

APPIMPACT:
**A Framework for
Mobile Technology**
in Behavioral Healthcare



APPIMPACT:

A Framework for Mobile Technology

in Behavioral Healthcare

Project Summary	3
An Overview	4
Fitting the App to the Need: App Options in Behavioral Healthcare	9
Checklist for App Selection	13
Closing	17
References	20
Acknowledgements	21

Project Summary

APPIMPACT:
**A Framework for
Mobile Technology**
in Behavioral Healthcare

In collaboration with the D.N. Batten Foundation, Centerstone Research Institute developed appImpact, a guide to integrating mobile technology into behavioral healthcare.

From selection and implementation to evaluation, appImpact offers behavioral healthcare providers the framework needed to realize improved outcomes and cost savings through the use of mobile technologies in healthcare—otherwise known as mHealth.

About Centerstone Research Institute: Centerstone Research Institute (CRI) is a not-for-profit organization dedicated to improving the quality and effectiveness of care for those with mental health and addiction disorders. CRI provides research, analytics and evaluation services that help bridge the gap between the scientific discovery of effective treatments and the implementation of these treatments into standard clinical practice. CRI is funded through contracts, grants, foundations and individual donors who share the organization's commitment to bridging the gap between science and service. Learn more about CRI at www.centerstoneresearch.org.

An Overview

APPIMPACT:
**A Framework for
Mobile Technology**
in Behavioral Healthcare

Mobile technology is becoming more widely used around the world.

As of January 2014, **90% of Americans own a cell phone** with **64% owning a smartphone** (Pew Research Center, 2014). The use of cell phones has made it universally easier for people to stay in contact with each other regardless of their physical location. The use of mobile technology is spreading into the behavioral health field as well, as it enables clinicians to assist their clients in their everyday lives and provides tools for regular self-care and behavior modification.

A mobile app is a computer program that is designed to run on smartphones, tablet computers and other mobile devices and can be easily moved from place to place. Apps for mobile technology started making their appearance in the early 2000s (Meyers, 2011). The first app stores became publicly available in 2008 (Donker et al, 2013). There are many types of apps available for free and some may be purchased online. Behavioral health agencies may be hesitant to implement mobile technology in their clinical settings due to a variety of reasons such as limited technological knowledge, belief that the use of technology will be too time consuming, etc. There are, however, many advantages to using mobile technology in the behavioral healthcare setting. Mobile technology can be beneficial for clients with mental and/or substance use disorders, clinicians and people who are in leadership positions in these agencies.

Mobile technology
can increase a
client's motivation
to change
behaviors and
help exactly
at the time
when needed.

WHY Mobile Health: Client View

From a client perspective, mobile technology can extend treatment beyond the walls of the clinician's office by helping the client practice and maintain a skill between sessions that they learned while meeting with a therapist face to face. The use of mobile technology also can increase a client's motivation to change behaviors and help exactly at the time when needed most. Due to advances in technology, a client can now enter exactly how he feels and what he is struggling with at that given time, and an app that has been pre-programmed can respond back with suggestions on how to get through the current situation and encourage positive behaviors. Another benefit of mobile technology is in rural settings where it is often difficult to find accessible treatment. With technology, people can receive treatment where they otherwise would not be able to.

WHY Mobile Health: Clinician View

On a clinical level, mobile technology can help clinicians reach the desired outcomes for their clients. By using mobile technology, a clinician can assign homework to the client and use an app to send reminders to complete the assignment. With a paper assignment, the client can easily set it aside and forget to do it or forget to bring it back for their follow-up session. With digital homework, a clinician can follow the client entries between sessions and discuss during a face-to-face meeting. Time is often an issue for many people, including clinicians, and by having clients use technology between sessions, the clinicians can increase their productivity by using the data from an app to appropriately target the clients' needs during their session. With live data at their fingertips, a clinician can see what is working and what is not working for their clients and adjust treatment accordingly. Another benefit is that the technology can collect information from the client at the moment a situation is taking place (real-time data in a real world setting) and does not rely on the memory of the client to recall exactly what happened. An app can assist in a time of crisis by automatically connecting someone to crisis intervention services, if programmed to do so. Mobile technology also can help increase engagement in treatment and reduce missed appointments. Additionally, reminders can be sent to clients regarding their medication.

With live data at their fingertips, a clinician can see what is working and what is not working for their clients and adjust treatment accordingly.

Applications
can aid in
efficiency and
productivity of
clinicians, since
more clients can
be reached in
less time.

WHY Mobile Health: Leadership View

Leadership in behavioral health agencies can benefit from the use of mobile technology because applications can aid in efficiency and productivity of clinicians, since more clients can be reached and helped in less time. Using mobile technology to enhance traditional services costs less than a clinician's salary and can be automated. If clients engage in symptom tracking and provide live data to treatment providers, it can speed the therapy process. This will make a 30-minute appointment more advantageous for clinicians, which can aid in reaching productivity targets. Clients often have transportation or geographical barriers to treatment, and by using mobile apps, treatment can go anywhere a cell phone can go. Mobile applications also can add a new revenue source through embedded ads or app purchases.

The use of mobile technology enables clinicians to assist their clients in their everyday lives and provides tools for regular self-care and behavior modification.

WHY Mobile Health: Pros and Cons

There are many advantages to using mobile technology in behavioral healthcare, yet some agencies are still somewhat hesitant to adopt the idea. This document describes the factors that an agency should consider before implementing mobile technology into their clinics. In order to select and implement mobile technology, the first thing that an agency should do is determine the needs of the clients with whom they are working. We have narrowed our examples down to two specific target populations to show how technology can assist in behavioral health treatment. We have chosen to focus on **1) Medicaid superutilizers** (people with expenses more than \$25,000 a year who experience preventable emergency room visits and hospitalizations) and **2) adolescents at risk for mental illness and/or addiction**. However, it is important to note that your target populations may be different for your agency. Once the target population has been established, then desired outcomes can be determined and a decision must be made on how those desired outcomes will be met using mobile technology. The following sections present factors to consider when selecting and implementing mobile technology in your agency.

Fitting the App
to the Need

APP OPTIONS

in Behavioral Healthcare

It is very important that you choose apps that fit your organization's needs – not that you choose really cool apps.

Decide what the goals of your organization or of a particular intervention are and select apps that are value-added features to your interventions. Can they provide alerts and monitoring that saves hundreds of hours of staff time? Can they reduce your case management travel costs by identifying best routes in a given day?

Below are two examples of how apps could assist interventions seeking to make a difference for two target populations:

1. Medicaid superutilizers and
2. Adolescents at risk for mental health issues.

Superutilizer Desired Outcomes

How are you going to achieve these? How can a mobile application help?



REDUCE

Hospitalizations Days and/or
Emergency Department Visits

An app can:

- ALERT when a client is more at risk for hospitalization (i.e. not responding to calls/texts, not leaving the house, answering poorly to survey questions in the app).
- ALERT when the client is geolocated at a hospital or Emergency Department setting.
- ENCOURAGE and help motivate a client to make positive behavior changes.
- PROVIDE audio and visual reminders to take important medication or attend important doctor's visits.
- CONNECT a client to a case manager, nurse, primary care physician or other clinician to work through situations to determine whether hospitalizations can be prevented.



IMPROVE

Clients' Physical Health

Technology can monitor clients' physical activity, send medication reminders and track key health indicators (i.e. blood pressure, glucometer readings).



DECREASE

Clients' Social Needs

Mobile devices can connect clients to a case manager or clinician to address any social needs, and other support in their community.



IMPROVE

Clients' Mental Health

Apps can help clients monitor symptoms through passive and/or active data collection and send medication reminders.



INCREASE

Clients' Satisfaction
with Services

Technology can enhance engagement and deliver client satisfaction surveys.

At-Risk Adolescent Desired Outcomes

How are you going to achieve these? How can a mobile app help?



INCREASE

Clients' Social Connectedness

Requiring mobile game players to play with others creates a social network.



INCREASE

Teen Sense of Purpose

Mastering a certain skill presented in a mobile app or game encourages a sense of happiness.



INCREASE

Teen Sense of Control

Mobile apps or games facilitate empowerment and create positive feelings of accomplishment.

What Can Apps Offer?

The possibilities are endless, but here are three key areas in which apps have had significant impact.



1. Greater Information

- a. Helping clinicians make a diagnosis.
- b. Informing prescribers about uses and common contraindications for pharmaceutical medication.
- c. Referencing current research related to the field.
- d. Automatically collecting patient progress, treatment planning and evaluation outcomes, helping to enable third-party collection of data that determines whether a particular intervention is working or not.



2. Enhance Treatment

- a. Continuously monitoring the many hours in the week that the client is not receiving treatment.
- b. Providing needed psychoeducation that provides information on how to deal with a mental illness.
- c. Enabling self-directed Cognitive Behavioral Therapy (CBT) to change clients' thinking in order to obtain positive behavior changes desired.
- d. Providing clinical screening and/or assessments.
- e. Monitoring client treatment adherence behaviors.
- f. Providing a secure communication medium between client and clinician.



Patient Engagement

- a. Tracking biofeedback monitors in real time, including physiological measures — heart rate, blood pressure, sleep, etc. — moods, symptoms, substance use, exercise, and diet.
- b. Gamifying apps by using an avatar to engage in recovery treatment or through tracking “movement points” to get to the next level in a game that incorporates pedometer or accelerometer data.
- c. Providing key reminders to patients and their care team member to engage in health behaviors, take medications, remember medical visits, and engage with their communities.

SELECTING, IMPLEMENTING, EVALUATING

Your App for Behavioral Healthcare

Mobile Technology Checklist

Selection

- 1. Know the Developer
- 2. Understand the Cost
- 3. Ask Key Questions
- 4. Pilot the Technology

Implementation

- 1. Train Staff
- 2. Obtain Consent from Clients
- 3. Consider Your Target Group
- 4. Ensure the Client's Device is Password Protected
- 5. Monitor Data

Evaluation

- 1. Determine the Outcome Metrics
- 2. Decide on a Program Evaluation Design
- 3. Analyze Baseline Data with Follow-up Data
- 4. Examine Use-Data
- 5. Decide on Criteria for Success

Selection

□ 1. Know the Developer

Did the developer consult with a healthcare provider (Murfin, 2013)? Did the developer do any testing on the app? What evidence is there to show that it works? Can the developer connect you with the people who have researched the app?

Developers include:

- Unknown
- Private individuals
- Group of health care providers
- Academic institutions
- Professional organizations
- Pharmaceutical companies

□ 2. Understand the Cost

Purchasing software, hardware and the time required for setup and implementation (Murfin, 2013).

- Will your agency be providing the technology or will clients be using their own equipment? Will the app be free for clients or will they have to purchase it?
- How will funding be maintained for continued updates, and data management?
- Questions for supporting research include: (Murfin, 2013)
 1. *Are references to support content available?*
 2. *Are the references from research articles or do they come from secondary or third references?*
 3. *Are references peer reviewed?*

□ 3. Ask Key Questions

- **HIPAA Compliance**
Is the information in the app protected or is it easily shared with others?
- **Therapeutic Effectiveness**
Does the app provide the desired clinical outcomes?
- **User Experience**
What did the participant like or dislike about using the app?
- **Accessibility**
Can the participant easily connect with the app when needed?
- **Format**
Is the font the correct size? Do the graphics add to the content?
- **Functionality**
Does the app correctly complete the task that it was programmed to do?
- **Adherence**
Does the participant use the app regularly or not?

□ 4. Pilot the Technology

- Make sure that all staff understand how the technology used enhances traditional treatment.
- Try the app with potential participants.

Implementation

□ 1. Train Staff

- Once an app is selected, assure that all staff members are trained properly in working with the app. Clinicians must be willing to incorporate technology into their treatment and understand proper usage. If clinicians are unable to train the client on using the equipment, a coach or case manager may be used. A study conducted in 2010 found that, “Open access self-help programs not accompanied by contact from a therapist or support person are generally associated with higher drop-out rates than guided or supported programs (Cavanagh, 2010).”

□ 2. Obtain Consent from Clients

□ 3. Consider Your Target Group

- Consider age, level of executive functioning, background/culture of the target group and adapt to suit their needs (Matthews et al, 2008).
- Consider client technology literacy — older users may not be as familiar with technology as younger users (Matthews et al, 2008).

□ 4. Ensure the Client’s Device is Password Protected

□ 5. Monitor Data

- Decide how data is monitored, translated and transmitted to appropriate staff.

Evaluation

Look at different components of the intervention (i.e., case management, app, therapy) and not just the app by itself.

□ 1. Determine the Outcome Metrics

It is important to determine how you measure your outcomes and at what time points.

- Identify what instruments you will be using. Each group should be given the same instruments at preset time periods. Examples of instruments used in previous studies include: Mini-International Neuropsychiatric Interview, Patient Health Questionnaire (PHQ), Quick Inventory of Depression Symptoms and Generalized Anxiety Disorder (GAD) (Burns et al., 2011). More examples of instruments are the System Usability Scale (SUS) (Brooke, 1996) and the Work and Social Adjustment Scale (Mundt, Marks, Shear, & Griest, 2002).
- Collect any and all data possible.

□ 2. Decide on a Program Evaluation Design

You should choose the program evaluation design that is best for your project from the examples below. The simplest design is to randomly select participants who will receive an app and a control group that will not.

- Examples of program evaluation design:
 1. Pre-post test design
 2. N-of-1 design
 3. Interrupted time-series design
 4. Randomized control trials
 5. Regression discontinuity design
 6. Stepped-wedge design (Doherty, Coyle, & Matthews, 2010)
- Basic components of program evaluation:
 1. Outcome evaluation. It is important to have at least one end point after deployment, and better to have two: one baseline, one follow-up.

2. Data collection. It is very important to get as much outcome data as possible. Missing data can lead to erroneous conclusions. For example, if a depression outcome is included in an app, then only people who use the app will complete it, and it may lead to a conclusion that the app is useful, when in fact it is not since the depressed person may not be using it. Therefore, for outcomes, it is important to collect data outside the app itself and have somebody tasked with collecting that data.
3. Randomization. Many behavioral health problems have a natural trajectory, which may mean that people will get better without the app. It is therefore important to have a control group in which people do not get the app. The assignment of patients should be done randomly (for example, use randomization.com).

□ 3. Analyze Baseline Data with Follow-Up Data

□ 4. Examine Use-Data

This is the number of times a client opened the app, amount of time spent and what sections the client spent the most time on (Doherty, Coyle, & Matthews, 2010).

□ 5. Decide on Criteria for Success

Statistical analyses done for the purpose of evaluation at a single site does not have to be as stringent as those used to generalize findings beyond a single site (Cheung & Duan, 2014). An analysis will be completed to compare baseline to follow-up data to determine the impact.

Closing

APPIMPACT:
**A Framework for
Mobile Technology**
in Behavioral Healthcare

Behavioral health apps are not extensively regulated for the most part, and not all apps available in app stores are evidence-based.

Since there is limited regulation in regard to apps, there is no guarantee that the information an app presents is accurate. It is important to use caution when implementing a new technology in a clinical setting if you are unsure if the app was scientifically validated. Further research is needed in this area. For updated information on the regulation of mobile applications by the FDA, visit: <http://www.fda.gov/forconsumers/consumerupdates/ucm263332.htm>.

The availability of apps has increased considerably over the last few years, and as of July 2014, there were **1.3 million apps available for download on Android devices** and **1.2 million apps available for Apple products** (Statistica: Statistics Portal). A 2014 study that looked at 100

1.3 million apps
available for
download on
Android devices

1.2 million apps
available for
Apple products

70% of the target
population owns a
smartphone

patients from an outpatient mental health clinic in Boston, found that 70% of the target population owned a smartphone, and 50% of them said that they would be willing to download an app to help with their mental health (Torous, Friedman, & Keshvan, 2014).

On the next page, a breakdown of current (January 2015) behavioral health apps available on the Android and iPhone platforms is shown. As the chart shows, there is an abundance of apps available that claim to address behavioral health issues. When trying to select an app to use in your agency, it is important to take many issues into consideration, such as the various factors previously described. It seems quite logical to begin using mobile technology in behavioral healthcare since society as a whole has adopted it and uses technology on a regular basis. However, the use of mobile technology in the behavioral healthcare setting is still a relatively new concept and therefore has not been as rigorously tested as other methods of treatment. Additional research, implementation and dissemination in this area is greatly needed to determine which apps are truly proven to effectively reach the desired clinical outcomes.

SEARCH TERMS

GOOGLE PLAY
(ANDROID)*IOS APP STORE
(APPLE)*

Depression

1,625

635

Anxiety

1,345

862

Schizophrenia

66

26

Bipolar

147

107

Psychiatry

212

182

Alcoholics

2,094

180

Drug abuse

149

23

*These numbers were derived from searches on the Android's website, AppBrain, and the iPhone's App Store on January 23, 2015.

Google, Apple, iOS, and Android are all trademarks™ or registered® trademarks of their respective holders. Use of them does not imply any affiliation with or endorsement by them.

References

APPIMPACT: A Framework for Mobile Technology in Behavioral Healthcare

- Brooke, J. (1996). System usability scale SUS: a “quick and dirty” usability scale. *Usability Evaluation in Industry*, 189-194.
- Burns, M. N., Begale, M., Duffecy, J., Gergle, D., Karr, C. J., Giangrande, E., & Mohr, D. C. (2011). Harnessing context sensing to develop a mobile intervention for depression. *Journal of Medical Internet Research*, 13(3), 55.
- Cavanagh, K. (2010). Turn on, tune in and (don't) drop out: engagement, adherence, attrition, and alliance with internet-based interventions. *Oxford Guide to Low Intensity CBT Interventions*, 227-233.
- Cheung, & Duan. (2014). Framing health matter. *American Journal of Public Health*, 104, 23-30.
- Doherty, G., Coyle, C., & Matthews, M. (2010). Design and evaluation guidelines for mental health technologies. *Interacting with Computers*, 22, 243-252.
- Donker, T., Petrie, K., Proudfoot, J., Clark, J., Birch, M. R., & Christensen, C. (2013). Smartphones for smarter delivery of mental health programs: A systematic review. *Journal of Medical Internet Research*, 15(11), 247.
- Matthews, M., Doherty, G., Coyle, D., & Sharry, J. (2008). Designing mobile applications to support mental health interventions, in handbook of research on user interface design and evaluation for mobile technology. *Information science reference*, 635-656.
- Meyers, J. (2011, May 6). Business insider: Watch the incredible 70-year evolution of the cell phone. Retrieved from <http://www.businessinsider.com/complete-visual-history-of-cell-phones-2011-5?op=1>
- Mundt, J. C., Marks, I. M., Shear, M. K., & Griest, J. M. (2002). The work and social adjustment scale: a simple measure of impairment and functioning. *The British Journal of Psychiatry*, 180, 461-464.
- Murfin, M. (2013). Know your apps: an evidence-based approach to evaluation of mobile clinical applications. *The Journal of Physician Assistant Education*, 24(3), 38-40.
- Pew Research Center. (2014, January). Cell Phone and Smartphone Ownership Demographics | Pew Research Center. Retrieved from <http://www.pewinternet.org/data-trend/mobile/cell-phone-and-smartphone-ownership-demographics/>
- Statista: Statistics Portal. (n.d.). • Number of apps available in leading app stores 2015 | Statistic. Retrieved from <http://www.statista.com/statistics/276623/number-of-apps-available-in-leading-app-stores/>
- Torous, J., Friedman, R., & Keshvan, M. (2014). Smartphone ownership and interest in mobile applications to monitor symptoms of mental health conditions. *Journal of Medical Internet Research*, 2, 2.

Acknowledgements

APPIMPACT: A Framework for Mobile Technology in Behavioral Healthcare

Thank you.

The authors would like to express their appreciation to the appImpact Advisory Board members, which include David Aylward; David Mohr, PhD, Camis Milam, MD; and Jeff Capobianco, PhD, for their extremely helpful consultation, guidance and review of this document.

appImpact Project Team:

April D. Bragg, PhD, *Vice President for Research Advancement*
Trenay Bynum, MSP, *Research Communications Manager*
Ellen Pogue, *Research Associate*
Russell Galyon, *COO*

The appImpact project was funded by generous support from the D.N. Batten Foundation. The D.N. Batten Foundation provides opportunities for more people to live healthy, fruitful lives, especially through the promotion of healthier environmental conditions and increased access to quality mental healthcare. It is based in Charlottesville, Va.

CENTERSTONE RESEARCH INSTITUTE
44 Vantage Way | Suite 44 | Nashville, TN 37228

centerstoneresearch.org



You may share, copy and redistribute this material in any medium or format for any purpose under the Creative Commons license.