C Tracker
Collecting Patient Reported Outcomes via Smartphones

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How do you do?
How do you do?
Mobile Health

The patient's platform
Medical Data Stores

HealthKit, Google Fit (2014), S Health (2015)
Medical Research

ResearchKit (2015), ResearchStack (2016)
• Open source frameworks for iOS and Android
• Guide through consent
  • Sign on screen, render to PDF
• Render surveys
• Multitude of “tasks”
  • Tapping speed
  • 6-min walk distance
  • Memory games
  • …

Do you take medications to treat the following risk factors (indicate all that apply)

- To treat and lower cholesterol
- To treat hypertension and lower blood pressure
- To treat diabetes/pre-diabetes and lower blood sugar
- None of the above

Next
Medical Care

CareKit (2016)
Care Card

Care Completion
April 22, 2016
25%

Outdoor walk 15 mins

Hamstring Stretch 5 mins

Ibuprofen 200mg

Insights

Weekly Charts

Medication Adherence
Your medication adherence was 21% last week.

Back Pain

Fri 4/15 N/A
Sat 4/16 8
Sun 4/17 50% 8
Mon 4/18 50% 7
Tue 4/19 50% 6
Wed 4/20 50% 5
Thu 4/21 100% 100%

Pain Medication Adherence
• Android and iOS users with newer operating systems are now able to **centrally store health data**
  • mostly used for fitness related data to date

• **iOS 10 brings native CCD/CDA support**
  • Users can store health documents, no setup required
  • By summer 2017, ~85% of iOS devices will run iOS 10
C Tracker

• *ResearchKit*-based iOS app, launched Oct 2015

• PRO study for *hepatitis C patients*, asking about impact of HCV and its treatment on daily living

• *Anonymous*: download app, consent and participate

• Returns *survey responses* along with *activity and workout data* automatically recorded by the phone
Dashboard

- Upcoming tasks
- Activity overview
- Completed tasks
- Study information
- Facts about hepatitis C
- …
• First patient Sept 19, 2000
• 5'000 patients enrolled
• ⅔ male, 90% white, 44 median age
• Seen once (w/o fibrosis) or twice a year in clinic
• Assess *activity*, assess *more often*
UUID

SCCSID

IDENTIFIED RESEARCH DATA

HOW ABOUT NO
Identity Store

SCCSID + demographics

Header: \{JWT\}
Body: UUID

iss: https://idm.c3-pro.io
exp: +1d
jti: F8AF01D0
aud: https://idm.c3-pro.io
sub: John Doe
birthday: 1954-10-12

name: ✓
bday: ✓
eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.
eyJpc3MiOiJodHRwczovL2lkbS5jMy1wcm8uaW8iLCJhdWQiOiJodHRwczovL2lkbS5jMy1wcm8uaW8iLCJqdGkiOiI4MkYyNzk3OUE5MzYiLCJleHAiOiIxNjczNDg4Iiwic3ViIjoiU2FyYWggUGVzIiwiYmlydGhkYXkiOiI5LTA0LTI4In0.
e_Fo1vrmn_EjQSN2gp0Pf9a1AI07tvFLnx5UEsLynO0
• We can now “link” app users to participants in cohorts and patients in EHRs

• This means we can now prescribe apps and collect new kinds of data

• Switzerland: no e-consent, so need to consent participants while in clinic ➔ link app