



# Computing and Global Health

## Lecture 6

### Patient Support

Winter 2015

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# Today's topics

- Trevor Perrier, SMS
- Phone messaging
- Messaging technologies
- Example Projects
- Messaging studies
- Adherence
- Health information systems



# Readings and Assignments

- SMS For Life
- WelTel Study
- Iron Tablet Adherence Study
  
- Homework 6
  - Design an SMS syntax for cold chain reporting

Date	Topic
Jan 7, 2015	Overview
Jan 14, 2015	Surveillance
Jan 21, 2015	Tracking
Jan 28, 2015	Medical records
Feb 4, 2015	Logistics
Feb 11, 2015	Patient support
Feb 18, 2015	Treatment support
Feb 25, 2015	Health worker support
Mar 4, 2015	Behavior change
Mar 11, 2015	Finance

# Organization

- Patient support
- Treatment support
- Worker support
- Behavior Change Communication

# Patient Support

- Messaging
  - Spam
  - Reminders
  - Interaction
  - Adherence messaging
- Adherence (other than messaging)
- Information services

# Phone Messaging

- Different types of messaging
  - What is the intended behavior to be influenced
  - What is the theory of behavior change
- Health knowledge
- Promotion of a specific activity
- Reminder of action
- Interaction with health system

# Adherence



- Medication
  - HIV ART
  - Tuberculosis
  - Diabetes
  - Iron Pills
- Lifestyle
  - Diet
  - (Not) smoking

# Obstacles to Adherence

- Why do people stop taking medication?



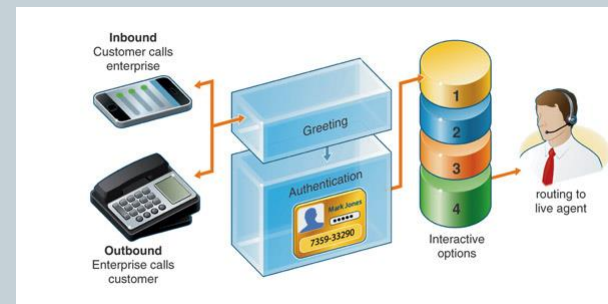
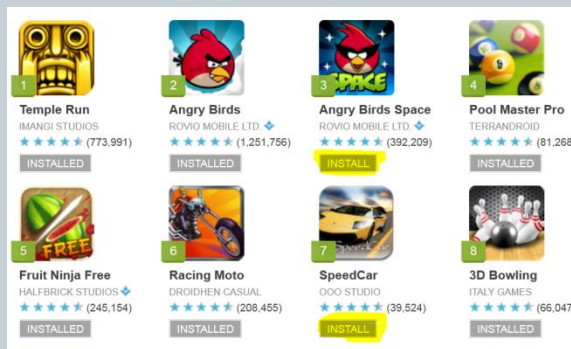
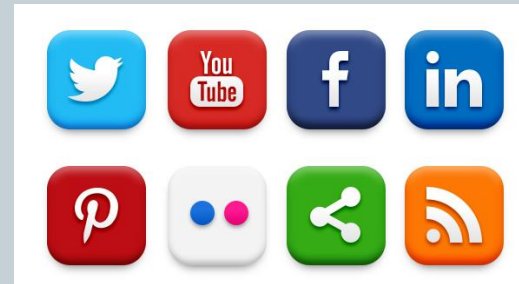
# Reminders

- Appointment reminders
  - ANC visits
  - TB Testing
- Immunization reminders
- Long term birth control



# Technology

- SMS, Voice, SmartPhone Apps, Social Media



# Personal mobile phones

- Mobile phones have tremendous reach, but
  - Vast variety in different situations
  - Rapid change



# Mobile Phone Issues

- Handsets
  - Generally available, prestige good
- Airtime
  - Prepaid. Costs vary dramatically
- Signal
  - Widely available, spotty coverage, no coverage
- Electrical power
  - Depends on the electrical grid
- Simcards
- Monopolies

# Mobile Phones and Gender

- Phone ownership models
  - Shared across household (less common)
  - Household phone
  - Individual phones
- Common practices
  - Men have better phones than women
  - Children have access to mothers phone



# SMS

- Available on almost all mobile phones
- Restricted message length
- Highly variable cost
  - Although essentially no cost for carrier
- Highly variable usage
  - Different populations and countries
- Gateway Issues
- SPAM!

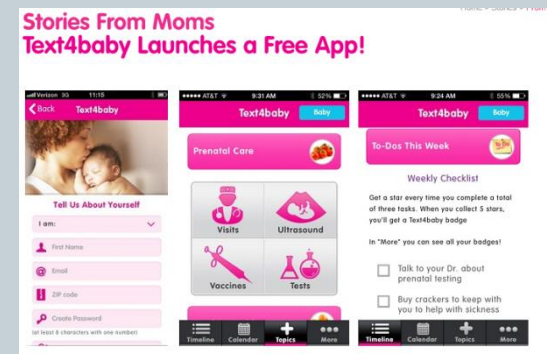
# Voice

- Universal on phones
- IVR – Interactive Voice Response
- Automated calls with recorded messages
- Callbacks triggered by missed call



# Smartphone Apps and Social Media

- Applicability depends on demographics
- Rapid change
- For global health, often an emphasis in reaching late adopters





# Example projects

# Walter Curioso

- Early work in SMS reminders in Latin America
  - Voxiva
- Messages aimed at high risk populations to influence behavior
- Many issues around confidentiality and privacy





# Text4Baby / MAMA

## How it Works

1. Text BABY (or BEBE for Spanish) to 511411.
2. When prompted, enter your due date and zip code.
3. That's it! Now tell your friends and family!

Free t4b msg: Morning sickness may be caused by a change in your hormones. Try eating crackers or dry cereal. Eat small meals often. Don't go without eating.

# Mobile Technology for Community Health (MOTECH)

- Platform developed by Grameen Foundation with support from BMGF
  - Motechsuite.org
- Evolving platform
- Significant deployment through BMGF grantees in Bihar
- Initial work in Ghana

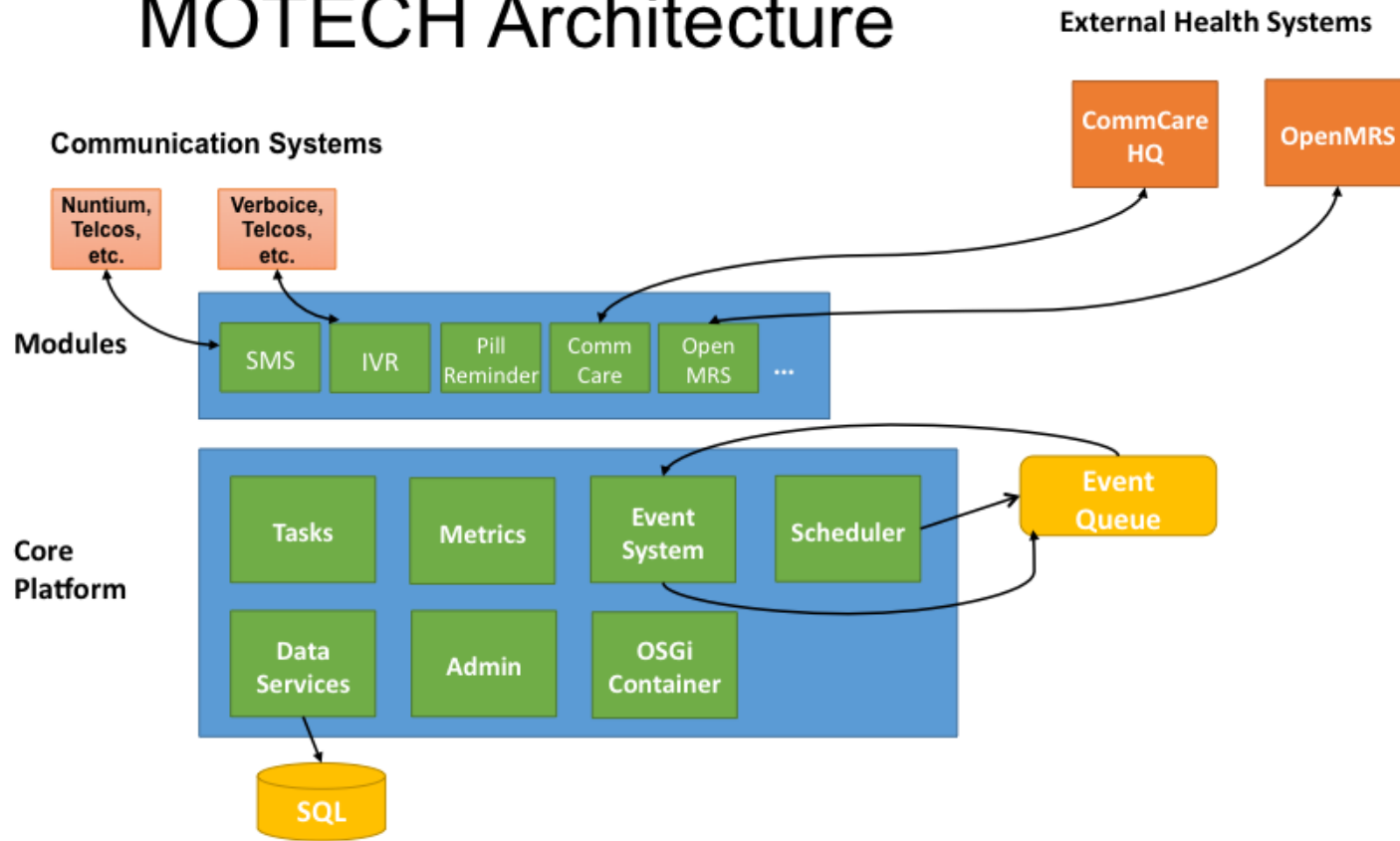


University of Washington, Winter



# MOTECH Architecture

## MOTECH Architecture



# Motech Ghana

- Initial deployment in Northern Ghana
- Early version of Motech developed to support deployment
- Maternal messaging and phones for nurses



## MOBILE TECHNOLOGY FOR COMMUNITY HEALTH IN GHANA

WHAT IT IS AND WHAT GRAMEEN FOUNDATION HAS LEARNED SO FAR

March 2011

# Lessons learned

- Phones for nurses
  - Phone management and logistics
  - Nurses did not feel the phones helped them in reporting
- Messaging
  - Voice, not SMS
  - Tremendous challenges in localization
    - Expense for translation
  - Cost and sustainability challenges
  - Significant formative work in identifying needs

# Evaluation Studies

- Very different approaches to evaluation based on discipline
- Medical evaluation
  - Define intervention
  - Construct study design
  - Enroll study subjects in different arms
  - Conduct study without further intervention
- Computer Science
  - Develop technology with initial field tests
  - Deploy technology in field with iterative adjustments
  - Analysis of multiple sources of ad hoc data from deployment
  - Promote large scale deployment or use



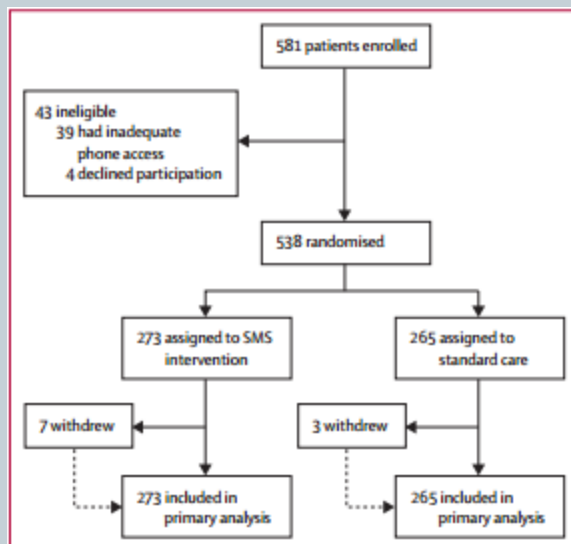


# WelTel Study

- HIV Patients on ART
- Simple intervention
  - Send patients a weekly SMS: Mambo
  - Patients respond: Sawa / Shida
- Measured outcomes
  - Self reported adherence
  - Viral suppression



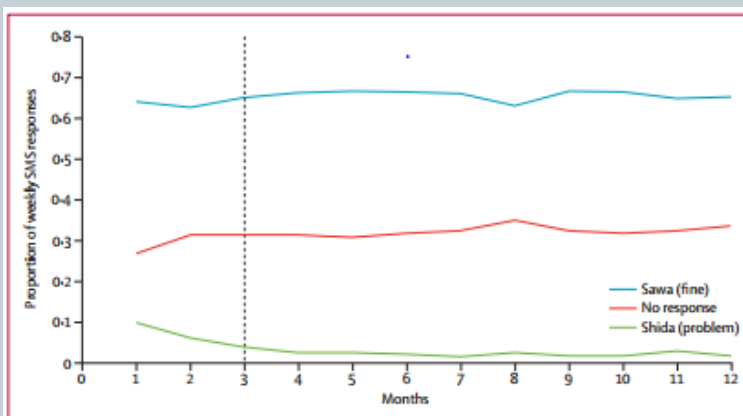
# WelTel Study



	SMS group (number [%])	Control group (number [%])	RR (95% CI)*	p value
<b>Primary outcome</b>				
<b>Intention-to-treat analysis†</b>				
Self-reported adherence (>95%)	168 (62%)	132 (50%)	0.81 (0.69–0.94)	0.006
Viral suppression (<400 copies per mL)	156 (57%)	128 (48%)	0.85 (0.72–0.99)	0.04
<b>Complete-case analysis‡</b>				
Self-reported adherence§	168 (91%)	132 (91%)	1.00 (0.94–1.07)	0.94
Viral suppression¶	156 (75%)	128 (66%)	0.88 (0.77–1.00)	0.047
<b>Secondary outcomes</b>				
Total attrition (missing)	53 (19%)	61 (23%)	1.24 (0.82–1.89)	0.31
Loss to follow-up	17 (6%)	27 (10%)	1.69 (0.91–3.23)	0.094
Mortality	25 (9%)	30 (11%)	1.27 (0.72–2.22)	0.42
Withdrawal	7 (3%)	3 (1%)	2.26 (0.59–8.67)	0.34
Transfer out	4 (1%)	1 (0%)	0.25 (0.19–2.17)	0.38

Percentages do not add up to 100% in some cases because of rounding. \*For non-adherence or virologic failure. †273 patients in the SMS group and 265 in the control group. ‡Because the intention-to-treat analysis classed all patients with missing data as non-adherent or having viral failure, the number of adherent patients and number of patients with viral suppression are the same here as in the intention-to-treat analysis. §185 patients in the SMS group and 145 patients in the control group. ¶208 patients in the SMS group and 194 patients in the control group. ||Fisher's exact test.

**Table 2: Primary and secondary outcomes**



**Figure 3: SMS intervention response rates**  
The graph is truncated at 12 months' follow-up. A line is drawn at 3 months indicating the usual transition to HIV disease stability and reduction in toxicities after initiation of antiretroviral therapy.

# Adherence to Iron Pills



- Evaluate if voice messaging improves adherence to taking pills
- Study goal – evaluate mHealth intervention with measurable health outcome
  - Anemia is highly prevalent for low income women in India
  - Simple treatment – iron pills
  - Measurable results – Hemoglobin test

# Sion Hospital Study

- High anemia rates, low utilization of iron pills
  - Pills available for free, but 70% of women fail to take them
    - Forgetfulness, dislike of pills
- Intervention
  - Recorded voice calls from doctor
  - Three messages per week in local language
  - Positive, affective messages

Hello, this is Dr. Niranjana Pai. We met in Sion Hospital. Your backache may increase. Don't worry, take rest. Take the prescribed pills regularly as they are important for you and your child's health. I will call you again in a couple of days. Thank you

# Results

- Slight positive results, treatment superior to control, but not statistically significant
- What went wrong
  - Study failed to enroll sufficient number of subjects who completed study
  - Difficulty in following up to get final Hb
  - Early subjects had to be de-enrolled due to poor quality Hb measurements

	Control Group (n=40)	Treatment Group (n=39)	<i>t</i>	<i>p</i>
Initial Hb	9.69 (0.98)	9.53 (0.99)	0.72	n.s.
Final Hb	9.59 (1.06)	9.86 (1.06)	-1.12	n.s.
Change in Hb	-0.10 (1.32)	0.32 (1.16)	-1.52	0.13

Table 2: Results of the trial. Values are encoded in the same way as in Table 1.

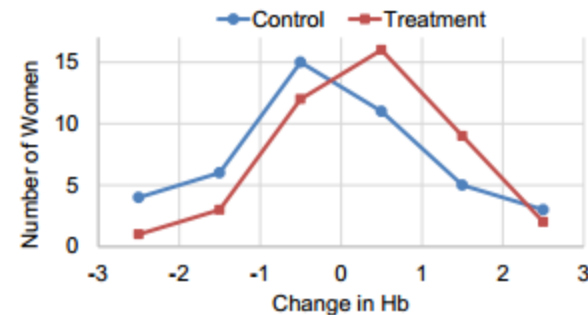
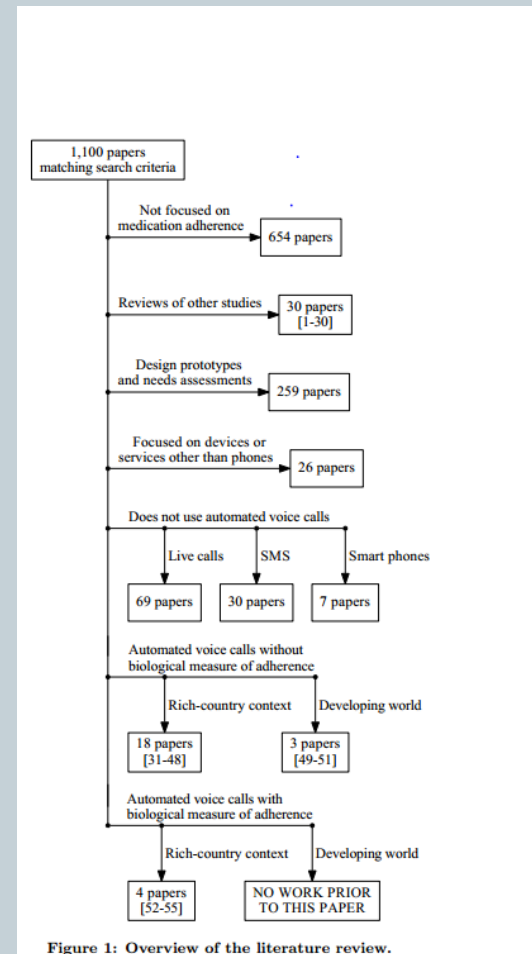


Figure 2: Graphical illustration of trial results. Values are grouped into bins of 1.0 g/dL change in Hb.

# How to do a literature review

- Determine if there has been prior work on assessment of voice based adherence support in developing countries

On PubMed and IEEE Xplore, we included all studies that contained both an adherence keyword and a phone keyword in the title or abstract, with at least one of the keywords appearing in the title. For adherence keywords, we used “adherence”, “adhere”, “adhered”, “compliance”, “comply”, and “complied”. For phone keywords, we used “phone”, “phones”, “telephone”, “telephones”, “interactive voice”, “voice response”, “automated calls”, and “automated voice”.



# Adherence

- Direct Observation Therapy



# TB Drug Distribution

- Fingerprint scanning in drug distribution





# SMS Reporting

- Send confirmation code associated with each pill



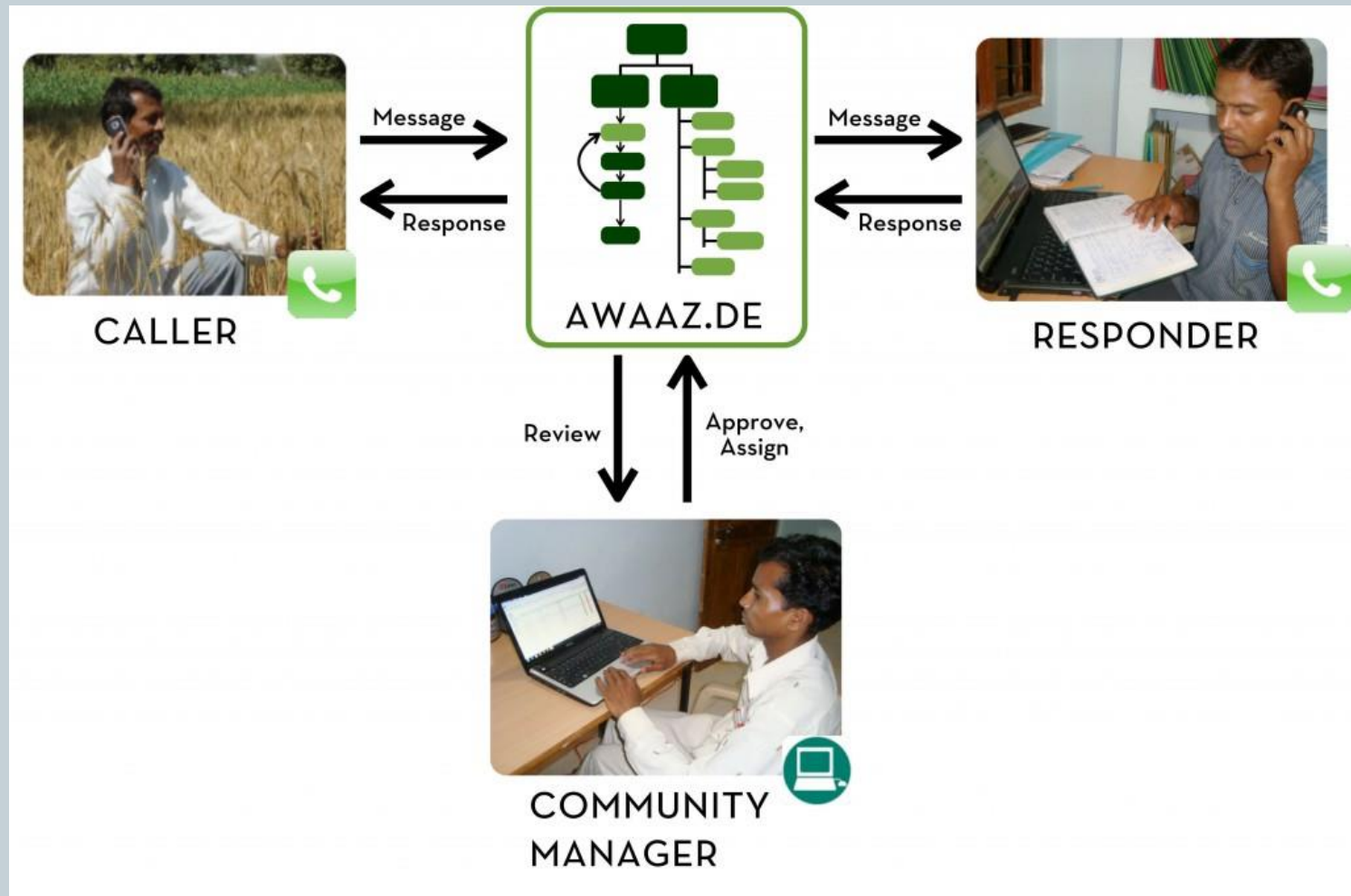
# Pill box notifications



# Health Information



# Awaaz De



# Health Line, Pakistan

- Voice based health information system
- Target low-literate users

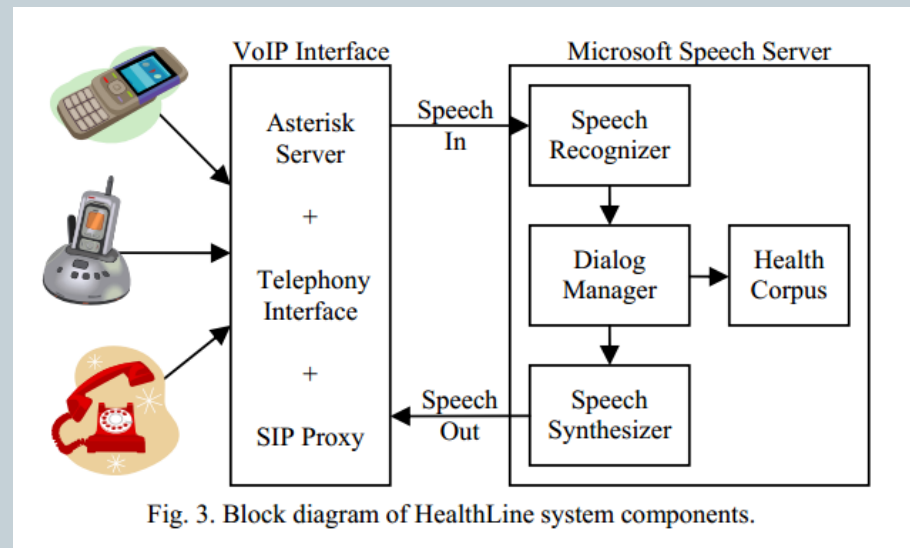


Fig. 3. Block diagram of HealthLine system components.

- Speech recognition research challenges

# Next week

- Treatment Support



University of Washington, Winter 2015

