hSITE

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University Health Network

hSITE

Theme 1: Clinical Workflows and Clinical Grade Requirements

Demonstrations and Prototypes

Theme 2: Context Aware Sensor Systems, Software, and Applications

Theme 3: Enabling Networks and Technologies

Theme 1: Clinical Workflows and Clinical Grade Requirements

Theme 1: Clinical Applications Design, Realization, and Evaluation

The Team: Faculty

- Academic Participants:
  - 8 Professors - Nursing, Medicine, Engineering, Computer Science, Rehabilitation, Occupational Therapy, and Health Services Research
  - 2 clinician-scientists (Doran and Strauss)
  - 2 hospital-based investigators (Strauss and Cafazzo)
  - Operations Research (Carter)
  - User-centered design (Chignell and Cafazzo)
  - Artificial Intelligence (Cohen)
  - Homecare Research (Doran)

The Team: Faculty

New additions:

–Lili Liu (Occ.Therapy)

–Edmond Lou (Rehab Engineering)

The Team: Students

Undergraduate	3
Masters	19
PhD	5
Post Doctoral Fellows	2
	29

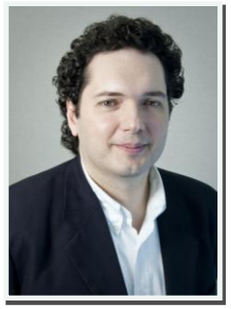
"Which patient do I see next?"

"the right person"
at "the right time"

reducing friction in the clinic

”Have you been taking your medication?"

“Why did you fall?”



Patient self-care

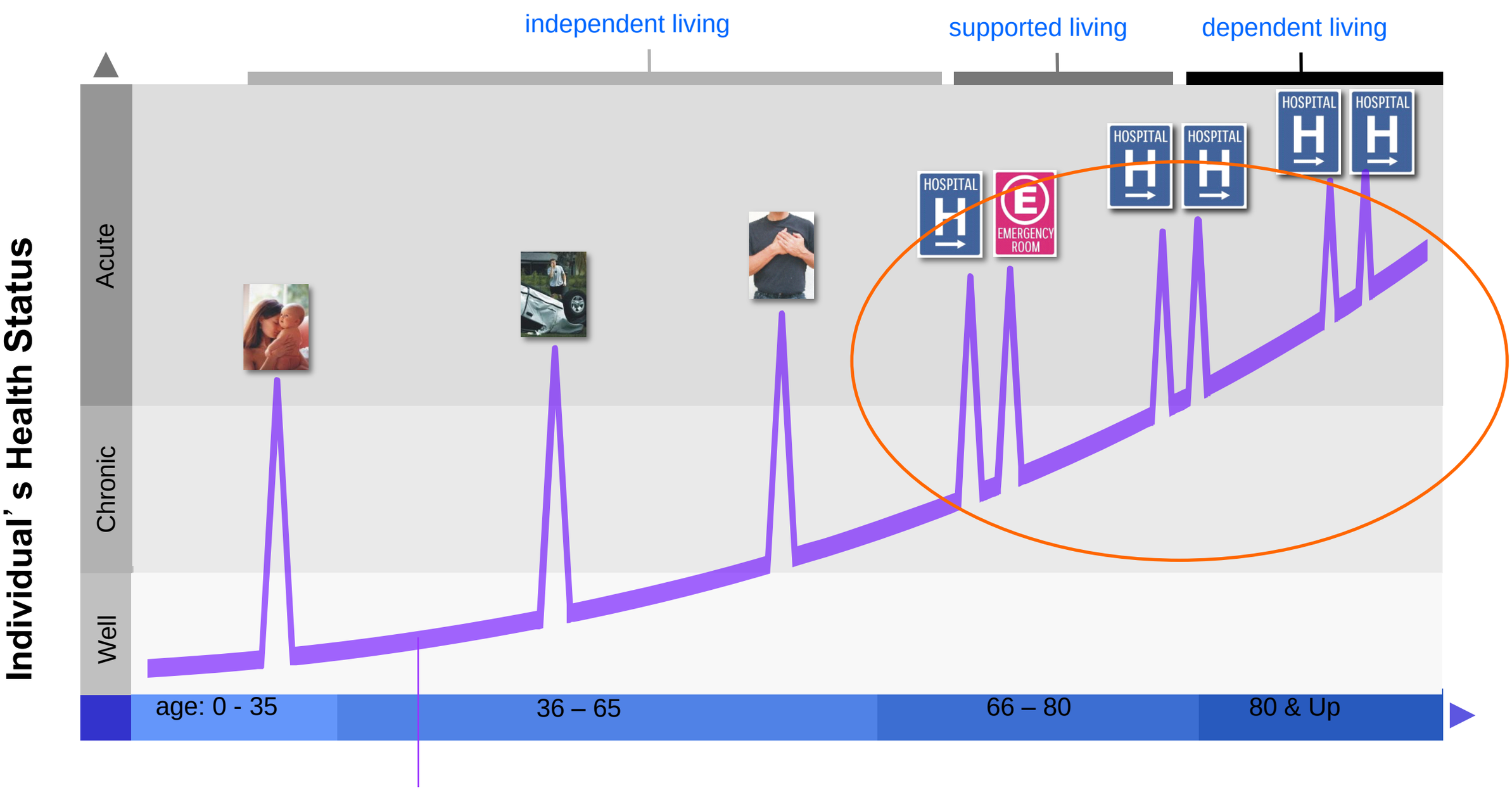
The Evolution of the Treatment of Chronic Disease: From Physician Management to Patient Self-Care

Joseph A. Cafazzo, PhD PEng
Lead, Centre for Global eHealth Innovation, University Health Network
Senior Director- Medical Engineering and Healthcare Human Factors
Assistant Professor, IBBME and HPME, Faculty of Medicine, University of Toronto

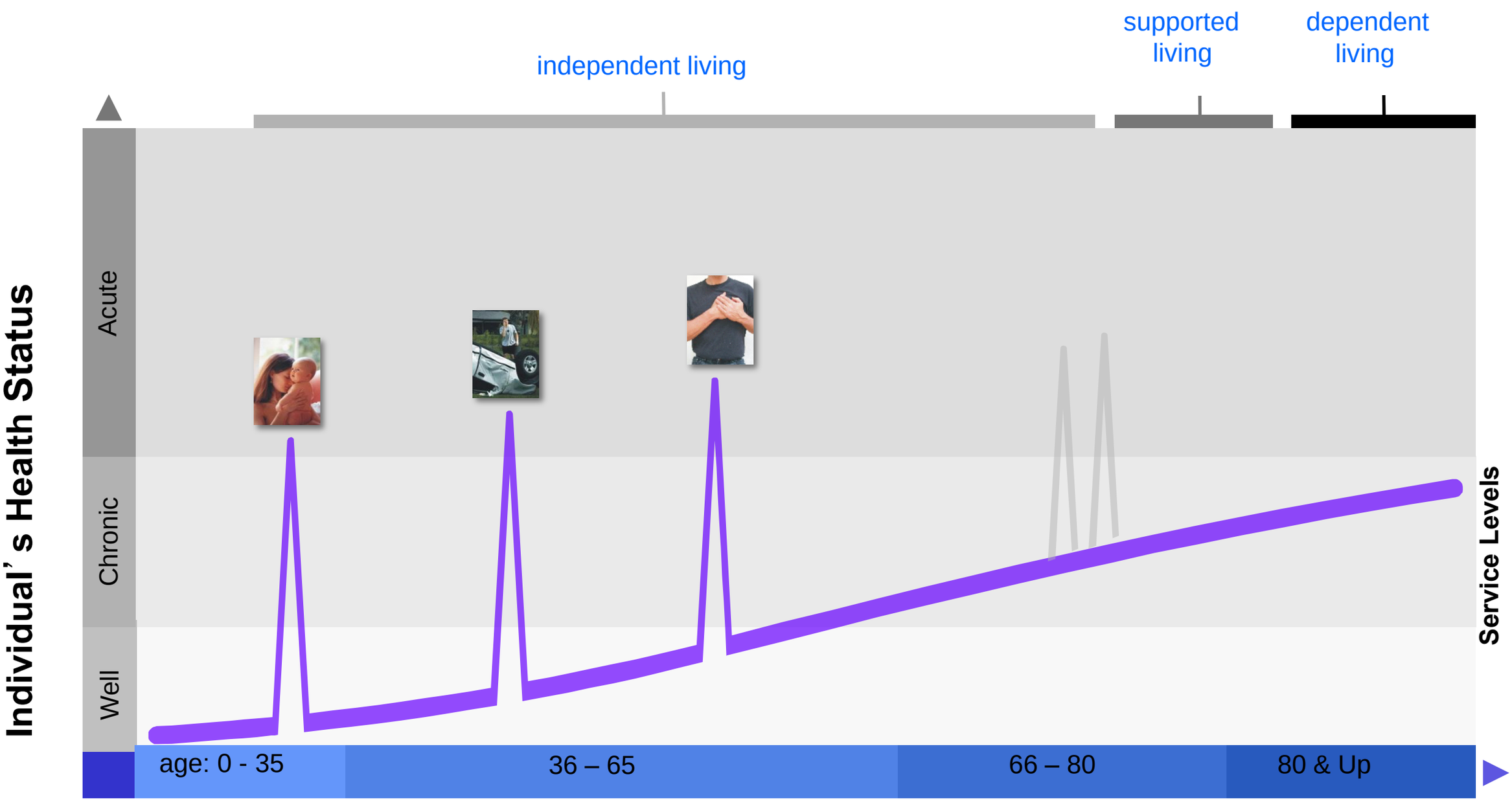
The Scope of Chronic Disease

- Six chronic diseases account for **60**% of healthcare spending in Canada:
    - Diabetes
    - High Blood Pressure
    - Kidney Disease
    - Heart Failure
    - Lung Disease
    - Mental Health

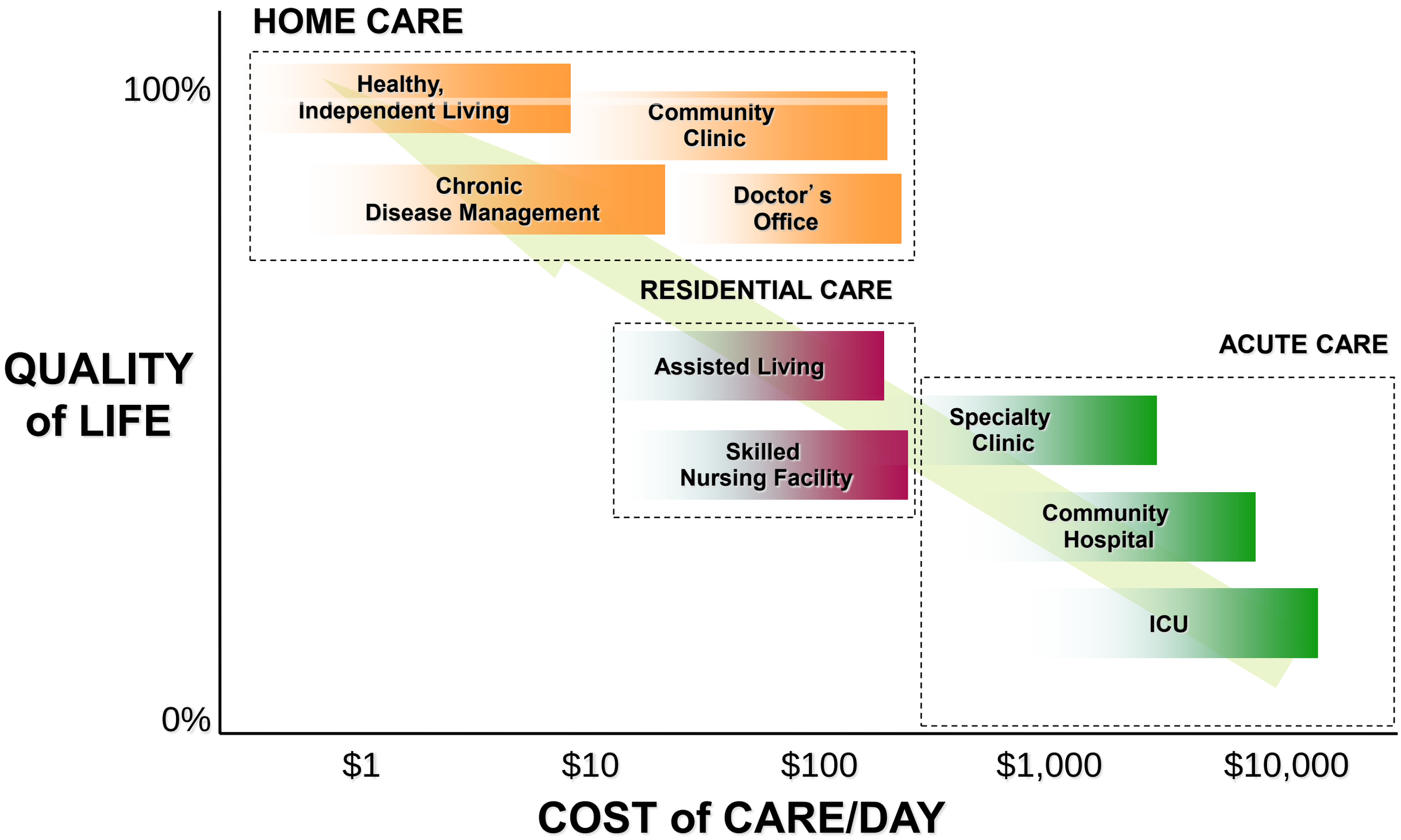
Current care models focus primarily on acute care



Can we suppress these acute events?

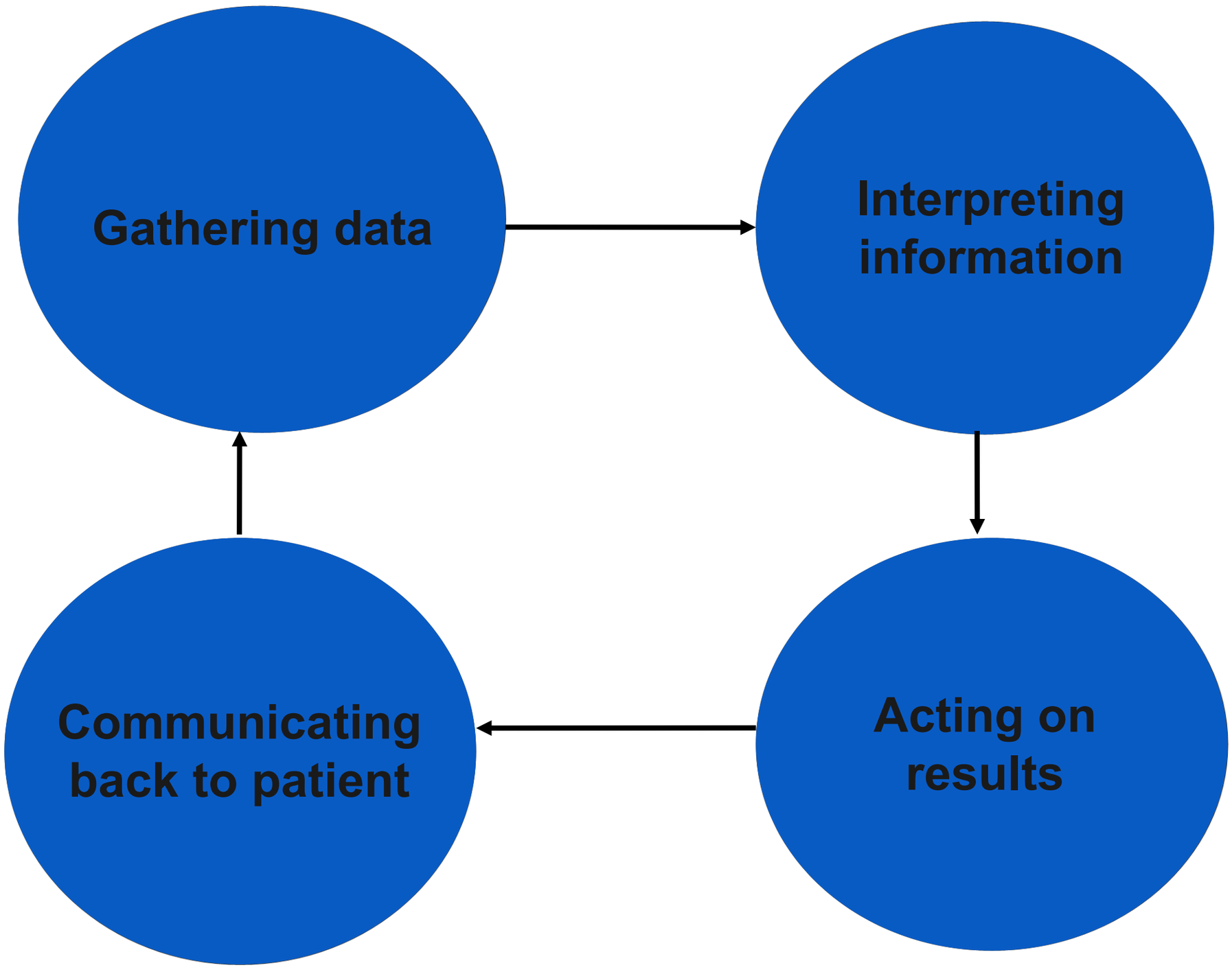


‘Shift Left’ of Healthcare through Technology[1]



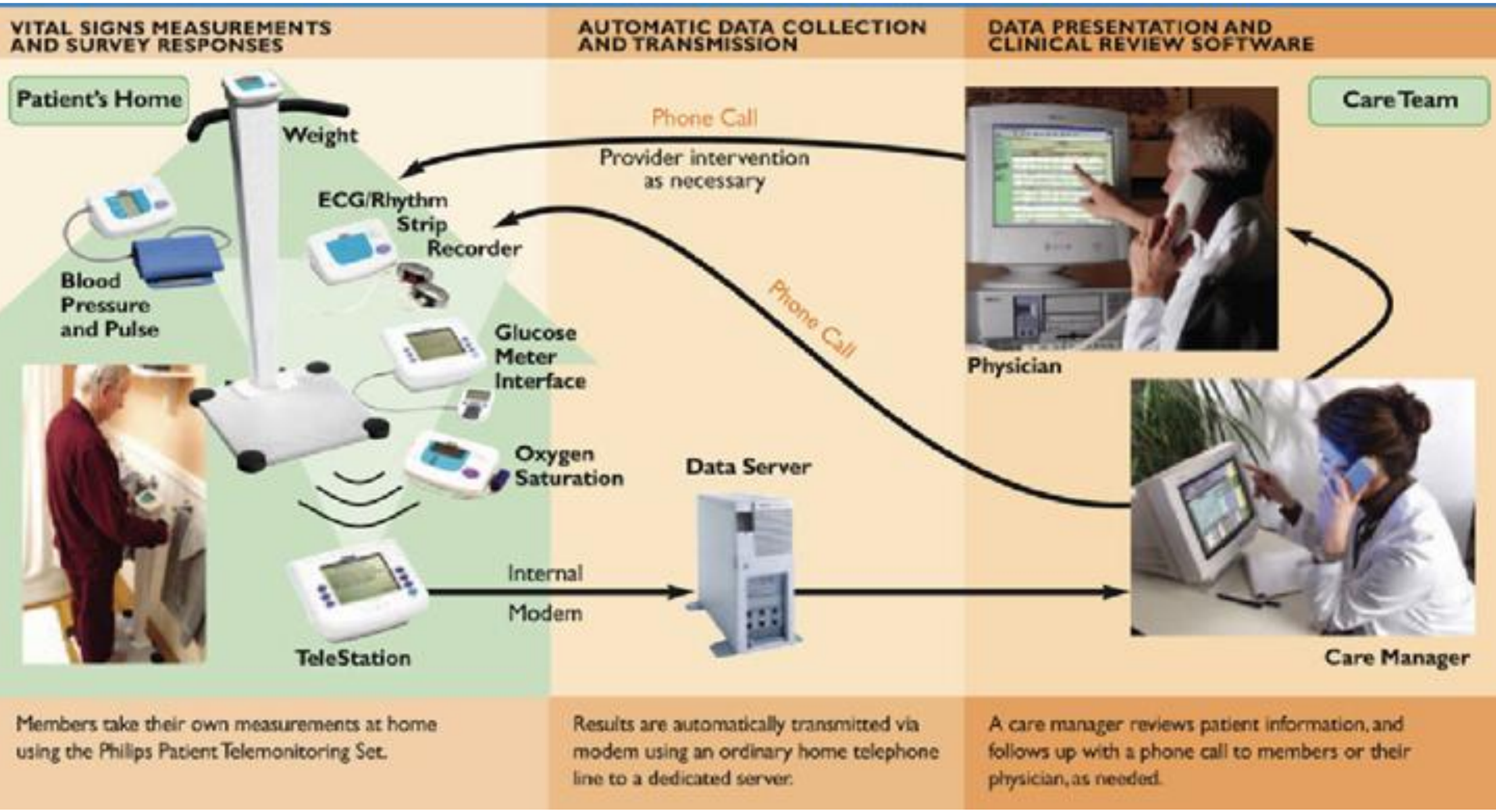
1) from Intel, and Center for Aging Services Technologies (CAST)

Patient-Provider Feedback Loop



“Classic” Remote Patient Monitoring

Joseph Hayduk, 86, is heart failure and uses a device that transmits his vital signs to a RN at Meridian Health. The RN calls all 18 patients in program daily. The New York Times Feb 13, 2009

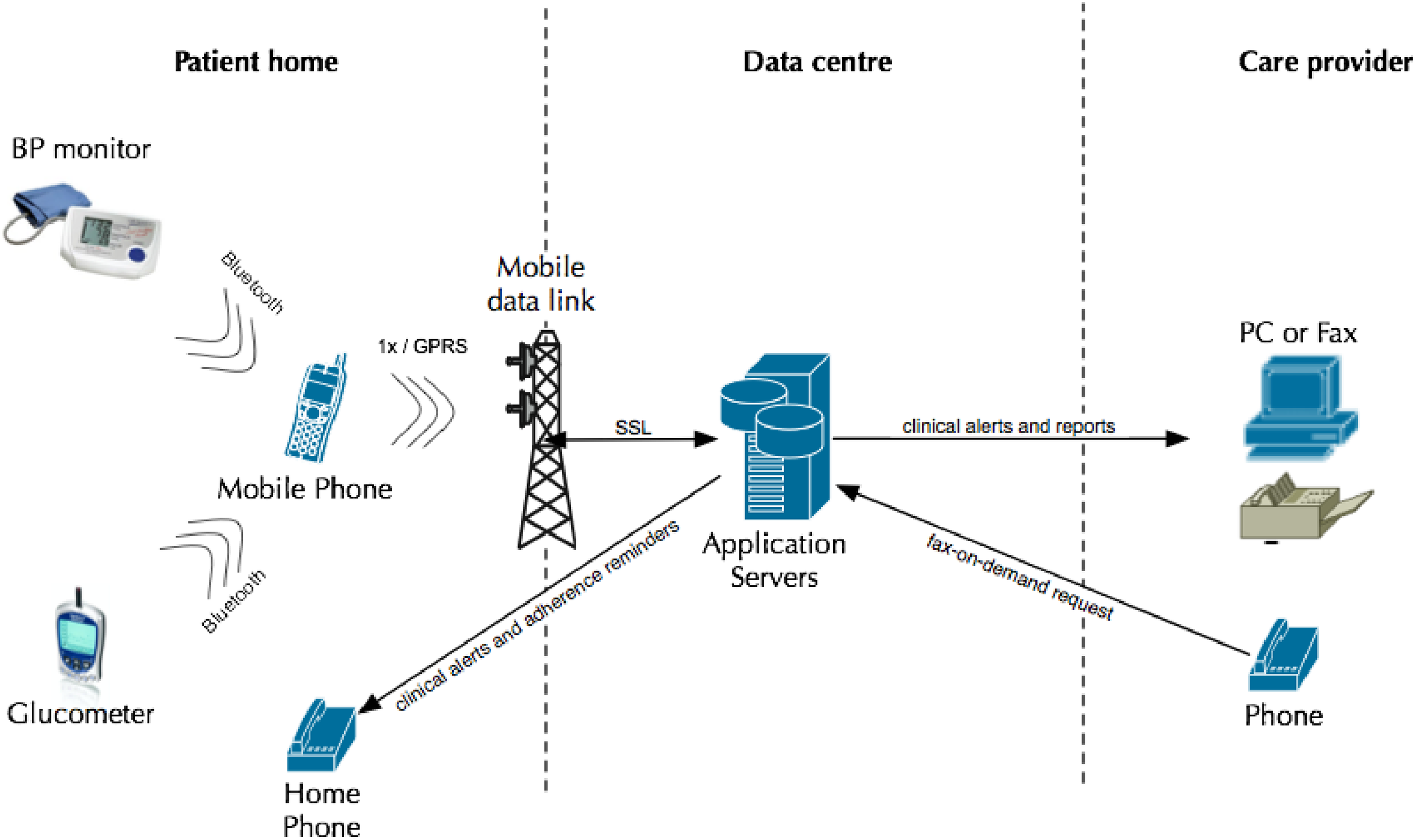

VITAL SIGNS MEASUREMENTS AND SURVEY RESPONSES
AUTOMATIC DATA COLLECTION AND TRANSMISSION
DATA PRESENTATION AND CLINICAL REVIEW SOFTWARE
Patient's Home
Weight
ECG/Rhythm Strip Recorder
Blood Pressure and Pulse
Glucose Meter Interface
Oxygen Saturation
TeleStation
Phone Call
Provider intervention as necessary
Phone Call
Internal Modem
Data Server
Care Team
Physician
Care Manager
Members take their own measurements at home using the Philips Patient Telemonitoring Set.
Results are automatically transmitted via modem using an ordinary home telephone line to a dedicated server.
A care manager reviews patient information, and follows up with a phone call to members or their physician, as needed.

Congestive Heart Failure Client


A&D


LIFESCAN


CARDIOGUARD
The Telemedicine Company
PMP
Self-Test ECG


Patient home
Data centre
Care provider
BP monitor
Bluetooth
Mobile Phone
1x / GPRS
Mobile data link
SSL
Application Servers
clinical alerts and reports
PC or Fax
Glucometer
Bluetooth
clinical alerts and adherence reminders
Home Phone
fax-on-demand request
Phone

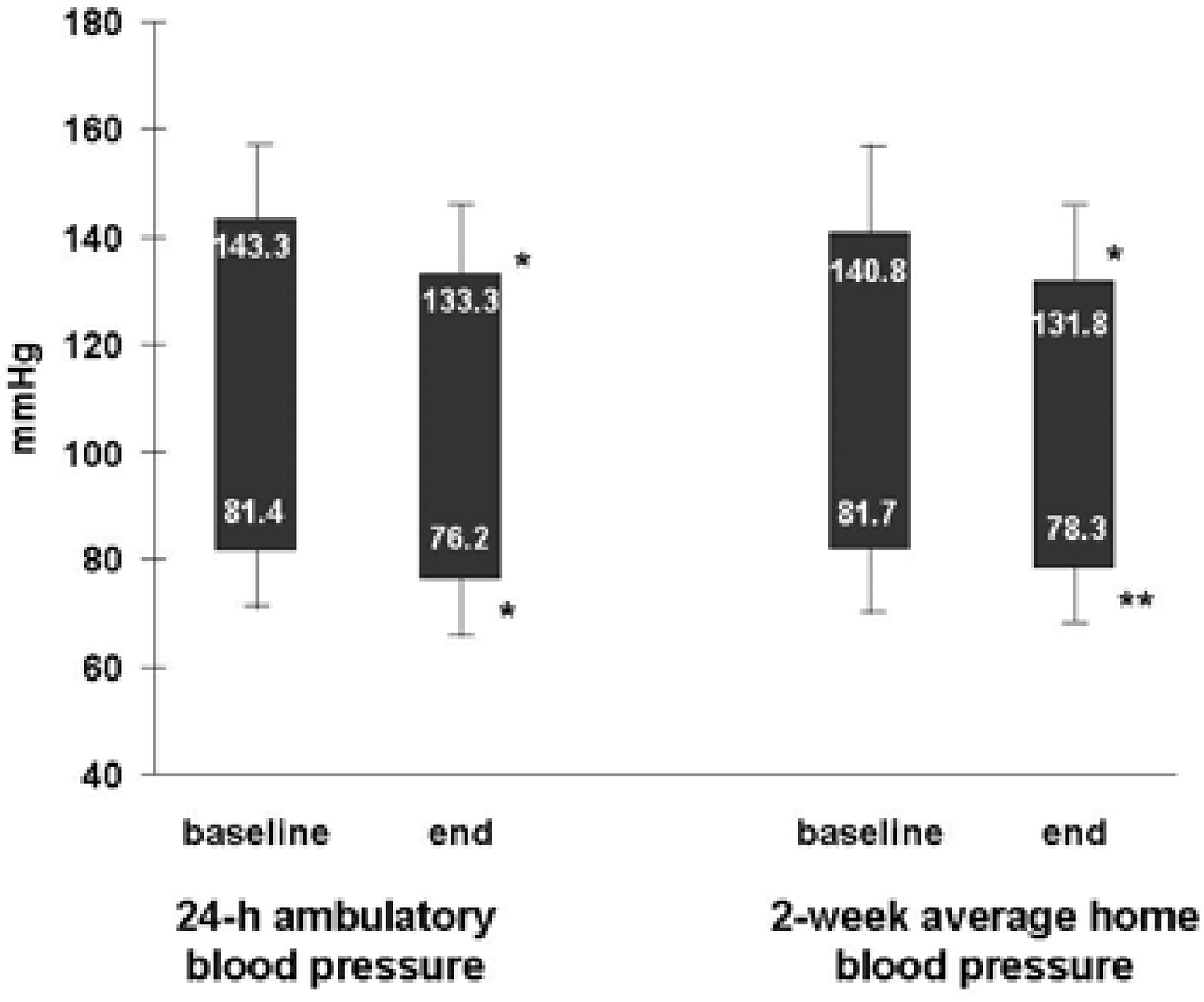
Clinical trials

- Diabetic hypertension pilot - complete
- Blood sugar and hypertension - complete
- Gestational diabetes pilot - complete
- **Diabetic hypertension RCT - complete**
- **Congestive heart failure RCT - complete**
- **Gestational diabetes RCT - midway**
- Adolescent type 1 diabetes pilot - underway

Pilot Results

Diabetic Hypertension

American Journal of Hypertension, 20(9), pp. 942-948, 2007



Intervention group
(55 patients)

Control group
(55 patients)

Intervention group
(55 patients)

Control group
(55 patients)

systolic ↓ -9.1 mmHg

no change

diastolic ↓ -3.2 mmHg

RCT Results

Congestive Heart Failure

BNP ↓ 150 pg/mL

LVEF ↑ 7.4 %

self-care ↑ 7 points

no change in the control group

RIM PRP

Medical Body Area Network (MBAN)

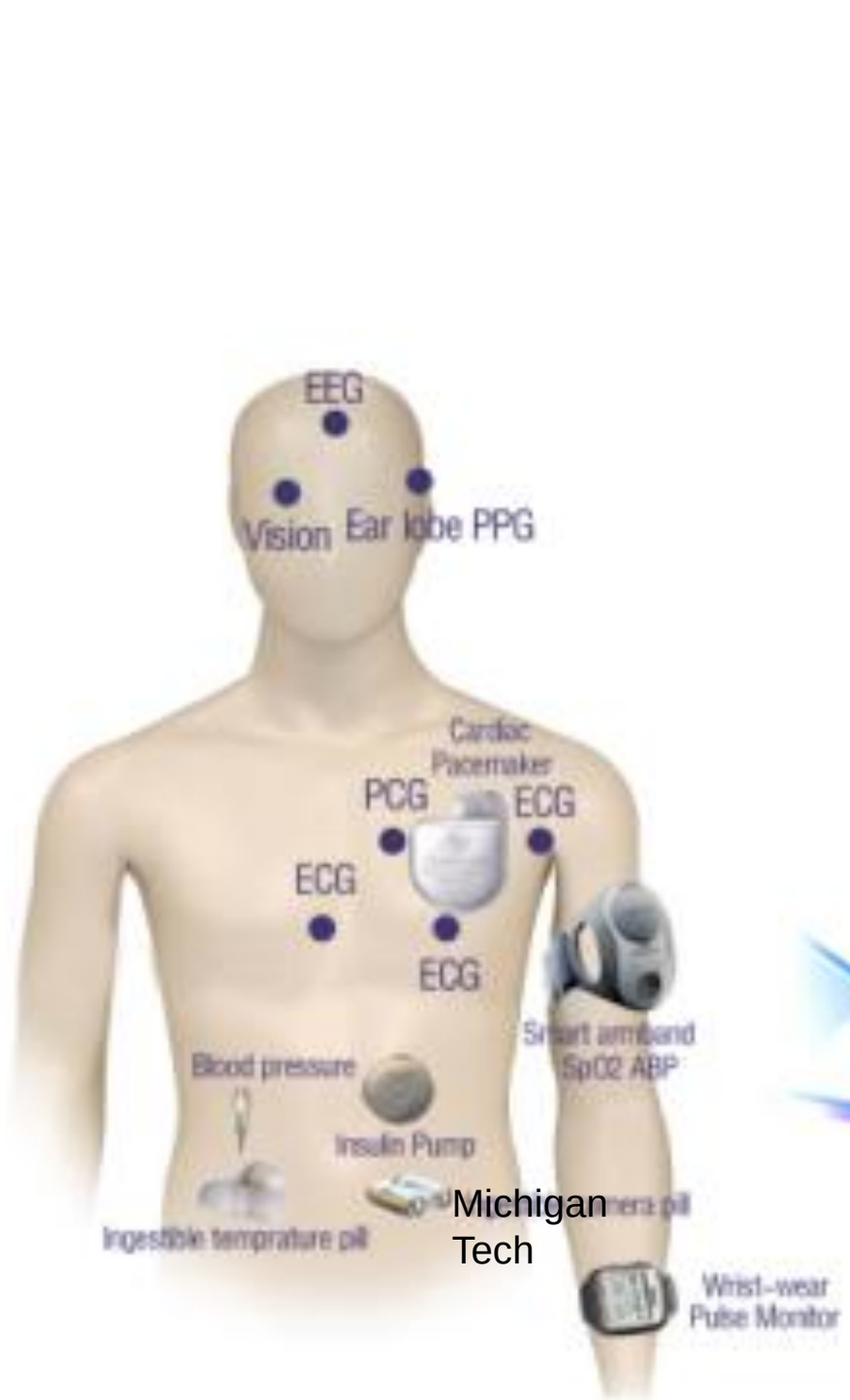
Platform for Ambulatory Monitoring (AM)

Partnered Research Project

Medical Body Area Network (MBAN) in mental health

application to mental health

- 20% of population
- almost no technological interventions
- promising developments for detection


EEG
Vision
Ear lobe PPG
Cardiac Pacemaker
PCG
ECG
ECG
ECG
Blood pressure
Insulin Pump
Ingestible temprature pill
Wrist-wear Pulse Monitor


Home PC
Physician
AMBULANCE
Emergency
Data Center
Internet
Smart Phone

design challenge

Enobio


Holst Centre

So what?

Shift current state of crisis-driven care
to pre-emptive care

THE GLOBE AND MAIL
CANADA'S NATIONAL NEWSPAPER · WEDNESDAY, MAY 11, 2011

Cellphones and cancer: watch that thing by your head

It is an open question whether cellphones can cause cancer. This is a very large open question in a world with 4.6 billion cellphone users. The answer to such uncertainty is caution about extensive use, especially among children.

Panic is not, as doctors like to say, indicated. But neither is denial. Cellphone use in cancer patients was studied in 13 countries, including Canada, and the results were published this week in the International Journal of Epidemiology. The cancer patients were divided into 10 groups, by time of use. In the group that used cellphones the most – more than 1,640 hours over 10 years, or 30 minutes a day – the risk of developing the rare form of brain cancer known as glioma was elevated by 40 per cent. In the other nine groups, there was no extra risk; in fact, there were fewer cases overall in these nine groups than in control groups.

- Cellphone safety study sends mixed signals about usage
- Heavy use of cell phones may increase tumour risk: study
- Worried about cell phones? What you can do

The study's authors, led by Elisabeth Cardis, formerly of the University of Ottawa, say the findings are inconclusive. The elevated risk could have been caused by flaws in the study. No one is saying moderate cellphone use protects

Theme 3 involvement

Ramesh Abhari, McGill University

interaction of printed and wire antennas with the human body

optimization of the performance of selected on-body antennas

develop new antennas with optimized performance for operation in proximity of human body and for integration with a health monitoring sensor system

TELUS PRP

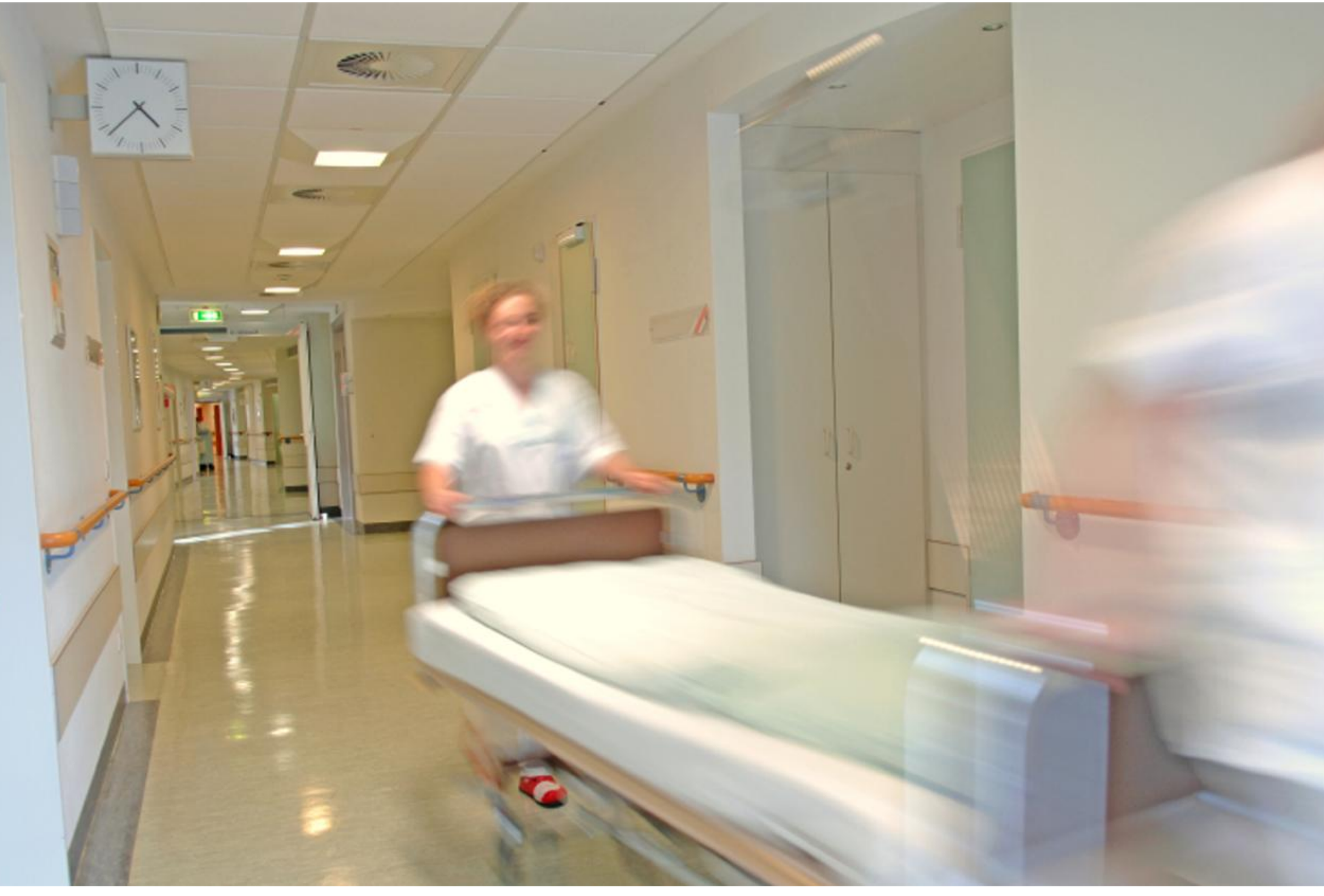
Advanced Information Access and Communication in the Modern Hospital

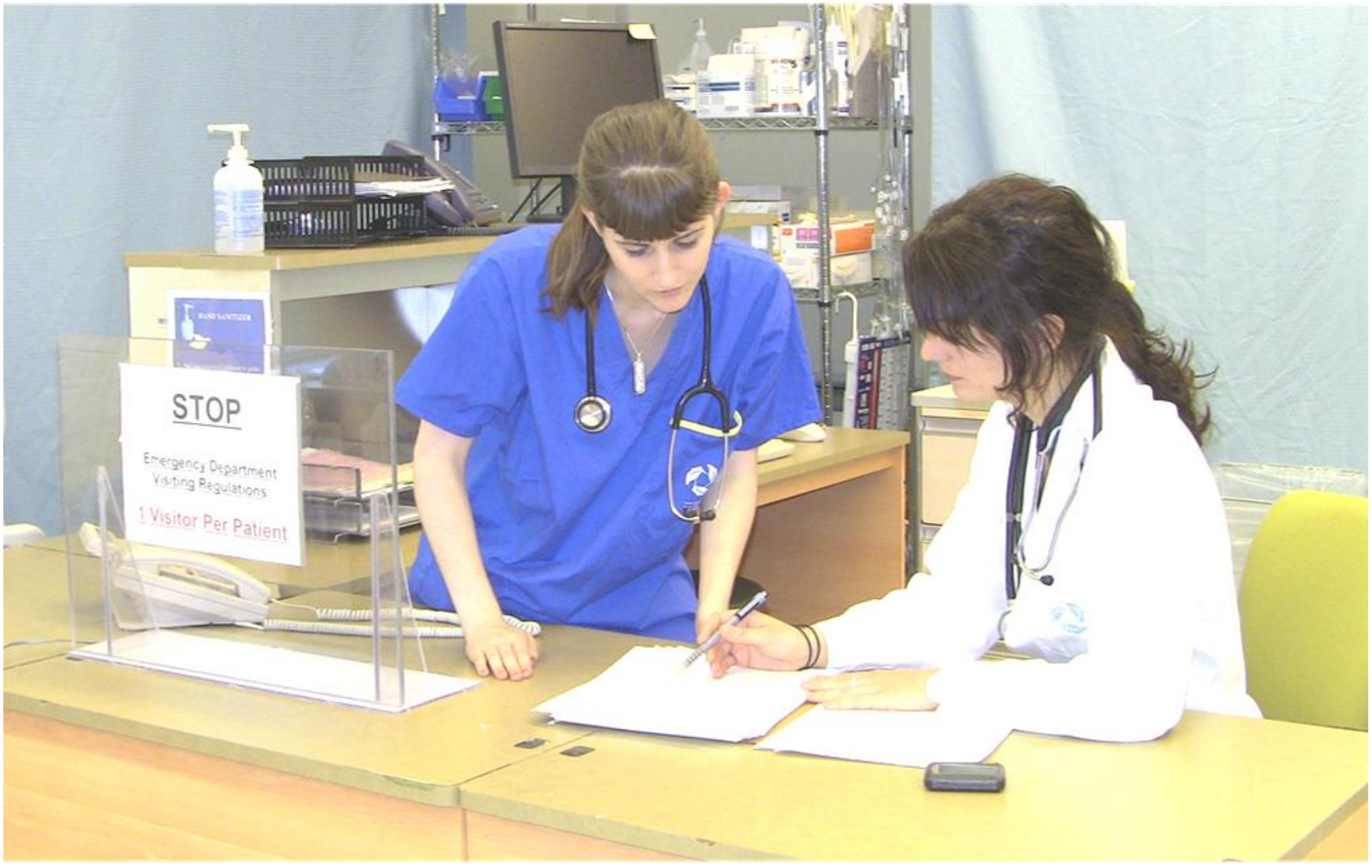
Partnered Research Project

Patient-centered perspectives of ***communication*** *and* ***handover***

“handovers”

- Auckland study
  - average patient saw 17.8 health professionals (6 physicians, 10.7 nurses, and 1.0 allied health)
  - surgical patients saw 26.6 health professionals




STOP
Emergency Department
Visiting Regulations
1 Visitor Per Patient

“handovers”

- Auckland study
  - average patient saw 17.8 health professionals (6 physicians, 10.7 nurses, and 1.0 allied health)
  - surgical patients saw 26.6 health professionals

The questions

- What information from EHRs is needed to facilitate communication between clinicians, particularly during the critical time of handovers?
    - What subset of information from EHRs would be best provided on a mobile device to enable effective communication?

Communication Issues

too many unconnected tools

Contact information for clinicians is hard to find!

Lack of context awareness. Test is done? Consultation is done?

Unintuitive user interfaces!

DELAYS IN PATIENT CARE

ERRORS

INCORRECT ORDERS

MISSING ORDERS

Dangers of pagers!

Interruptions & distractions!

Mix of paper & electronic orders!

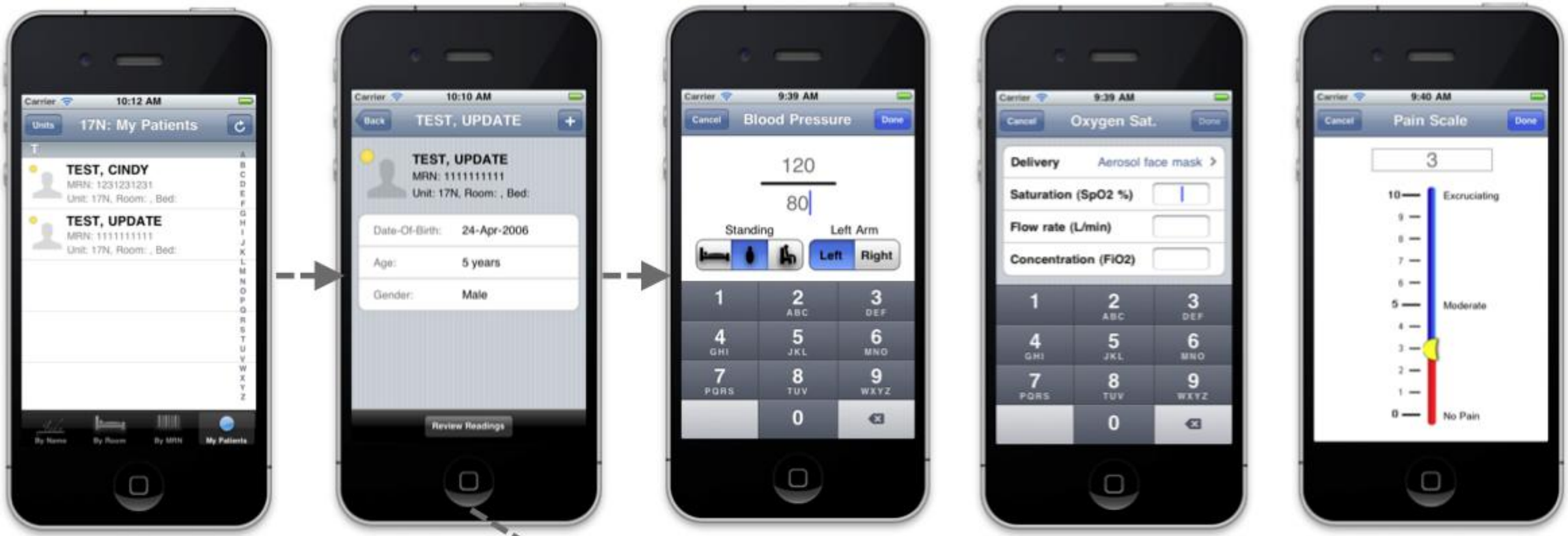
Dangers of paper!

What’s next?

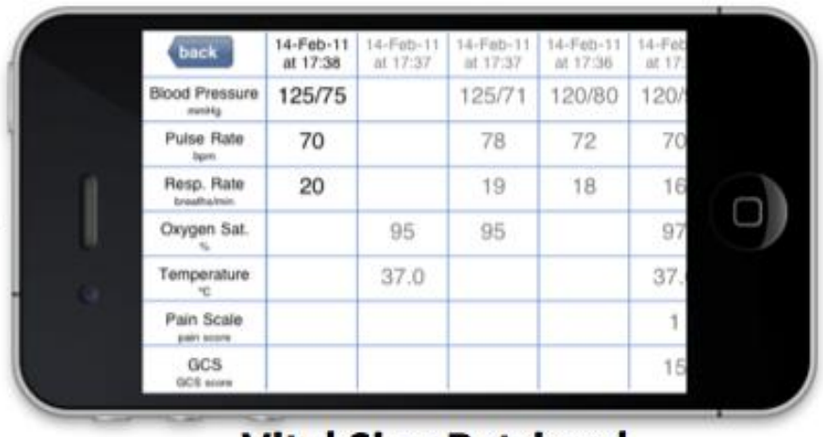
“Failure to Rescue”

Vital Signs Capture on a Smartphone

Vital Sign Collection



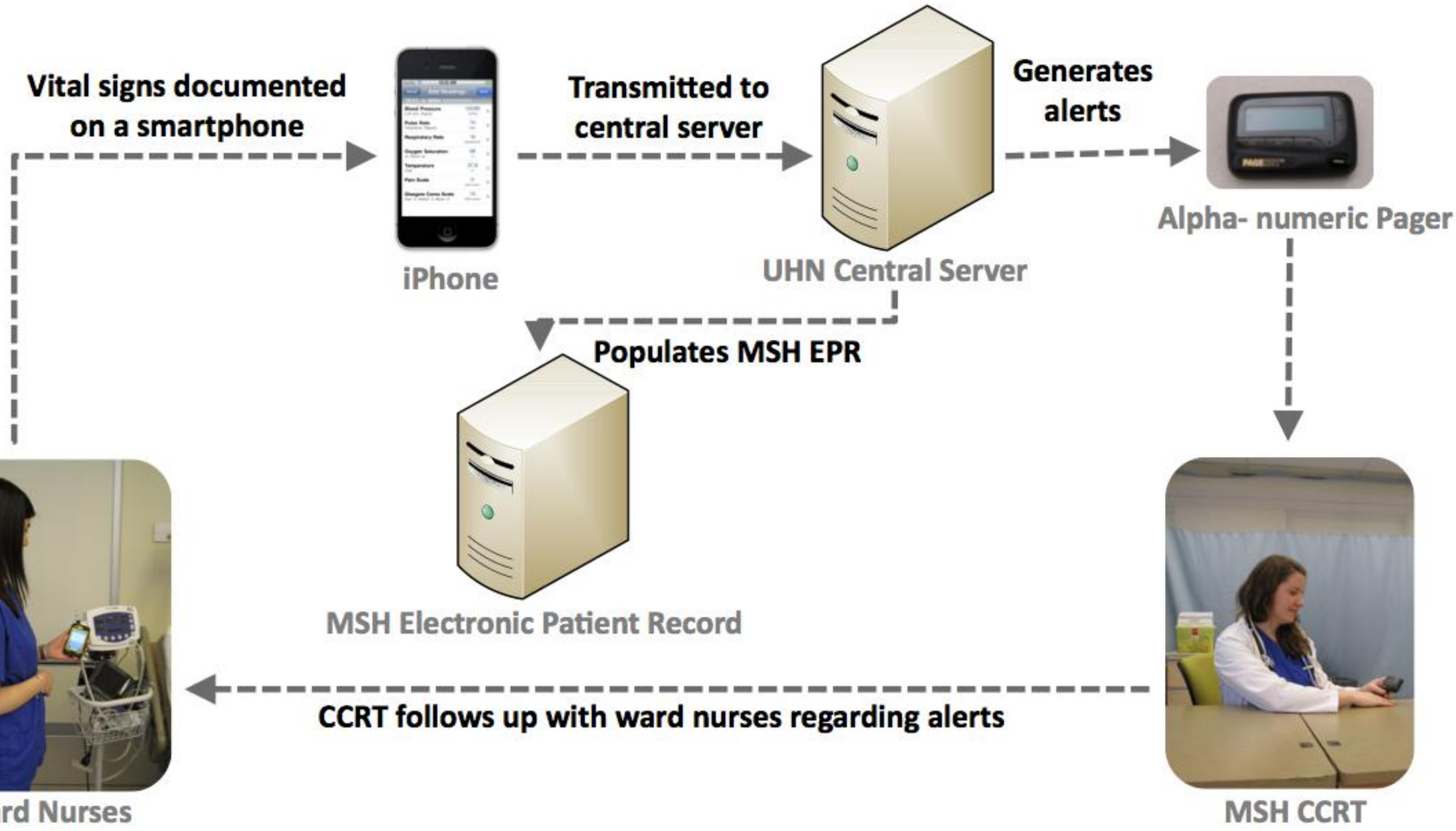
The application developed on the iPhone provides a user-friendly interface on the touchscreen that allows for manual entry of vital signs.



Vital Sign Retrieval

System Architecture

Vital Signs collected on the mobile devices are relayed to a central server and CCRT members are notified if patients' vitals meet MOHLTC CCRT Calling Criteria



The students!

Emily Seto, PhD

Archana Gopal

Ilinca Popovic

Greg Jackson

The students!

Thuva Sivayogan
Jules Goss
Natasha Radhu

Centre for Global eHealth Innovation
University Health Network