Digital Health Research: Ethical, Regulatory and Technological Challenges and Opportunities for Researchers and IRBs – And What to Do About It

Jeremy Block, PhD
Managing Partner, Venture Catalyst

Human Subject Protection: *Changes*

OPENING REMARKS

Thursday, October 6, 2016

JEREMY BLOCK is the Managing Partner of Venture Catalyst, a company that works with investors and venture-backed companies to maximize the odds of venture success. Dr. Block is also an adjunct professor of public and international affairs at Baruch College. Jeremy is currently the executive director of a digital health trial focusing on population screening of genetic founder mutations at Memorial Sloan Kettering Cancer Center. Previously, Dr. Block was an Assistant Professor of Population Health Science & Policy at the Icahn School of Medicine at Mount Sinai where he was also an IRB Chair at hospitals within the Mount Sinai Health System. Jeremy is primarily interested in the intersection of science and technology with society and public policy. His background includes advising at the federal, state, and local levels on a variety of science and technology relevant fields include; green procurement, human research subject protections, chemical & biological weapons, emerging properties and markets with science and technology components, and research systems at public and private universities. In addition Jeremy has been involved in technology development in the areas of virtual reality and also mobile health applications. He has a background in teaching ethics in public policy, bioethics, and science and technology policy at both the undergraduate and graduate level.

He holds a Bachelors in Chemistry & Biology, Masters in Public Policy, and Ph.D. in Biochemistry from Duke University.

Digital Health Research: ethical, regulatory, and technological challenges & opportunities for researchers and IRBs - and what to do about it.

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Digital Health Call to Action

(the most important slide to remember)

We have a moral obligation to act and do our part to ensure the upstream research and development in digital health that redefines healthcare does not recreate the same problems that do not serve the vulnerable amongst us. To do so robs people of dignity and autonomy, places them at an institutionalized increased risk compared to others, and unjustly excludes them or places them last in line to reap the rewards of new research & developments.

Digital Health | mHealth | Health IT

let's agree for now that it's all the same thing…

Novel vs. Better vs. Unfamiliar

Unfamiliarity: digital health research has been going on for a few years. Most people are simply unfamiliar with it because they haven't seen it yet.

Better Technology: Depending on the study, a portion of digital health research is simply doing the sorts of research we've seen before, but using better technology. Once we filled out surveys using pen & paper, then Scantron, then a computer, then a mobile device.

Novel Technology: A useful combination, truly new method for collecting data, new data type, or emergent property. Examples include continuous monitoring, GPS tracking and integrations, some forms of telemedicine, etc.

Science & Technology Policy Problem

Accept that technology is in continuous development

Overlay our thinking about the technology with our current regulations and ethical considerations; see what happens.

Find flexibility, develop sensible guidance that doesn't paint yourself into a corner, be an evangelist to your peers.

How are digital health solutions designed?

- There's a team…
- There's a solution to be built...

Silicon Valley vs. Healthcare

Tech industry professionals go about their work is fundamentally different ways than human subject researchers who submit protocols to IRBs.

The two cultures need to court one another and spend the time to learn where the boundaries are.

Difficulties of interdisciplinary work!

This is not a new problem!

Redefining Study Design

In some cases, the entire digital health platform is the study design.

- Massive improvement in transaction efficiency means research design changes
- The interactions and interventions in the app
- The underlying schema and build of the app directly impacts design
- Exploratory apps with lots of integrations make the details “under the hood” critical to understand.

Interdisciplinary Struggles

- **Manage and understand the different cultures**
  - Make clearer roadmaps for development: IRBs should consider confirming they have a plan and clarity
- **Identify and fill holes in development teams**
  - Ensure there is regulatory and research oversight involvement during development.
- Mismatch between development expectations from funders and tech industry and the realities of development in healthcare environments.

Research Ethics & Digital Health

Research Ethics Considerations

- Autonomy: eConsent
  - Tech can help us do this better: will it work, or will it backfire?
  - The Block Rule: Multi-modal consenting.
- Risk:Benefit & Risk determination (not today, this takes a while!)
  - ***New or Different risks***: Ethics of telemedicine and whether you're providing medical care = who is responsible?
  - ***Magnitude of Risks***: Are some of the risks, which historically are considered minimal now greater than minimal? (confidentiality, privacy, cybersecurity). Impacts of non-compliance and problems.
- Justice considerations:
  - Access to research gets blown apart, in a good way
  - Local context could be completely lost
  - ResearchKit & ResearchStack
  - What about those who can't afford it?
  - Is it platform-specific?

Autonomy

EULAS vs. Consents

Consent is a process, not a click-box

EULA: The End User Licensing Agreement

- long legalistic language in tiny print that the user simply clicks accept to without usually reading.
- Facebook included 'research' buried somewhere in there.

Investigators and IRBs need to teach our colleagues in the technology industry about how we view and approach consent.

A focus should be placed on the opportunity to improve the consenting process using technology

Research consents may contradict EULAS. It's important to compare the EULA of something with the consent and take care of that early

ResearchKit | Asthma Health

- Entire project done without ever seeing a subject
- Uses location-based data and user-reported data
- Accrued 5k+ people in under a month
- Remote eConsent
- Data accessible to user

First 6 months 2015	Download	Enrolled	
Mar 8- Apr 7	43949	6027	0.137
Apr 8- May 8	3645	878	0.241
May 9 – Jun 8	1113	322	0.289
Jun 9 – Jul 9	501	123	0.246
Jul 10 – Aug 9	446	126	0.283
Aug 10 – Sep 9	309	117	0.379

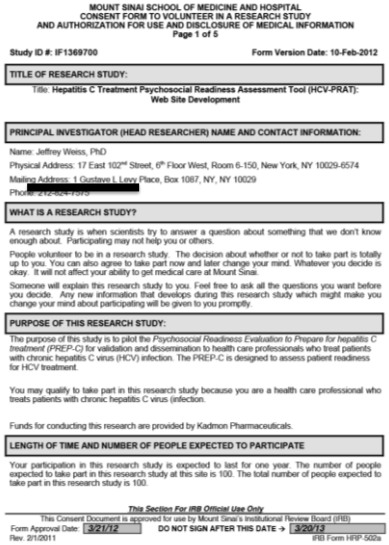
eConsent work with thanks to:
Colleagues at Mount Sinai, and John Wilbanks

The Asthma Health App

The Asthma Mobile Health Study

- Users use app to learn about asthma and track/manage their asthma
  - Asthma history
  - Symptom and medicine surveys (daily)
  - Health care utilization (weekly)
  - Monitor symptoms and lung function and track graphically (peak flow)
  - Feedback on asthma status based on above criteria
  - Weather and air quality warnings
  - Educational materials

Traditional research consent



MOUNT SINAI SCHOOL OF MEDICINE AND HOSPITAL
CONSENT FORM TO VOLUNTEER IN A RESEARCH STUDY
AND AUTHORIZATION FOR USE AND DISCLOSURE OF MEDICAL INFORMATION
Page 1 of 5

Study ID #: IF1369700 Form Version Date: 10-Feb-2012

TITLE OF RESEARCH STUDY:

Title: **Hepatitis C Treatment Psychosocial Readiness Assessment Tool (HCV-PRAT): Web Site Development**

PRINCIPAL INVESTIGATOR (HEAD RESEARCHER) NAME AND CONTACT INFORMATION:

Name: Jeffrey Weiss, PhD

Physical Address: 17 East 102nd Street, 6th Floor West, Room 6-150, New York, NY 10029-6574

Mailing Address: 1 Gustave L Levy Place, Box 1087, NY, NY 10029

Phone: [redacted]

WHAT IS A RESEARCH STUDY?

A research study is when scientists try to answer a question about something that we don't know enough about. Participating may not help you or others.

People volunteer to be in a research study. The decision about whether or not to take part is totally up to you. You can also agree to take part now and later change your mind. Whatever you decide is okay. It will not affect your ability to get medical care at Mount Sinai.

Someone will explain this research study to you. Feel free to ask all the questions you want before you decide. Any new information that develops during this research study which might make you change your mind about participating will be given to you promptly.

PURPOSE OF THIS RESEARCH STUDY:

The purpose of this study is to pilot the *Psychosocial Readiness Evaluation to Prepare for hepatitis C treatment (PREP-C)* for validation and dissemination to health care professionals who treat patients with chronic hepatitis C virus (HCV) infection. The PREP-C is designed to assess patient readiness for HCV treatment.

You may qualify to take part in this research study because you are a health care professional who treats patients with chronic hepatitis C virus (infection.

Funds for conducting this research are provided by Kadmon Pharmaceuticals.

LENGTH OF TIME AND NUMBER OF PEOPLE EXPECTED TO PARTICIPATE

Your participation in this research study is expected to last for one year. The number of people expected to take part in this research study at this site is 100. The total number of people expected to take part in this research study is 100.

This Section For IRB Official Use Only

This Consent Document is approved for use by Mount Sinai's Institutional Review Board (IRB)

Form Approval Date: 3/21/12 DO NOT SIGN AFTER THIS DATE → 3/20/13

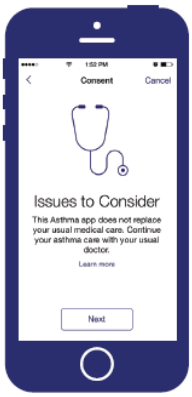
Rev. 2/1/2011 IRB Form HRP-502a

Traditional boilerplate informed consent forms meet regulatory requirements but complexity and legal document format inhibit understanding

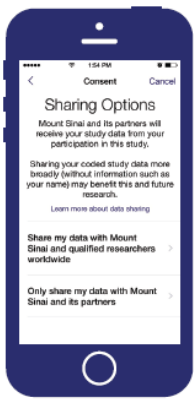
Iconic interfaces with layered information
&
eConsent Video

Data Use

Secure Database

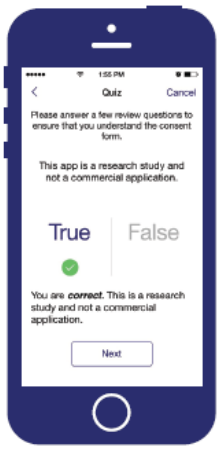


Issues to Consider



Sharing Options

discussion vs. assessment of comprehension



Quiz

- Informed consent discussion with investigator is considered the cornerstone of informed consent
- Test of understanding of main issues highlighted in iconic interfaces
- Can request phone or email contact for questions, verbal discussion

The Block Rule: Multi-Modal Consenting

One exciting development in digital and mobile health are going to come out of the consenting process.

Multi-modal consenting; using visual (charts, graphics, videos), and written consenting that includes interactivity (quizzes, check-boxes, discussions etc.) in e-consenting platforms.

The Block Rule: the use of three different modalities to adequately ensure that subjects understand and comprehend the study is likely enough to meet the regulatory criteria for informed consent.

eConsent: aspects of digital consent worth promoting

- **Multistep process, multimedia (low literacy, numeracy)**
- **Proceed through process, as interested, at their convenience**
- **Access to full standard consent document in app at all times during the study**
- **Objective documentation of comprehension in real time**
- **Corrective feedback during assessment of comprehension aids retention**
- **Technical approaches to ensure potential participant is engaging with the content and not just swiping through**
- **Device & operating system agnostic**

That was 18 months ago; now what?

- Good first effort; do better!
  - Take advantage of what tech developers already know
  - Use knowledge of instructional design

Risk : Benefit

Risk | Benefit
Digital/Mobile Health Related Risks

Privacy / confidentiality (GPS data, IP addresses, location-based services). *Much of this is directly tied to the technology itself.*

Collecting information from or about bystanders. What data types or activities are more likely to have this occur? Some interesting technology can help with this.

Consent legitimacy: can you verify the person using it is the person you think they are and is appropriate to be in the study? What technical solutions can accomplish this verification?

Risk | Benefit
Digital/Mobile Health Related Risks

Hawthorne: Participants may be self-conscious about giving constant information.

Anti-Hawthorne: Participants might become so accustomed to being monitored/giving information that they forget about, resulting in giving information they wouldn't otherwise want to share.

Efficiency of technology: efficiently diffusing non-compliance! Digital health solutions often wonderfully make processes more efficient. This also means that an error in them efficiently diffuses the non-compliance and could scale it.

MR <> GTMR Blurring If you upload a large amount of data – significant percentages of an EMR to the cloud and perform analyses; how do you assess the risks?

Risk | Benefit
Digital/Mobile Health Related Risks

Mandating information in order to participate;

- What is coercive?
- What is undue influence?
- What is a data grab?

In Europe, they're dealing with this: if it's not-related, you cannot mandate it to participate.

The scope of WHO could enroll will really matter. Not just the characteristics of the individual, but the ***situation*** that they may find themselves in matters too.

Risk | Benefit
Vulnerable Populations

Group

- Children – tech adoption higher, generational knowledge of risks shows big differences
  - Cyber-bullying
  - Sharing practices very different

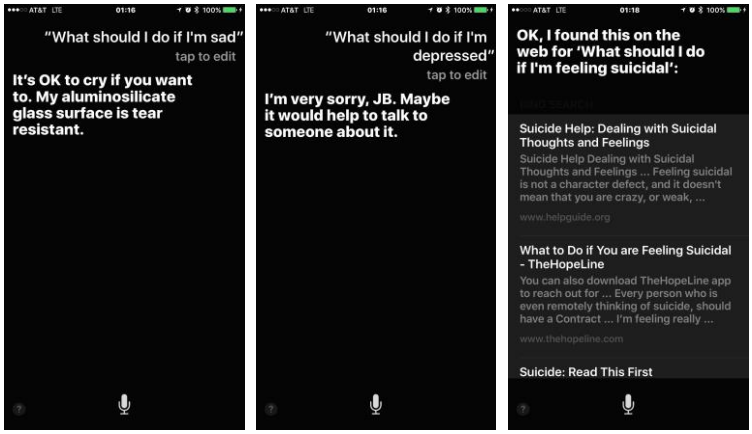
- Prisoners – generally they have extreme limitations of access to technology

Situational

- School environment (FERPA & DOE)
- Catastrophes & Disasters
  - Remember what happened to the disabled during Katrina…
- In public
  - Inadvertent disclosures

Risk | Benefit
Vulnerable Populations

doing nothing, or doing something



Risk | Benefit
Vulnerable Populations

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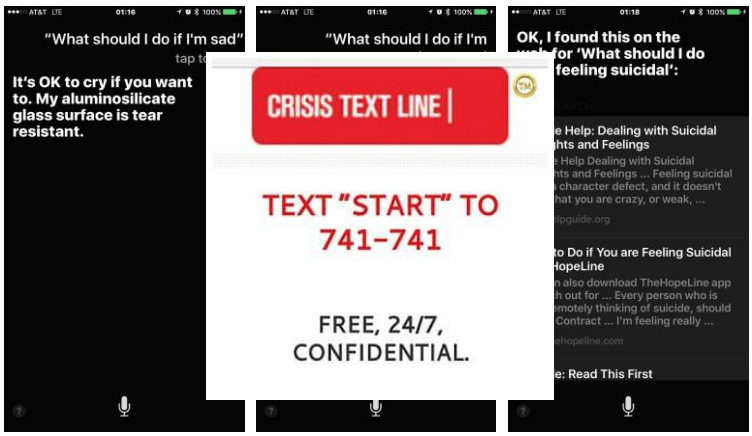

Justice Considerations

The Good:

- Access to research gets blown apart, in a good way
  - For participants!
    - IMPLICATIONS FOR POPULATION BASED STUDIES, REGISTRIES, SCREENING
  - For researchers!

The Challenges:

- Access Biased towards adopters:
  ResearchKit & ResearchStack | Web-based | Text-based | Infrastructure or device-lacking

- Design for all populations; particularly those that are vulnerable or underserved by the healthcare ecosystem.
- Information content really matters

CAUTION!

Caution: Recreating The Same Problem!

Much of the boom of consumer technology and the IoT is developed in Silicon Valley / San Francisco. This reflects the people and norms of that area. A predominantly white, upper or upper-middle class American population.

We are merely recreating the same divide that already exists today.

We must purposefully make the necessary justice arguments.

Caution: It's all about the data

Developing new methods for data collection, sharing, security, and privacy are critical to the future of this work.

***Evolve the consumer tech industries thinking*:**

1. The tech industry is accustomed to *collecting all the data that's possible* and using it without the type of oversight seen in human subjects research reviewed by IRBs.
2. In human subject research, *only the minimal amount of data necessary to answer the research question* is allowed and all data collection must be justified.

This poses a challenge to the open-ended exploratory process of new product development and the workflow of most in the tech industry

Caution: Non-compliance

- It's hard to tell in these systems without really being methodical if it meets all the crtieria
- Creating massively efficient systems using technology means you can create massively efficient non-compliance!
- Jurisdiction and applicability of laws: foreign countries, different laws by state or municipality etc.
- Bad actors, cybersecurity threats etc.

Best Practices & Recommendations

Protocol Recommendations

- Describe in tabular and graphical the data
- Provide a schematic of the underlying logic of the app. This is an extension of the study design!
- Make a distinction between what's *novel* technology vs. what is using technology to do something that has been accomplished through another medium (like a survey)
- Rethink the risks, including situational risks based on a reasonable prediction of how/when/where the app will be used.

Data: collection, sharing, security, privacy

	Who?	What?	Where?	When?	Why?	How?
Data Type	Entered by subject? Auto-collected by device/platform?	PHI? Survey? GPS? Interaction or usage of device/platform?	Under what circumstances or situation will it be entered?	By user action? By device/platform?	Primary data for the study? Data about the device/platform itself?	What is the detailed mechanism for collecting this?

Investigators and developers should map out all the data collection, and sharing points along with descriptions of the security measures and how it protects the privacy of the subjects

This will go a very long way in terms of explaining the more complicated workings of the applications researchers develop and seek to use

IT Experts / Developers & IRBs

It is time to have IT professionals involved with IRBs

The sophistication present in the new technology used in digital health and mobile apps is at a level where IRBs likely do not have the expertise to evaluate it.

Having appropriate expertise is a mandate in the Common Rule!

What should we ask them to do?

They should be tasked with assessing the technology and issues surrounding data collection, storage, analysis, security, privacy, and confidentiality.

IRB Best Practices: digital health

- The Block Rule: Three different methods, at a minimum, for eConsent (charts, graphs, questions, videos, etc.)
- Get tabular and chart form explanations of the app and the who/what/where/when/why/how of the data.
- Get mockups of the app submitted. Once it's built, it could be expensive to modify.
- Learn about the technology itself: it can heavily effect vulnerable populations; making it better or worse!
- Non-compliance oddities: foreign country access, jurisdictional issues in different states with differing laws, data integrity of false reporting, active undermining of the research by bad actors.

Overall Recommendations

- **Be a better collaborato**r; insist on an ongoing dialogue with those in the tech industry to teach them about our expectations and visa versa.
- **Investigators need to teach the IR**B about the new capabilities and engage in a dialogue around how to best incorporate them into studies.
- **IRBs need to develop SOP**s for digital and mobile health studies to guide investigators and set clear expectations.
- **IRBs need to include IT experts** in IRB review of research is now a must.

Acknowledgements

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Thought Partners:

Eric Kroll, John Wilbanks, Charlotte Coley, Bruce Gordon

Thank You!

Get slides: jeremy@venturecatalyst.nyc

Email me to collaborate on your next digital health or mHealth project!

Email me to help you think about new SOPs, serve as a consultant to your board, or join your board.

COPY | ADAPT | IMPLEMENT

(but, please credit…)