mHealth Technology for individualized, n-of-1, assessments

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Funding sources: NSF, NIH, RWJF; AOL, UHG, Google, Adobe
Small data and the feedback loops of health

Participant self-care
How is this new medication working for me?

Clinical care
How is the patient responding to new care plan?

Research evidence
What works best in different contexts?

THE HEROISM OF INCREMENTAL CARE
We devote vast resources to intensive, one-off procedures, while starving the kind of steady, intimate care that often helps people more.

By Atul Gawande
Example: Limbr intervention for chronic lower back pain

Patient-centric Pain Measurement and Management using Automatically Inferred Behavioral Biomarkers and Multi-Modal Self-report

Co-PIs: Tanzeem Choudhury (PhD), Deborah Estrin (PhD), Geri Gay (PhD), JP Pollak (PhD), Daniel Stein (MD, PhD)
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This work aims to transform the derivation of clinically-actionable pain measures from patient-generated, mobile-health data.

In particular, we are designing, implementing and evaluating:

- behavioral biomarkers that synthesize passively collected and patient reported data into individually-tailored measures of a patient’s health status,
- multi-modal self-report that engages users through visually rich interfaces,
- a participatory design approach and prototyping platform for engaging clinicians in the definition and evaluation of behavioral biomarkers.

w/Vijay Vad, Force Therapeutics, UHG
Smart(er) self report

Photographic Affect Meter

Adaptable Visual Assessment for Pain Interference

PAM vs PANAS
Pollak, et al

AVA vs ODI, Visual Analog Pain Scale
small data lab
AVA: Adaptable Visual Assessment

(1) modernize standardized “instrument”

(2) personalized, daily reporting

(3) condition-specific, images

replace this ... with this

patient filters down to relevant items

Stroke
Post-op recovery
Rheumatoid Arthritis
Depression
Anxiety
Impulsivity
AVA development process

Phase 1

Transcribe assessment(s) to images

Validate full assessment with patients and clinicians

Phase 2

Deploy in patient population over time and compare to standard assessments

JP Pollak, et al
ResearchStack for Android: for cross-platform studies

- Android for affordability, market-share, socio-economic diversity
- **ResearchStack: designed to minimize added work:** ResearchKit™ syntax to define studies, but with Android UI/style
- **Example Studies:** OHSU, Sage MoleMapper, Impulsivity (Northwell, Cornell Tech), Sage mPower, UCSF-Sage MyBPLab Study

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**Bits**

**DIGITAL HEALTH**

**Bringing iPhone-style Medical Research to the Android World**

By STEVE LOHR  NOVEMBER 12, 2015 11:00 AM  6 Comments
ResearchSuite, built on top of ResearchKit™, ResearchStack
http://github.com/ResearchSuite/docs

Extends available surveys to include adaptable visual assessments and custom active tasks, geofencing, and supports integration of various backend modules.
LS2 - Lightweight Study Server
Simple, open source, omh-compliant data store for mHealth apps

Developer friendly:
- Easy to deploy via docker
- BYO database support for Postgres, MySQL, MSSQL
- SDKs for iOS and Android

Researcher friendly:
- Web portal for study management and data access
- Fully encrypted data storage
- Open source

github.com/CuriosityHealth/LS2 | jp@curiosityhealth.com
Open mHealth: Standards for Interpretability and Interoperability

**Defining schemas** to model mHealth data for (e.g., blood glucose, step count, sleep, mobility)

**Open mHealth schemas** implement a clear semantic representation of data by detailing relevant context (e.g., temporal relationship to meal for a blood glucose measurement), units of measure, representation of time

Can be downloaded from the [GitHub repository](https://github.com)

**Shimmer** tool available to integrate data from apps/devices, by translating data into Open mHealth compliant format
IEEE P1752 Main Work

- Validate existing schemas
- Define open API for mHealth data
- Prioritize additional schemas
- Prepare draft standard for ballot, and secure approval
- Promote and support community use, contribution and refinement

http://sites.ieee.org/sagroups-1752/
Conclusion

Participant self-care
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n=1

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http://destrin.smalldata.io
http://openmhealth.org

http://researchstack.org
http://researchsuite.org
TBD: Photo montage from dedication? View out to Manhattan? Capture the last sentence?