



“Mobile Health in the U.S. Army: The Power of Virtualizing Healthcare”

Colonel Ronald Poropatich, MD

Deputy Director, Telemedicine & Advanced Technology Research Center (TATRC)

US Army Medical Research & Materiel Command (USAMRMC)

Fort Detrick, MD 21702

USA

National Network for Telehealth

21 June 2012

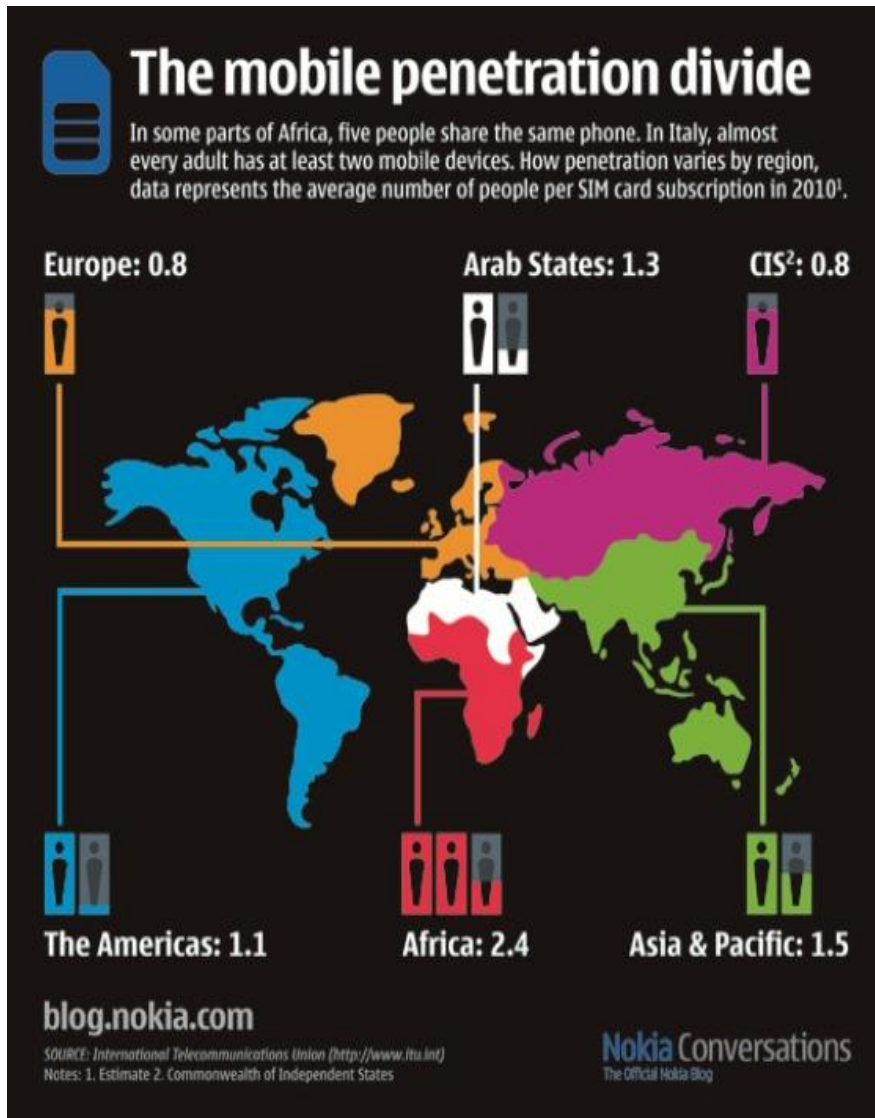
Disclaimer

"The views and opinions expressed in this presentation are those of the author and do not reflect official policy or position of the Department of the Army, Department of Defense or the U.S. Government."

Military Health System

- US Military Health System- \$43B global health system serving over 9.8 million beneficiaries.
- Interested in telemedicine & mHealth as a mechanism to preserve and promote health and ensure soldier fitness.

The Propagation of Mobile Technologies



- 6 billion mobile phone subscribers worldwide. (ITU, Nov 2011)
- Mobile data networks cover 90% of the people on the planet.
- 60% of the world's population can access fast mobile connections (HSDPA/3G+).
- On average, your mobile phone is within an arm's reach 19 hours per day.
- Majority of new internet connections worldwide are mobile.

Mobile phones – then and now!

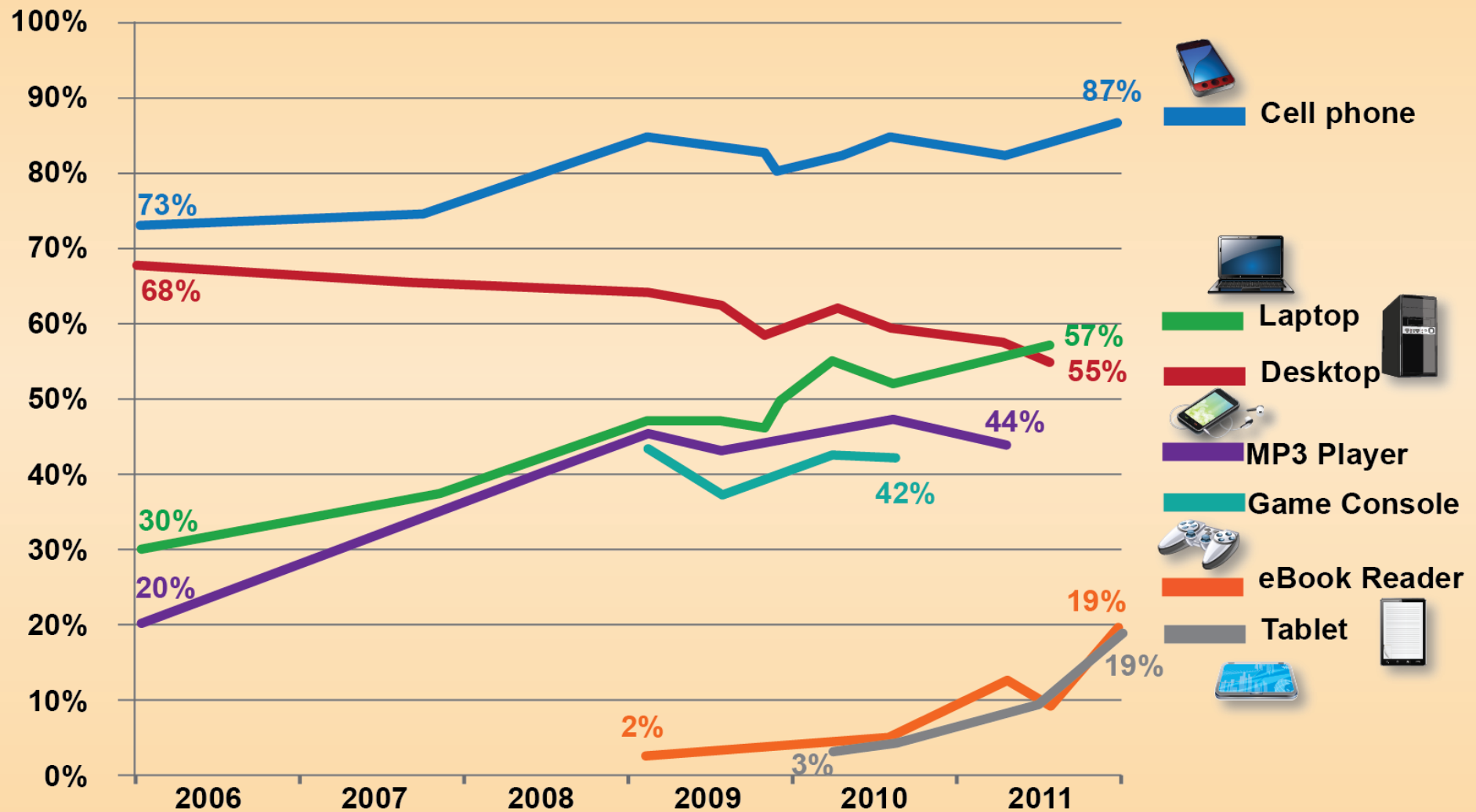


MODEL SELECTIVE TELEPHONES ON DRESS PARADE.



Adult gadget ownership over time (2006-2012)

% of American adults who own each device



Source: Pew Internet surveys, 2006-2012.



“Obama orders federal agencies to step up mobile services”

23 May 2012

Obama administration is calling for government services to get on the mobile bandwagon.

Digital Government Strategy initiative - President Obama directed all government agencies to make at least two of their "priority customer-facing services" available on mobile devices within the next 12 months.

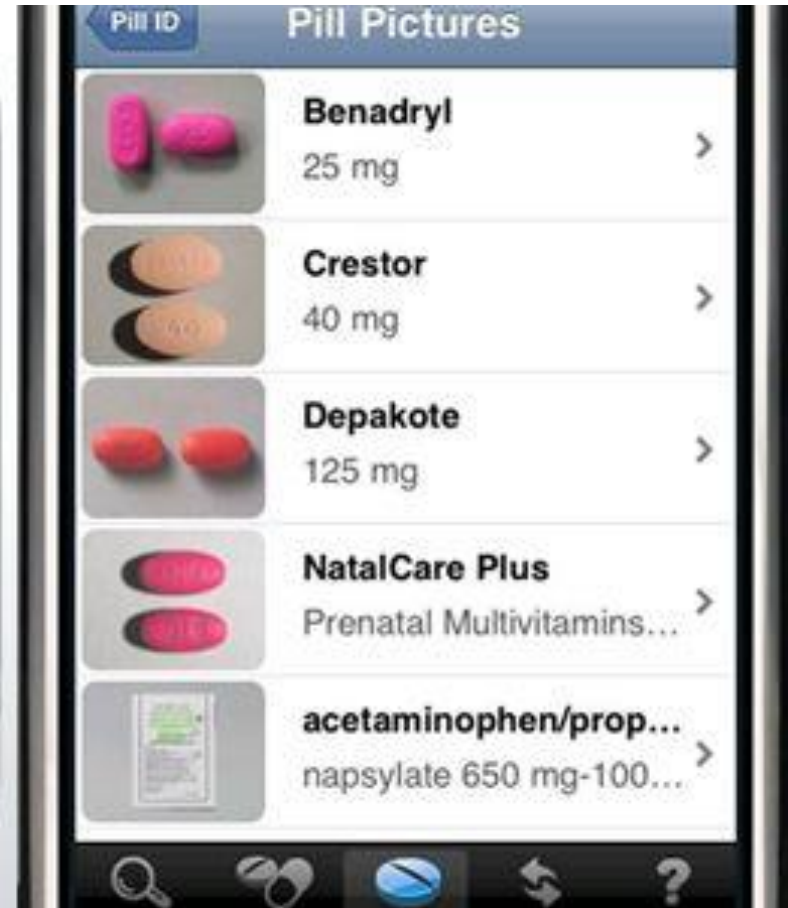
Each agency is to create a web page outlining its digital strategy within two months and use web performance analytics & customer satisfaction measurement tools on all ".gov" websites

Data.gov site will be transformed into a data and API catalog that pulls directly from agency websites in real time to encourage more outside development

Current data shows that doctors are supportive of mHealth

- 88% of physicians would like their patients to track or monitor their health at home, particularly their weight, blood sugar levels and vital signs.
- 56% of physicians using mobile devices say they expedite decision-making.
- 67% of physicians say they are using personal mobile devices for health solutions that aren't connected to their practice or hospital IT systems.
- Doctors are 250% more likely to own a tablet than other consumers.

Mobile Health Applications Flooding Marketplace



Mobile Health Applications

Application	Number of health applications available for download	Intended for consumer / patient	Intended for healthcare professional	Number of downloads
iPhone	~6000	73%	30%	Unknown
Android	~600	81%	20%	3.5 million +
Blackberry	~200	70%	30%	Unknown

What is mHealth?

- mhealth is the use of mobile and wireless devices to improve health outcomes, healthcare services and health research.

-This definition was developed by a NIH Consensus group

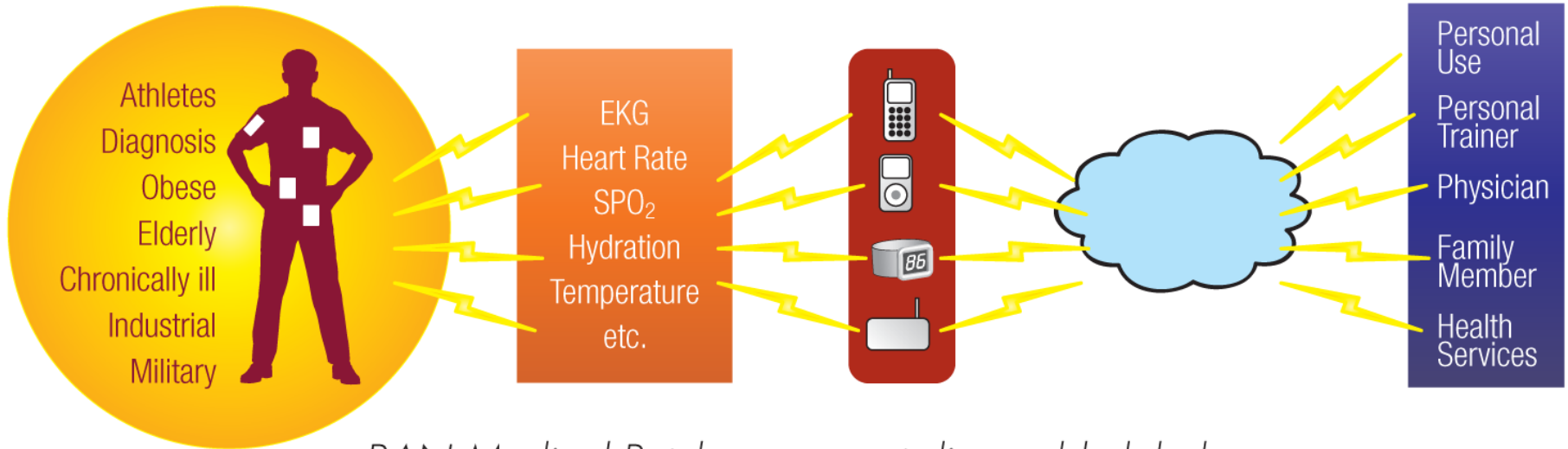


mHealth Evidence

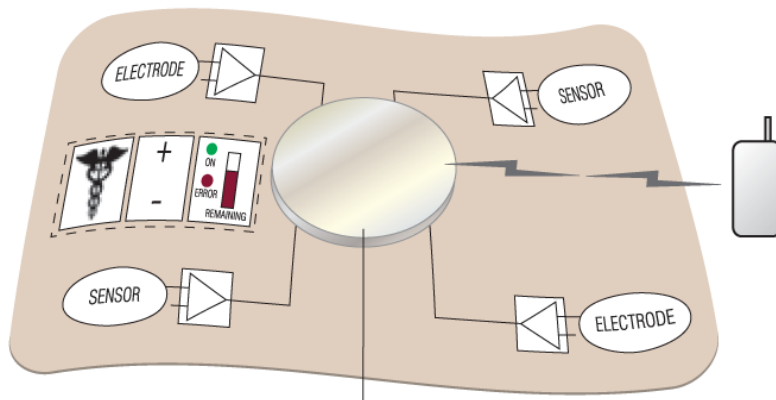
Agents for Behavior Change

- **Smoking Cessation: 28% of smokers receiving SMS messages quit vs. 13% of control group.** (A. Rogers et.al. Do u smoke after txt? *Tobacco Control* 2005;14:255-261).
- **Diabetes: For patients using interactive SMS support service, mean HbA1c improved from $7.5 \pm 1.5\%$ to $7.0 \pm 1.1\%$ ($P = 0.003$).** Hyuk-Sang Kwon, et. al. *Diabetes Research and Clinical Practice* Volume 66, December 2004: Pages S133-S137
- **Diabetes: The web-based intervention using SMS messaging improved levels of HbA1c in type-2 diabetic patients for the six-month duration of the trial.** *Journal of Clinical Nursing*, June, 2007, Vol. 16 No. 6, pp 1082-1087 Hee-Seung Kim, Ph.D., RN; Hye-Sun Jeong PhD, RN
- **Appointment Attendance. SMS reminders improved primary care attendance from 48% to 59%.** The use of text messaging to improve attendance in primary care: a randomized controlled trial. *Family Practice* 2006 23(6):699-705

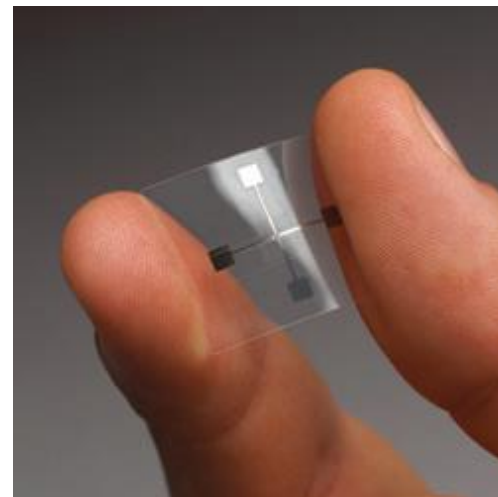
Wireless Body Area Network (wBAN) using "Smart" bandages



BAN Medical Patches as smart disposable labels.



Standardized, detachable, re-usable radio



First Clinical Trial



Wireless
Communication

corventis



Data Collection
and Analysis

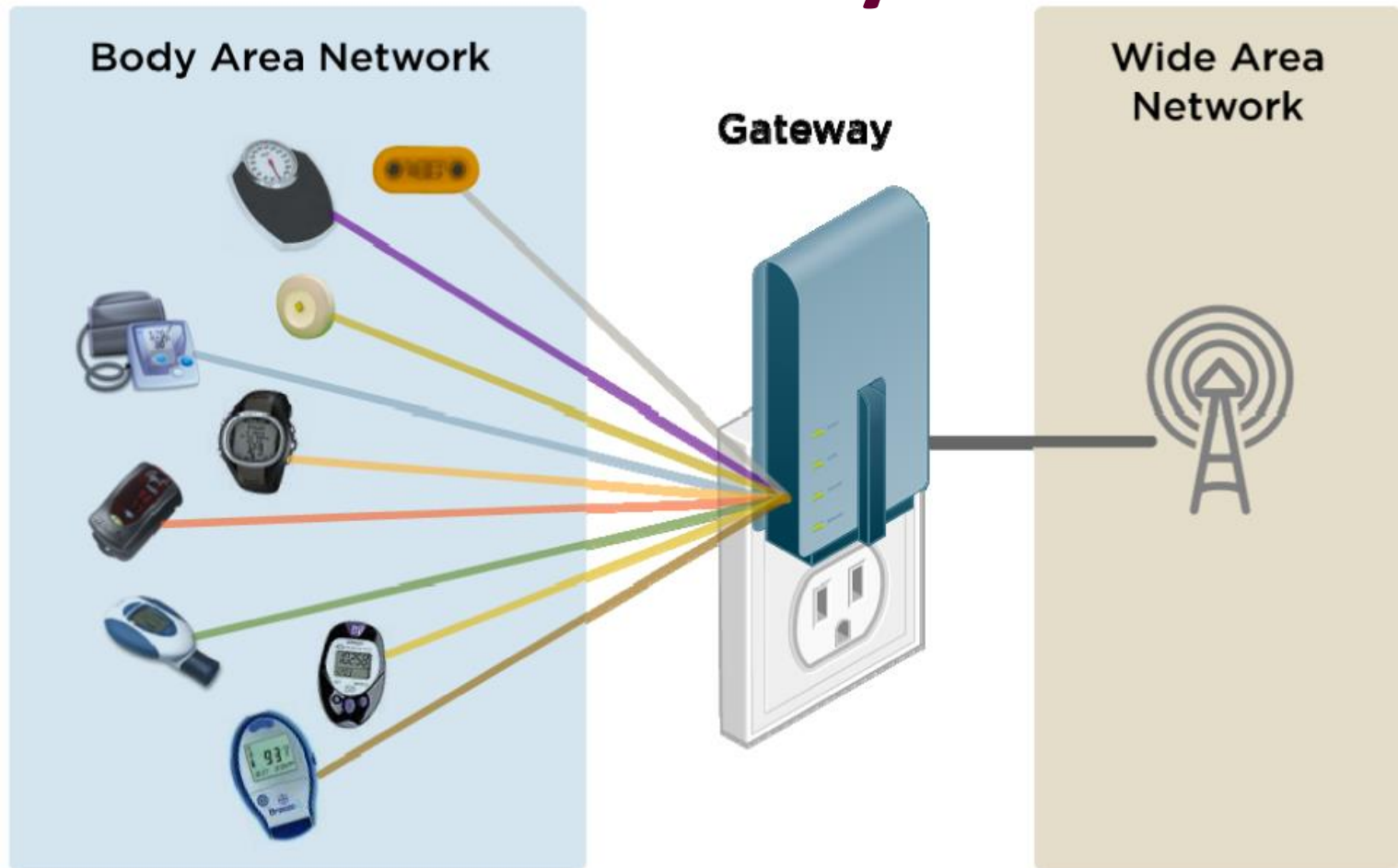


Clinician

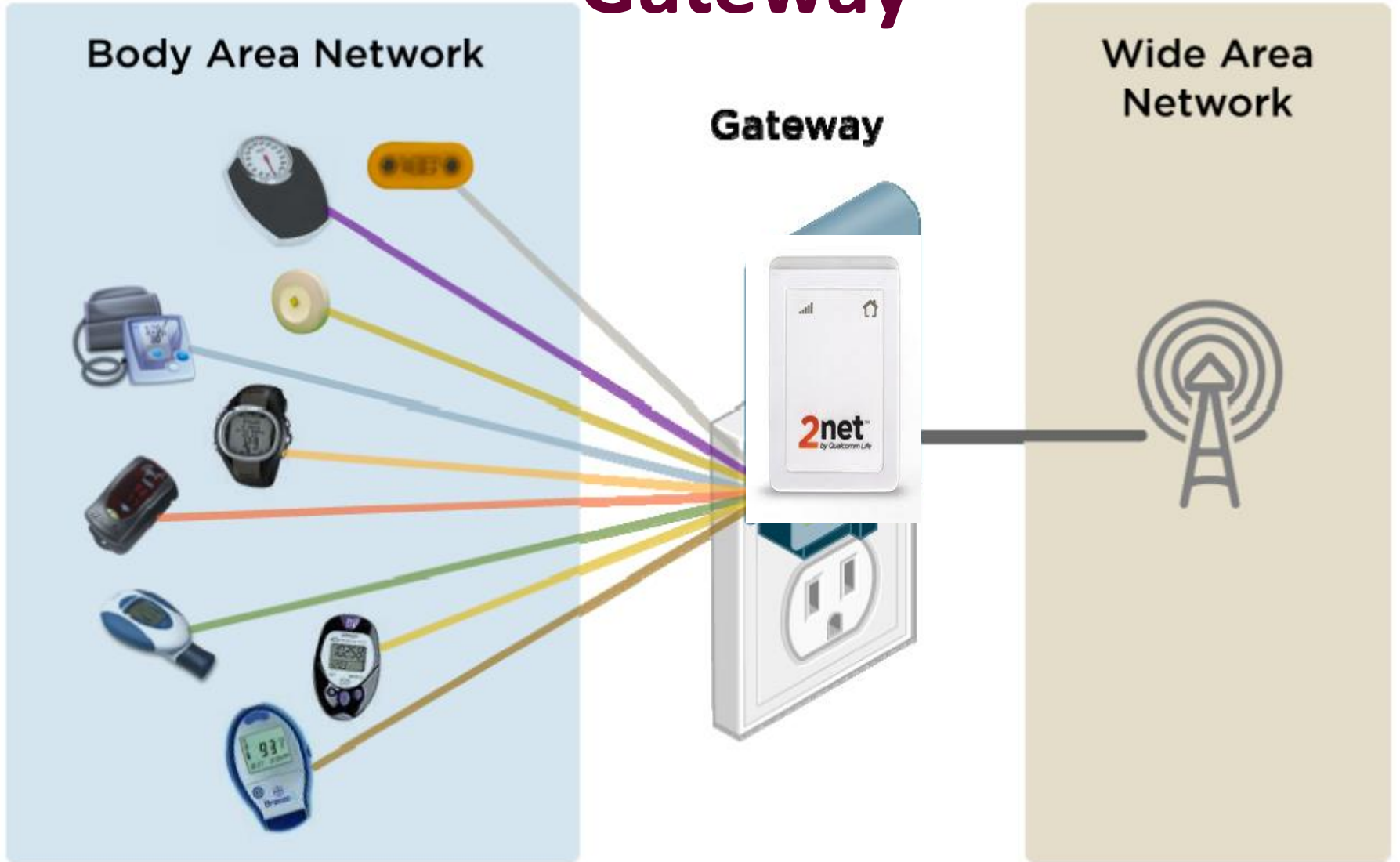
corventis



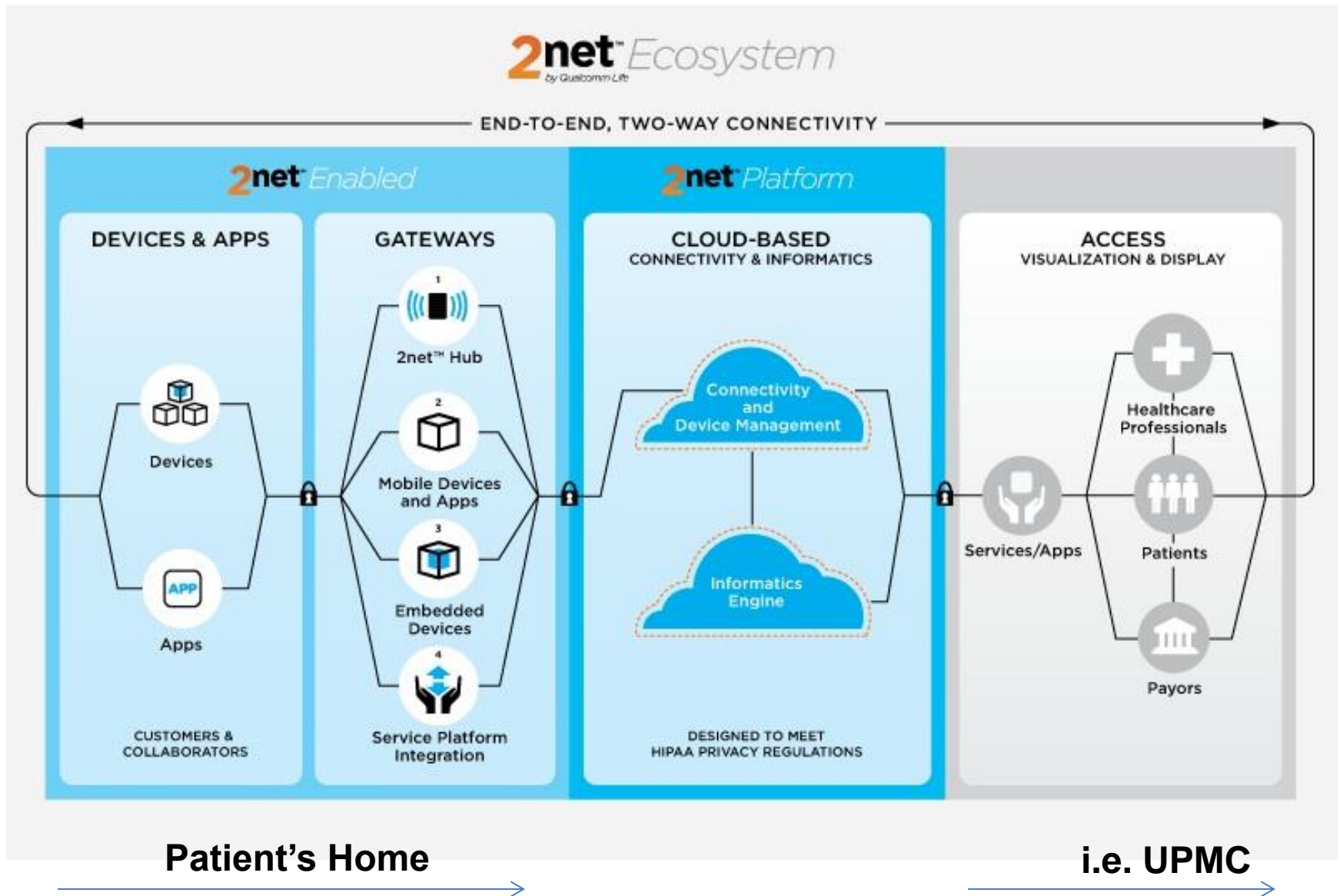
Low Cost, Easy to Deploy Health Gateway



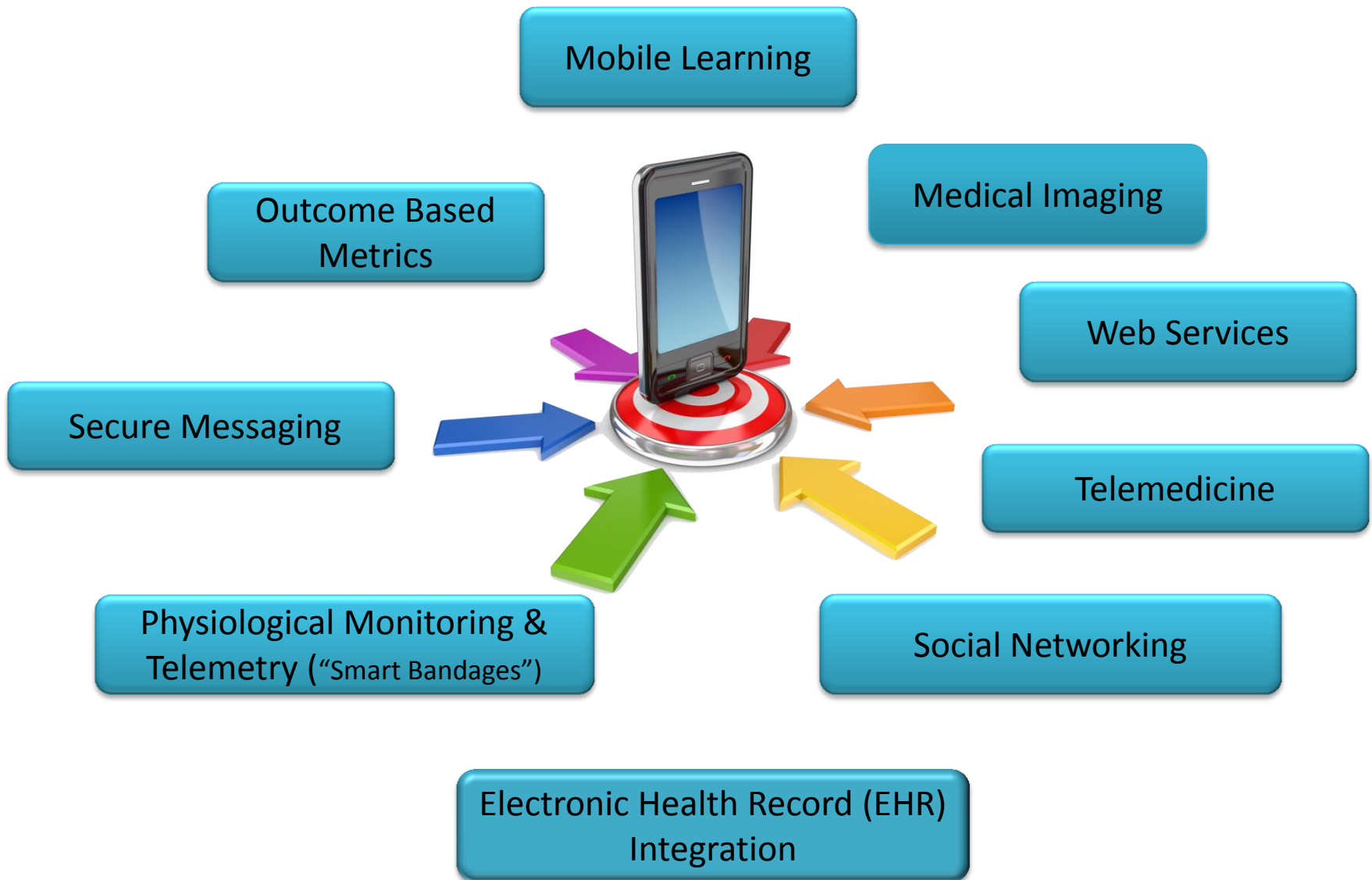
Low Cost, Easy to Deploy Health Gateway



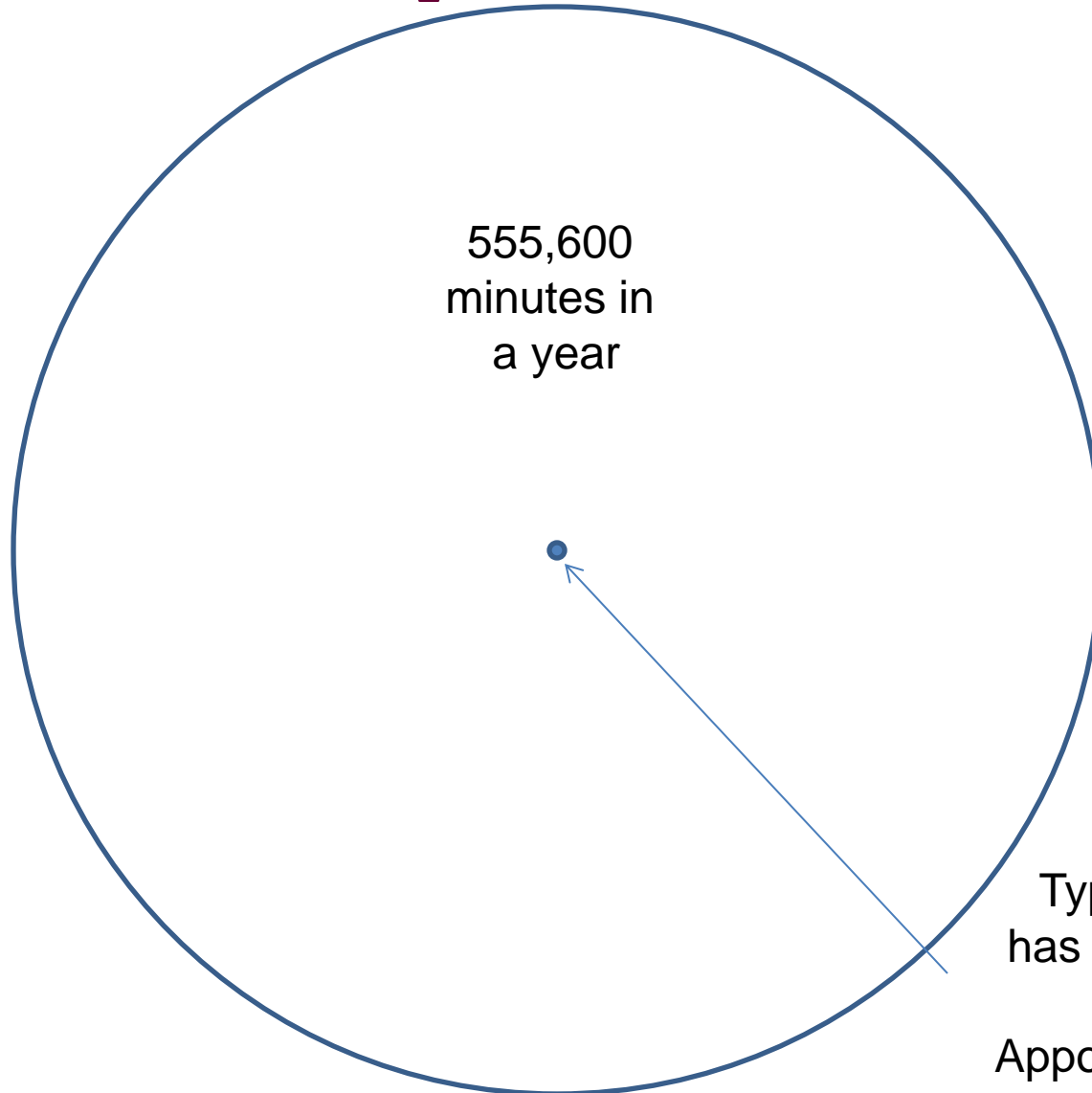
Qualcomm 2net concept



Key Mobile Health Capabilities



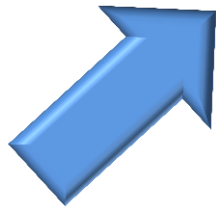
Can mHealth Fill in the “White Space”



TATRC Mobile Health Domains



Mobile Health



Theater



(Tactical)

- ❖ On the Move (OTM) linkage to fixed medical facility (COPs/FOBs)

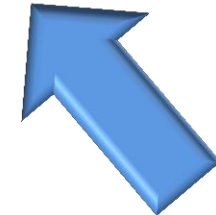


Garrison



Clinic/Hospital Home

- ❖ Patient Centered Medical Home (PCMH)
- ❖ Pain / Behavioral Health
- ❖ Warrior Transition Command



Global



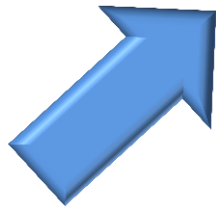
(International)

- ❖ Supporting COCOM
- ❖ Open Source software
- ❖ Medical Stability Operations
- ❖ Humanitarian Assistance/ Disaster Response(HA/DR)

TATRC Mobile Health Domains



Mobile Health

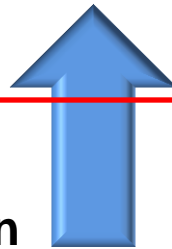


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(Tactical)

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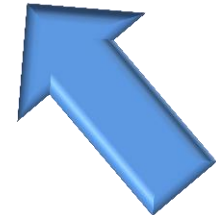


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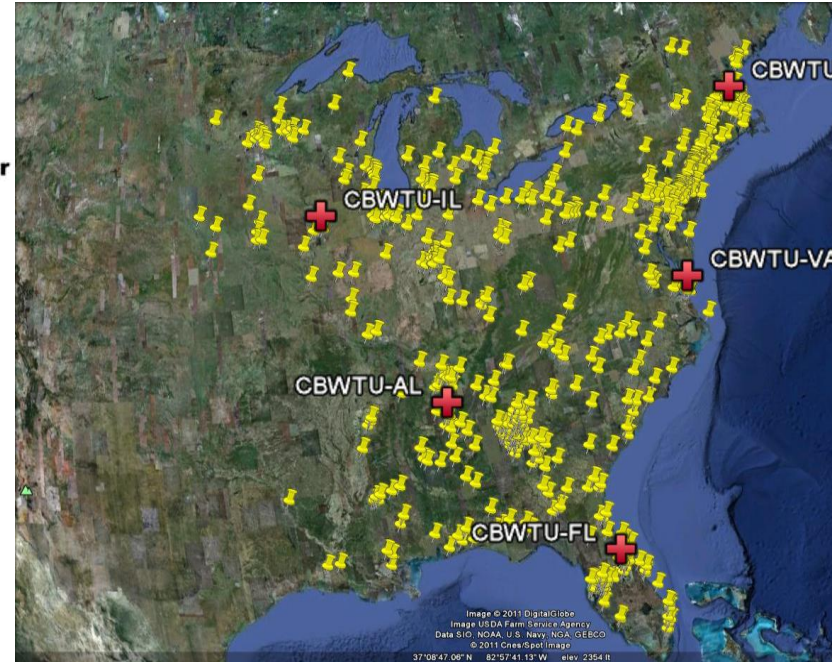
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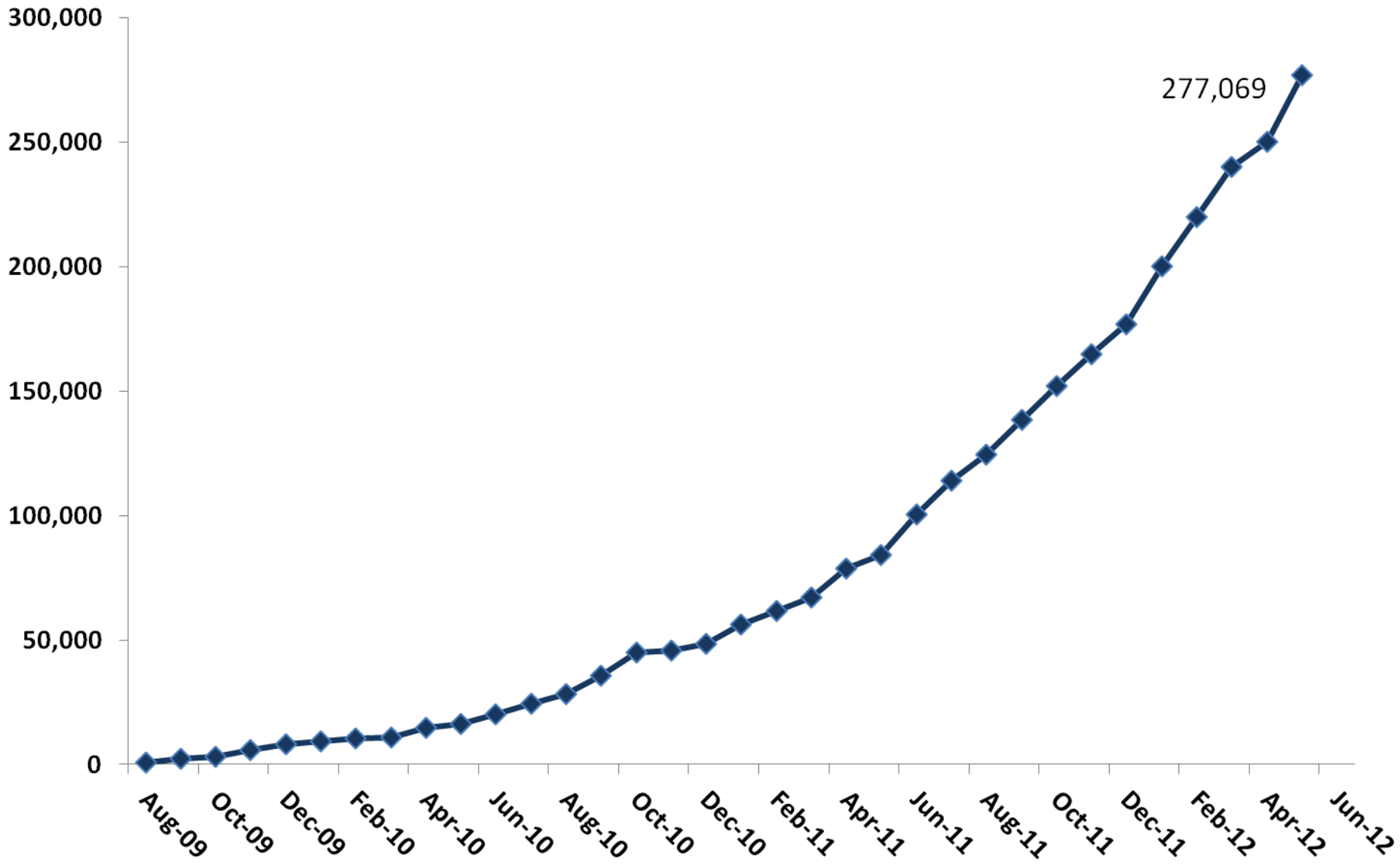
mCare:
Mobile Secure Messaging
for the Case Management
of Injured Soldiers

“mCare” : Mobile phone-based Secure Messaging System for the Case Management of Injured Soldiers



- Synchronization over distance of:
 - Wounded Warriors (mTBI)
 - Military care team members
- Uses patients' EXISTING cell phones
- Secure, HIPAA compliant messaging
- Simple patient responses (typically 1 character or one click)
- Care team leverages a website to access information

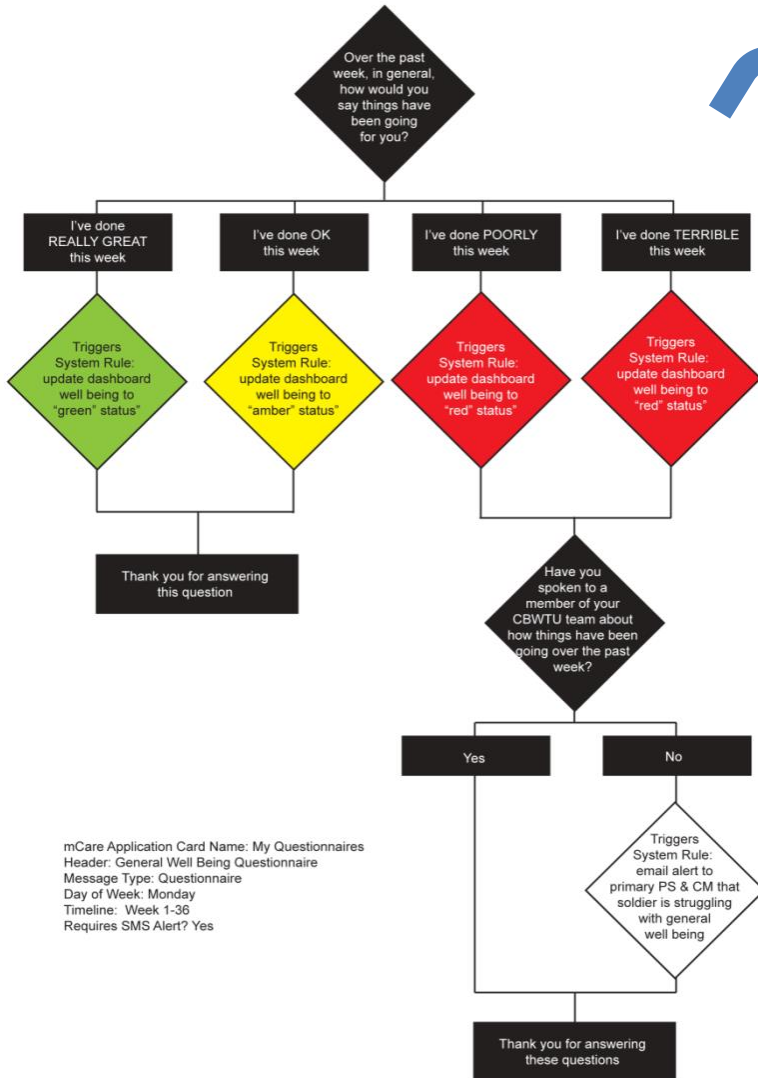
mCare Message Utilization from Launch Date





mCare Charting

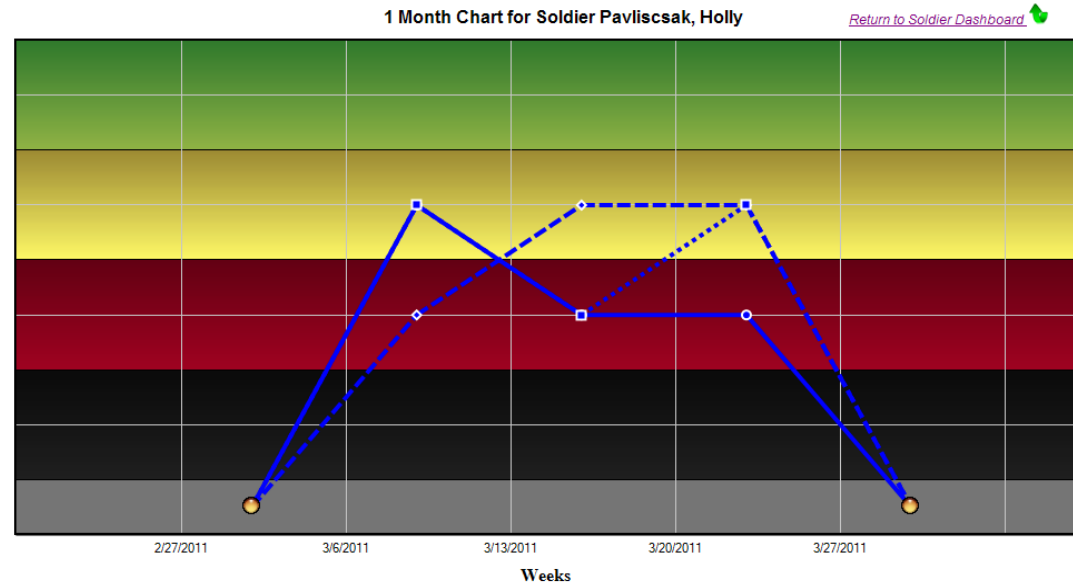
mCare: General Well Being Questionnaire



mCare Application Card Name: My Questionnaires
 Header: General Well Being Questionnaire
 Message Type: Questionnaire
 Day of Week: Monday
 Timeline: Week 1-36
 Requires SMS Alert? Yes



Cell phone user feedback accessed through the web portal dashboard



1 Month 3 Months 6 Months 9 Months 12 Months Custom Date Range 2/28/2011 3/30/2011

	Color	○	◇	□	△
Pain	<input type="checkbox"/> Extent of Pain	<input type="checkbox"/> Change in Pain Levels	<input type="checkbox"/> Severity of Pain	<input type="checkbox"/> Impact of Daily Activities	
Energy	<input type="checkbox"/> Energy Level	<input type="checkbox"/> Energy Daily Activities	<input type="checkbox"/> Sleeping	<input type="checkbox"/> Hours of Sleep	
Anger	<input checked="" type="checkbox"/> Temper Control	<input checked="" type="checkbox"/> Anger Interfering at Work	<input checked="" type="checkbox"/> Anger Interfering at Home		
Relationships	<input type="checkbox"/> Impact on Work	<input type="checkbox"/> Getting Along at Work	<input type="checkbox"/> Getting Along with Family/Spouse		
Mood	<input type="checkbox"/> Life Satisfaction	<input type="checkbox"/> Good Spirits	<input type="checkbox"/> Future Outlook		
General Wellbeing	<input type="checkbox"/> Monthly Weight	<input type="checkbox"/> General Wellbeing	<input type="checkbox"/> Comprehensive Transition Goal Plan		

Life Event - Mouse Over for Details No Response Received From Question

mCare Toolbox

mCare

ARMY STRONG



U.S. ARMY

Home

User Management

Logout

Group Dashboard **Toolbox**

Toolbox

Announcements

With this tool you can Add New, Schedule and Assign Existing Announcements.



Health & Wellness Tips

With this tool you can Edit, Delete, Copy, Schedule, Assign and Deactivate Tips.



Questionnaires

With this tool you can Add New, Schedule and Assign Questionnaires



Websites / Links

With this tool you can Add New, Edit and Delete Websites / Links.



Cell Phone Group Admin

With this tool you can Add New, Edit Transfer and Delete Groups.



Appointment Confirmation (All Patients)

With this tool you can Add New, Confirm, Edit and Delete Appointments.



Scheduler

With this tool you can add new and view existing schedules

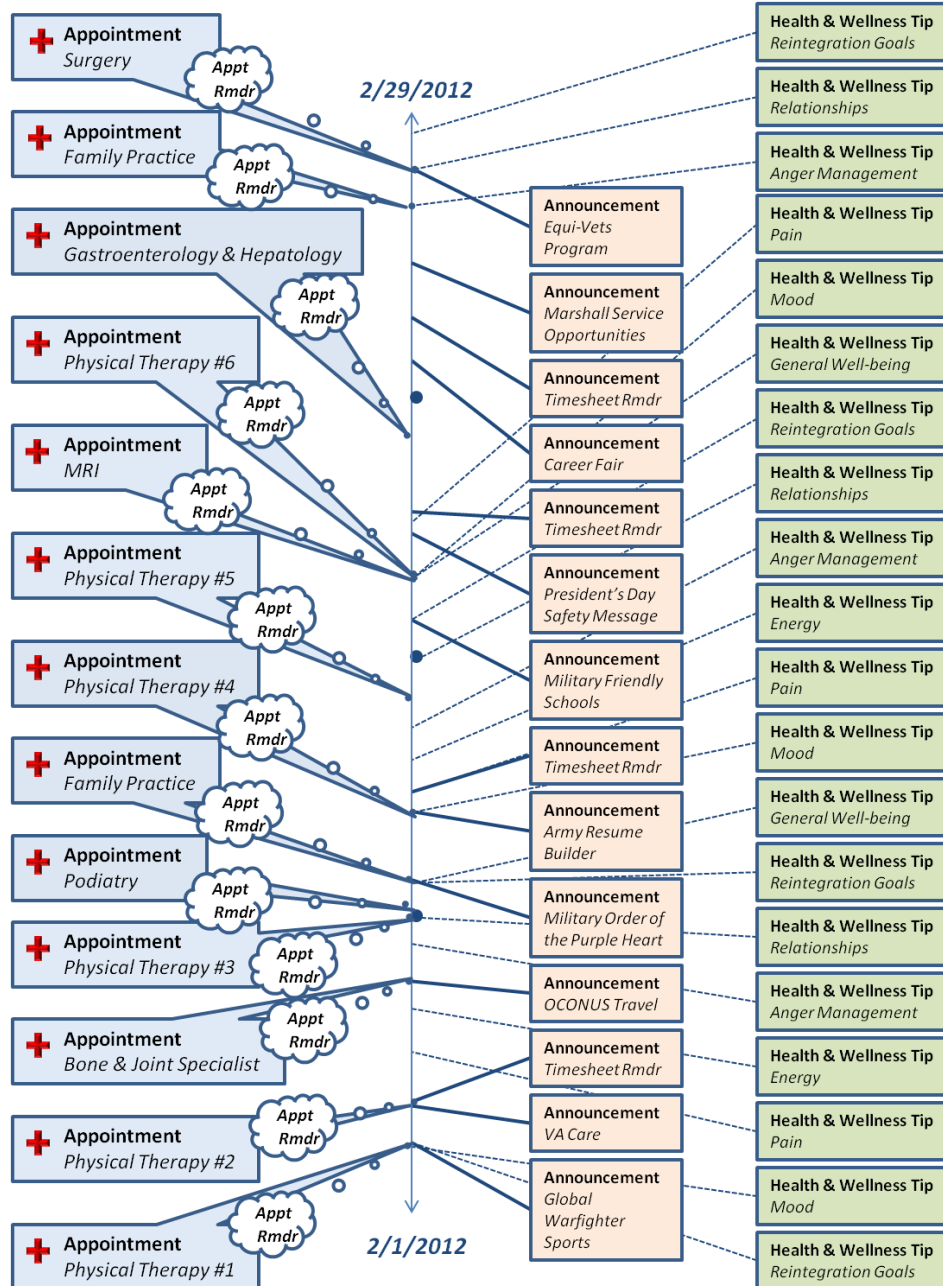


Extras / Fun Stuff

With this tool you can Add New, Edit and Delete Extras/ Fun Stuff.



Patient Case Study



Typical Monthly Messages (February 2012)

Appointment Reminders	13 (7 specialties)
Announcements	14
Health & Wellness Tips	<u>20</u>
TOTAL	47

mCare Research Study

- Prospective, randomized, two arm, placebo controlled, IRB approved trial
- n=184
- Completion date: October 2012

Outcomes	Objective	Measurement	Expected Benefit
Administrative	Increasing contract rates	Contact rates assessment btw SM, CM and PS	Improvement contact rates
	Satisfaction with CM Care	Management Quality Assessment	Increased communication = increased satisfaction
	Appointment attendance rates	Rates of verified appointment attendance	Decreased no-show rates
Clinical *	Well-being / Neurobehavioral	General Well-Being Schedule Neurobehavioral symptom Inventory	Evaluation of current symptoms
	Goal awareness	Comprehensive Transition Plan assessment	Accurate goal awareness
Technological	System performance	System analysis	Prioritization of features required
	System utilization – Service Member	System analysis	System is functional and reliable
	System utilization – Case Manager/Platoon Sergeant	System analysis	System is functional and reliable
System-based	User Satisfaction – Service Member	Focus group evaluation QUIS technology assessment	Acceptability of system
	User Satisfaction – Case Manager/Platoon Sergeant	Focus group evaluation QUIS technology assessment	Acceptability of system

Text4Baby

SMS messaging to promote
maternal-fetal health

Text4Baby



First ever **free-to-end-user mobile** health information service taken to scale in the US.

Educational program of the National Healthy Mother Healthy Babies Coalition focused on maternal & child health.

Allows women to receive timely information via their personal mobile phones - **keeps them informed on ways they can improve their health & the health of their babies**

Three SMS text messages per week through pregnancy & the first year of life timed to due date or baby's date of birth.

Johnson & Johnson VOXIVA

CTIA The Wireless Foundation



>150,000 women (and men) enrolled since 4 Feb 2010 and
>11 million messages sent



<http://www.text4baby.org>

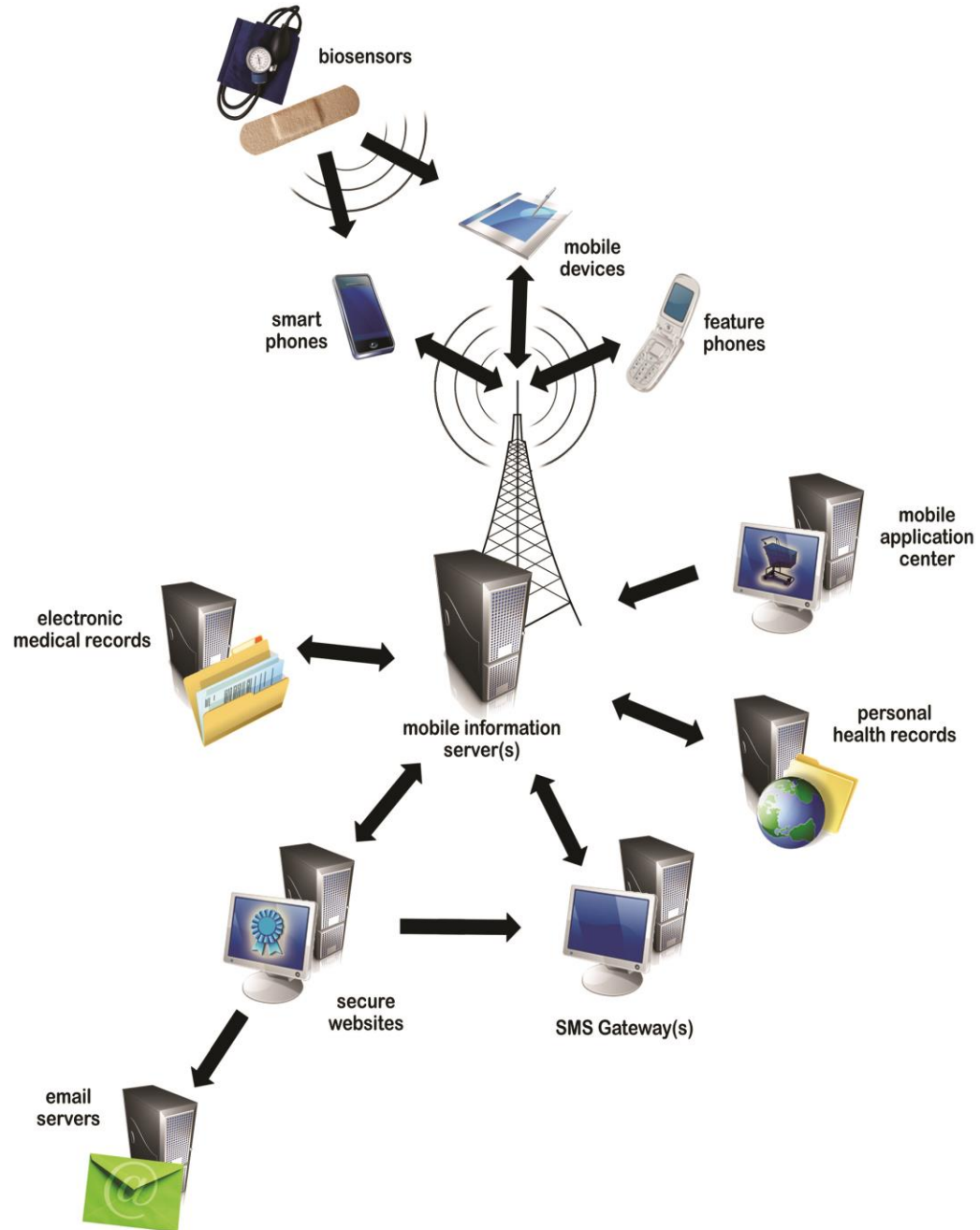
Text4Baby Evaluation Summary

- TATRC sponsoring evaluation of text4baby at Madigan Army Medical Center with GWU assisting in the evaluation (December 2011 start date)
- Randomized controlled trial with approximately 1,000 pregnant active personnel & dependents
- Comparing: text4baby + usual care with usual care
- Powered to detect improved pre-natal care utilization (PNCU)
- Hypothesis: Text4baby will promote PNCU & pre-natal healthy behaviors targeted by text messages:
 - smoking, alcohol consumption, immunizations, folic acid & vitamin consumption
- Enrollment: 428 enrolled as of 22 May 2012
- Four Surveys for each study participant

Concept of Operations (CONOPS) for the Army Medical Department

Mobile Health Environment (MHE)

MHE High Level Operational Concept



Scope: Inclusive of 4 Domains

- Mobile interactions:
 - Patient to Provider
 - Patient to System
 - Provider to Provider
 - Provider to System



Concept of Operations (CONOPS) for Mobile Health Environment (MHE)

Version: 1.0

December 2011

Prepared by:

Health Policy and Services (HP&S)
Army Medical Department (AMEDD), Office of the Surgeon General (OTSG)

And
United States Army (USA) Medical Research and Materiel Command (MRMC)
Telemedicine and Advanced Technology Research Center (TATRC)

And
USA Medical Department Center and School (AMEDD C&S)
Total AMEDD Systems Management Directorate (TASM)

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TATRC Mobile Health Domains



Theater



- ❖ On the Move (OTM)
- ❖ OTM linkage to fixed medical facility (COPs/FOBs)

Garrison



- ❖ Patient Centered Medical Home (PCMH)
- ❖ Pain / Behavioral Health
- ❖ Warrior Transition Command
- ❖ Medical Management Center (MMC)

Global



- ❖ Supporting COCOM
- ❖ Open Source software
- ❖ Medical Stability Operations
- ❖ Humanitarian Assistance/ Disaster Response(HA/DR)

"Army Times"

13 December 2010

Connecting Soldiers to Digital Applications

Exploring ways to issue soldiers cell phones and pay the monthly bill – for use both in garrison & deployed settings.

Goal is for soldiers to get information when they need it, wherever they are.

“One of the options potentially is to make it a piece of equipment in a soldier’s clothing bag.”

Lieutenant General Michael Vane,
Director, Army Capabilities Integration
Center, on issuing cell phones to soldiers.



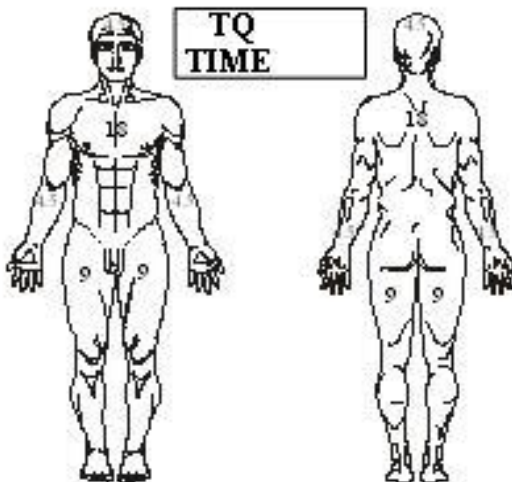
“Combat Smart Phones”



Casualty Treatment Data Capture

Tactical Combat Casualty Care (TCCC) Card

Name/ID: _____
 DTG: _____ ALLERGIES: _____
 Friendly Unknown NBC



A: Intact Adjunct Cric Intubated
 B: Chest Seal Needled Chest Tube
 C: TQ Hemostatic Packed PressureDx
 IV IO

FLUIDS: NS / LR 500 1000 1500
 Hextend 500 1000

Other: _____

DRUGS (Type / Dose / Route):

PAIN

ABX

OTHER

GSW BLAST MVA Other _____

TIME				
AVPU				
PULSE				
RESP				
BP				

Medic's Name _____

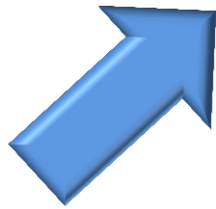
Combat Casualty Care Informatics & Telemedicine – First Responder Medic



TATRC Mobile Health Domains



Mobile Health

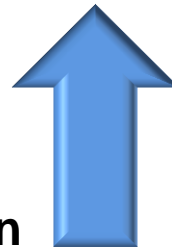


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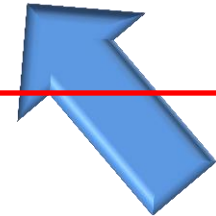
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Global



(International)

- ❖ Supporting COCOM
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Mobile Learning Environment (MoLE)

Using Smartphones to enhance
Humanitarian and Disaster Relief
Operations

Department of Defense Instruction 6000.16



Department of Defense INSTRUCTION

NUMBER 6000.16
May 17, 2010

USD(P&R)

SUBJECT: Military Health Support for Stability Operations

- References:
- (a) DoD Directive 5124.02, "Under Secretary of Defense for Personnel and Readiness (USD(P&R)), " June 23, 2008
 - (b) DoD Instruction 3000.05, "Stability Operations," September 16, 2009
 - (c) DoD Directive 5136.01, "Assistant Secretary of Defense for Health Affairs (ASD(HA)), " June 4, 2008
 - (d) Joint Publication 1-02, "Department of Defense Dictionary of Military and Associated Terms," current edition

1. **PURPOSE.** This Instruction establishes policy, assigns responsibilities, and provides instructions for military health support of stability operations in accordance with the authority in Reference (a). Military health support for stability operations is hereafter referred to as medical stability operations (MSOs).

2. **APPLICABILITY.** This Instruction applies to OSD, the Military Departments, the Office of the Chairman of the Joint Chiefs of Staff and the Joint Staff, the Combatant Commands, the Office of the Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities within the Department of Defense (hereafter referred to collectively as the "DoD Components").

3. **DEFINITIONS.** See Glossary.

4. **POLICY.** It is DoD policy that:

a. MSOs are a core U.S. military mission that the DoD Military Health System (MHS) shall be prepared to conduct throughout all phases of conflict and across the range of military operations, including in combat and non-combat environments. MSOs shall be given priority comparable to combat operations and be explicitly addressed and integrated across all MHS activities including doctrine, organization, training, education, exercises, materiel, leadership, personnel, facilities, and planning in accordance with Reference (b).

Military Health Support for "Stability Operations" (May 17, 2010)

- *Required development of specialized training – new course to teach "Medical Stability Operations" (i.e. MSOC) to support Humanitarian Assistance and Disaster Response.*
- *Ideal candidate for exploring mobile delivery of content and tools given newness of material and remote nature of those who will likely need it.*

Assessment of mLearning Trends - DoD

September 14, 2009

Needs Analysis Report
A004

Assessment of mLearning Trends for Military Use



Prepared for:
Combating Terrorism Technical Support Office /
Technical Support Working Group
(CTTSO/TSWG)



Prepared by:
Center for Innovative Technology
2214 Rock Hill Road
Suite 600
Herndon, Virginia 20170
September 14, 2009

M-Learning definition:

“Mobile learning (m-learning) is defined in this report as training, educational, or job-specific content that can be accessed, viewed or created from a mobile device.”

mLearning Recommendations:

- **Look at “moments of need” rather than courses.**
- **Do not present mobile learning as a training program, but rather as a productivity tool .**
- **Design content for mobile. Bulk conversion is not effective.**

Mobile Learning Environment Project

Coalition Warfare Program

Goal: Conduct research & development with foreign partners to enhance interoperability and unclassified information-sharing.

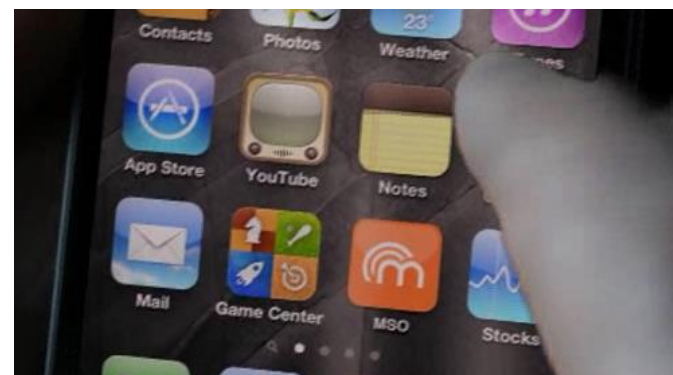
Project Objective: Develop a prototype mobile capability to support military medics (US and partner) deployed on humanitarian or disaster relief operations.

Not on .mil network/using personal Smartphones. Learning content to integrate with other back-end learning management systems

Address language and culture gaps.

Twenty-two countries participating.

Intro Movie: <http://bit.ly/moleintromovie>



MoLE Focus: Learning and Tools



Quick Reference



Tools



Your baby is just fine

Domain-Specific Medical Speech Translation



Collaboration

Mobile Learning Environment (MoLE) Project

Global Medical Aid for Humanitarian Assistance/Disaster Relief

Prototype App- Global MedAid

Mission Tools:

Checklists
Health Assessments

Library:

Publications
eBooks (NGO guide)
Video interviews (USAID)

Standards:

Code of Conduct
Geneva Convention
Sphere Handbook
Informed consent



Learning:

CTIP (Combating Trafficking In Persons) course
Medical videos (Univ. of Miami)
MoD wellness
NGO recognition activities

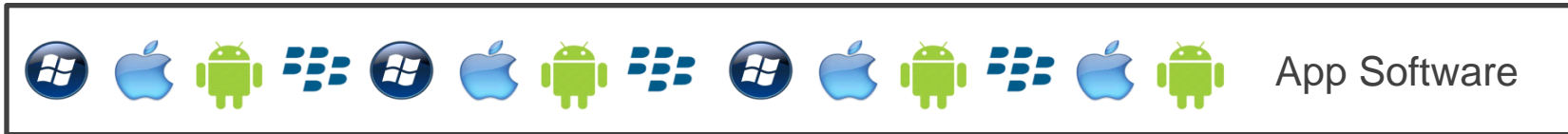
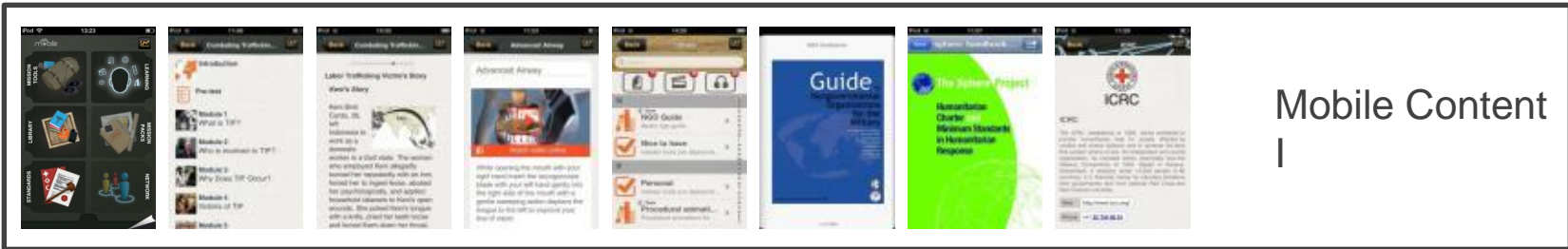
Mission Packs:

Different culture / destination / language packs to download (inactive for PoC)

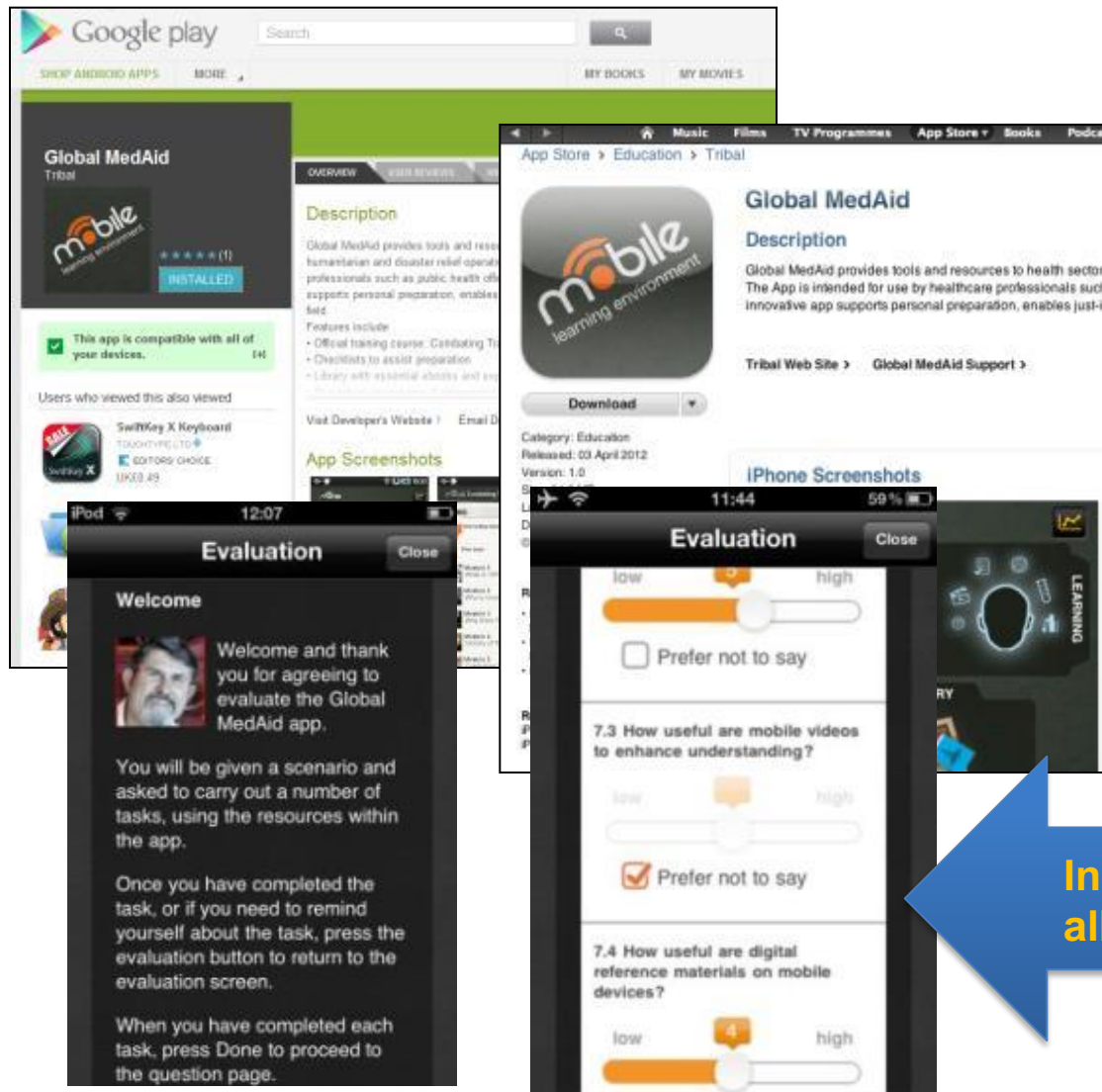
Network:

Lookup: Collaborative Yellow Pages

Developing underpinning capability



Live international trials ongoing



Proof of Concept Trials currently in progress

- Several app stores
- Private (own) devices
- Multiple languages
- Range of professions and skill levels

Goal: 600 volunteers in 26 nations

- 260 have already started
- Complete: September 2012

Innovative “in app” evaluation allows for remote trialling

Trial Connect

SMS messaging to enhance
outreach to vaccine trial patients

TrialConnect

Project Partnerships



sanofi pasteur

Sanofi Pasteur- Trial Sponsor

- Pharmaceutical company developed vaccine for dengue

MRMC-AFRIMS- Overseas Lab

- US-Thai Military medical research partnership assisting with vaccine trial administration
- Mahidol University and BioPath-research contractors employing clinical teams

MRMC-TATRC (Sponsor)

- US Army medical technology research center contributing Health IT expertise

Dimagi Inc.

- Health-technology company developing TrialConnect



TrialConnect

Use of Mobile Phones to Enhance a Phase III Dengue Vaccine Trial in Thailand & Philippines

- Operational Challenges
 - Demanding protocol – 3 years in duration
 - Large distributed cohorts of research volunteers
 - Communication challenges
 - Traditional methods involve community-based follow-up: expensive and inconsistent
- Goals
 - Improve operational efficiency, volunteer compliance and enhance volunteer and staff engagement using mobile phones.
- Research objective (s)
 - Design and implement an SMS (text) service called “TrialConnect”
 - Evaluate impact on a variety of factors
 - Implement in a way that avoids jeopardizing the integrity of the clinical trial.



Mobile penetration
Philippines ~80%
Thailand ~ 100%
SMS is #1 in mobile messaging

TrialConnect

A mobile solution

A secure, HIPAA-compliant SMS system for:

Volunteer Protocol Compliance

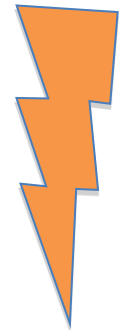
- Staff → Patient Messaging (Informational)
- Patient → Staff Messaging (Help Requests)

Organization and Logistical Support

- Staff → Staff Messaging (Organizational)
- Automated Messaging (Cold Chain)

Participant Engagement

- Automated Appointment Reminders with Confirmation
- Health Tips
- Holidays & Special Events

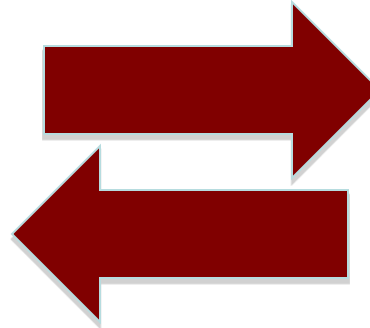


Using mHealth as a Force Multiplier

TrialConnect in Use

The screenshot shows the 'Send a Message' page in the TrialConnect web application. The interface includes a navigation bar with 'Dashboard', 'Send a Message', 'Appointment Reminders', 'Forwarding', 'Groups', and 'People'. The main content area has a 'Send a Message' section with a 'Send' dropdown set to 'Now', a message input field with '140 characters remaining', a 'Send Test Message' button, and a 'Groups' dropdown set to 'Select options'. A 'Send Message' button is at the bottom. To the right is a 'Recent Messages' section showing 'No recent messages'. The footer contains the text 'RapidSMS is available under the BSD license.'

The screenshot shows the 'Monthly Report' page in the TrialConnect web application. The page title is 'Monthly Report - ตุลาคม 2011'. It features a 'Report Month' dropdown set to 'ตุลาคม' and a 'Report Year' field set to '2011', with a 'Change Report Date' button. Below are three sections: 'Forwarded Messages' (listing 'Cold Chain' with 2 outgoing and 4 incoming), 'Appointment Reminders' (listing 3 sent, 1 confirmed, 2 unconfirmed, and 33.33% confirmed), and 'Usage Totals' (listing 55 incoming, 74 outgoing, and 129 total messages). A line chart shows message trends from July to October 2011, with a legend for 'Incoming Messages 55' and 'Outgoing Messages 74'. The footer contains the text 'RapidSMS is available under the BSD license.'



TrialConnect Technology

- 100% Open source, built on RapidSMS
- Easy to use authoring tools for messages, reminder schedules, etc.
- Modular design allows for new features to be added from RapidSMS community such as:
 - Logistics tracking (CommTrack)
 - Polling & surveys
 - Medication & adherence reminders
- Easy integration with 3rd Party systems
- Product approach to maximize re-use
 - All features were built to be configurable through an administration interface

TrialConnect

Focus Group Exercises



Community



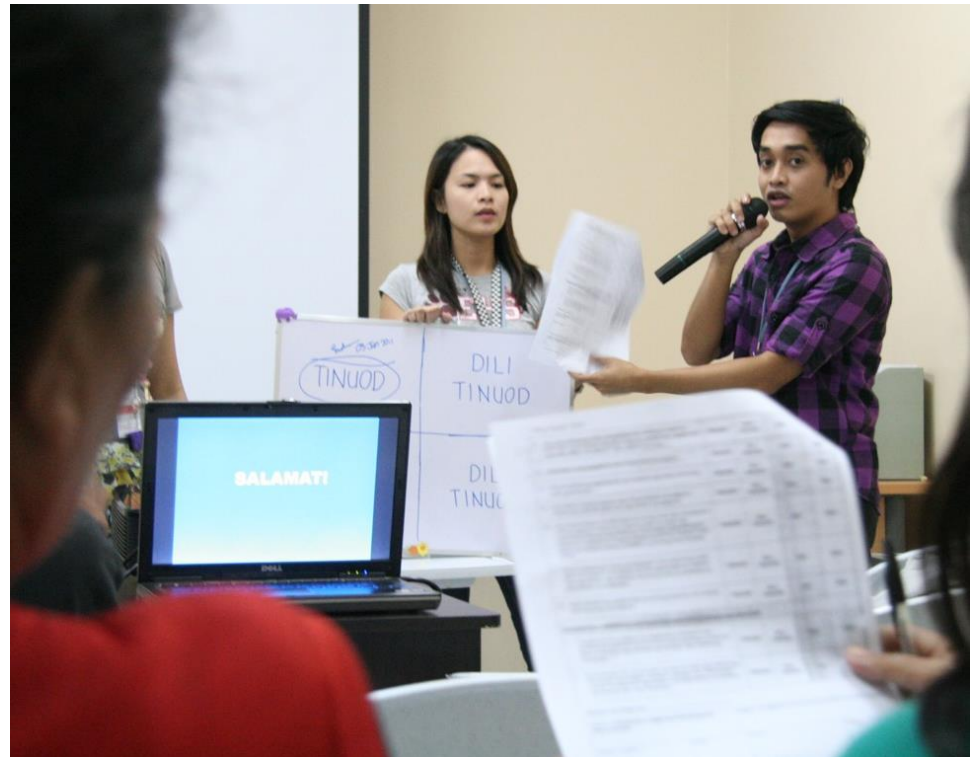
Study Staff



Stakeholders

Status- 1 January 2011

- Deployed at 2 sites
 - Cebu City, Philippines
 - Kamphaeng Phet, Thailand
- 1500 patients currently enrolled
- Staff-Staff messaging in use
- Appointment reminders active
- Broadcast messaging soon



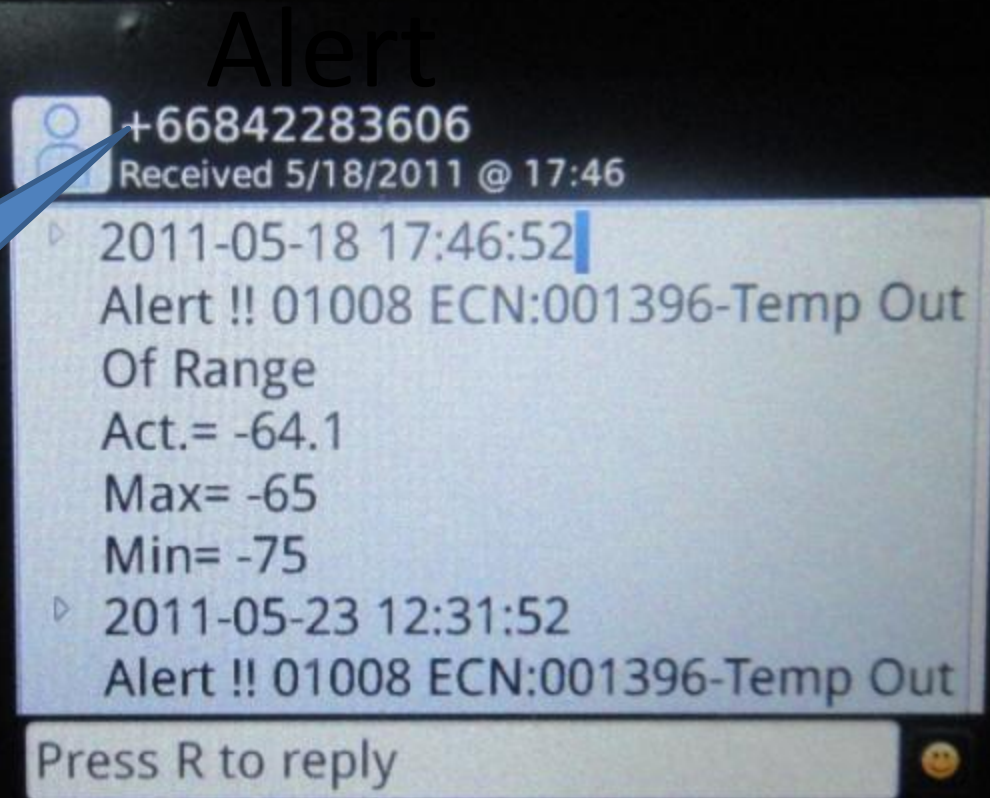
Cebu staff introducing prospective participants to the study

4 refrigerators
for Vaccine
storage

ICS probes inside
of all
refrigerators/
freezers



SMS on the phone when Alarm



SIM Number in the server
Will send SMS to
Logistician 1 , 2 and Head
of KAVRU. If the 1st person
not response by reply SMS
back to the server then it
will send SMS out to next
person again every 5 min.

TrialConnect

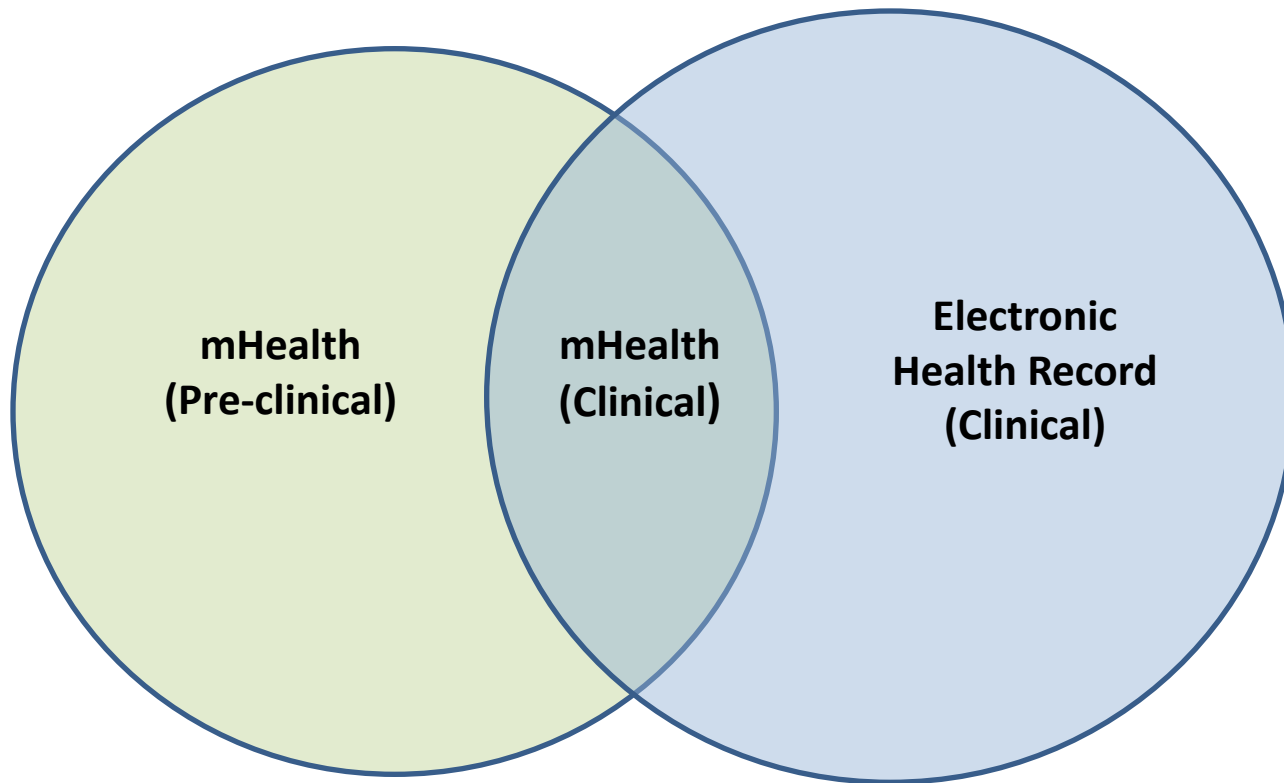


Kids getting enrolled into the trial in Cebu.

Mobile Health Critical Challenges

1. Integration of mobile applications with legacy information systems - Electronic Medical Records (EMR)
2. Information overload to providers – how best to manage?
3. Support for a variety of handheld devices (e.g., iPhone, Droid, Blackberry) & a variety of network connections (e.g., 802.11 Wireless Local Area Network (WLAN)/Wi-Fi, Bluetooth Personal Area Network (PAN), wireless broadband Wide Area Network (WAN), Ultra Wideband (UWB));
4. Security, privacy & confidentiality of patient data on the handheld and during transmission
5. FDA impact – mobile phone vs. medical device? - Role is evolving

Challenges in mHealth Implementation



Bi-directional data pull “to” and “from” the EHR

Summary

- US Army has a global mobile health presence and an extensive R&D portfolio.
- US Military mobile health solutions are all applicable to a civilian setting.
- Innovations in wireless are influencing all aspects of our lives.
- Mobile health is the future of Telemedicine and will continue to grow as the research outcomes will hopefully demonstrate.

Questions?

Ron Poropatich, MD

(001) 301-619-7967

Ronald.poropatich@us.army.mil

