No response given

**Does the patient have High Cholesterol?**  
No

**Does the patient have a previous case of Hypertension?**  
No

**Does the patient have Diabetes Mellitus?**  
No

**Please enter Patient's Blood Sugar**  
89.0

**Does the patient have blurry vision?**  
Yes



Zoom

Brightness

Contrast

Sharpness



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**Cayugan, Erlinda (ID# 243) 60 F**

**Status: Closed**

**Date of Specialist Consult:**

2011-10-05

**Specialist:**

Super User

**Urgency Level:**

Urgent

**Diagnosis:**

HYPERTENSION

**Plan:**

> for ECG; BP monitoring; lipid profile; UTS of KUB; > Paracetamol 500mg/tab 1tab q 4\* x prn >low salt low fat diet

> since when did he start having high blood? > what is the cholesterol level? when? > Describe the chest pain, pricking? heaviness? radiating to the back?; how long doe sit last? what are thje precipitating factors?



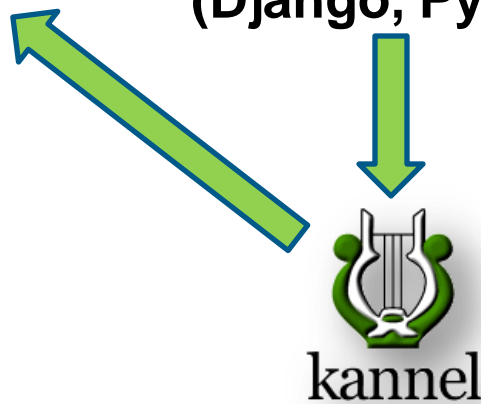
# Components of SANA



**Mobile Dispatch Server  
(Django, Python)**



**Medical Record System  
(OpenMRS, Java)**



# Philippine Pilot Implementation

## Strategic Partners in the Philippines

### Implementation & Operations

- IT capacity & support
- Project management
- Training, monitoring and evaluation

### Social Partner

- Existing relationships with clinical community & target patients
- Dedicated to improving health of rural poor

### Medical Partner

- Medical specialists for back-end support
- Community hospitals or clinics to handle patient referrals



# Philippine Pilot Implementation

## Implementation Partner



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## Academic Partner



**asia  
pacific  
college**

## Funding Partner



**CS FOUNDATION**  
Christian Service - Less for self, enough for all

# Philippine Pilot Implementation

## Social Partner and Medical Partner



Negros Women for Tomorrow Foundation, Inc.  
*working for a better tomorrow*

Visayas Region – Social and Medical Partner



Center for  
Community  
Transformation  
*Transforming Lives. Transforming Communities.*

Metro Manila and environs – Social and Medical Partner



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asia  
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college



# Philippine Pilot Implementation

Pilot  
Procedure  
(Hypertension)

Customization

Results



# Philippine Pilot Implementation

Adaptation

Issues

Iterative Process

Full  
Implementation





# Philippine Pilot Implementation

## Cost for implementation: 10 Phones, 1 year

<b>Hardware Costs</b>	<b>Unit Cost (Euro)</b>	<b>Quantity</b>	<b>Total Cost</b>
Android Smart Phone (ten units)	107	10	1,072
USB GSM Modem (one unit)	18	1	18
SMS Server (one unit)	268	1	268
<b>Monthly Recurring Costs</b>			
Virtual Private Server	200	12	2400
Monthly SMS cost	16	12	193
I.T. Maintenance Support	536	12	6,430
<b>Software License Cost</b>			
Open Source Software	0		0
<b>Total Costs</b>			10,381



## Conclusion:

Sana enables cost effective healthcare in remote areas, answering the need for 50% of the Philippine population that die without ever receiving expert medical attention.



## Conclusion:

The Sana Telemedicine system drastically lessens the cost of making expert medical care available in remote, rural areas.



# Conclusion:

“The whole is greater than the sum of its parts.”  
- Aristotle



# Sana

## Open Source Telemedicine



Thank You for Listening!

# Questions?

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**Asia Pacific College , CS Foundation**

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