

Advances in mobile mental health: opportunities and implications for the spectrum of e-mental health services

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Abstract: Mobile health (mHealth), telemedicine and other technology-based services facilitate mental health service delivery and may be considered part of an e-mental health (eMH) spectrum of care. Web- and Internet-based resources provide a great opportunity for the public, patients, healthcare providers and others to improve wellness, practice prevention and reduce suffering from illnesses. Mobile apps offer portability for access anytime/anywhere, are inexpensive versus traditional desktop computers, and have additional features (e.g., context-aware interventions and sensors with real-time feedback). This paper discusses mobile mental health (mMH) options, as part of a broader framework of eMH options. The evidence-based literature shows that many people have an openness to technology as a way to help themselves, change behaviors and engage additional clinical services. Studies show that traditional video-based synchronous telepsychiatry (TP) is as good as in-person service, but mHealth outcomes have been rarely, directly compared to in-person and other eMH care options. Similarly, technology options added to in-person care or combined with others have not been evaluated nor linked with specific goals and desired outcomes. Skills and competencies for clinicians are needed for mHealth, social media and other new technologies in the eMH spectrum, in addition to research by randomized trials and study of health service delivery models with an emphasis on effectiveness.

Keywords: Apps; care; internet; mental; mobile; technology

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Introduction

Perhaps no emerging technology development dovetails better with the patient-centered care (PCC) than mobile health (mHealth). PCC was conceptualized in the early 1990s by Harvey Picker and the National Research Council (1), is championed by the Institute of Medicine (2) and focuses on quality, affordable, and timely care. Person-

centered healthcare emphasizes the whole person or person behind the patient (3). These shifts emphasize participatory medicine, moving patients from being mere passengers to responsible drivers of their health (4) by shared decision-making—in line with international standards (5). The patient-reported preferences, experiences and outcomes (PRO) is becoming a standard method for health systems and guideline development. mHealth empowers, enables

and engages patients and other healthcare participants better and “around” the patient rather than the acute care and outpatient clinic (ironically called the medical home).

People and patients are empowered by mHealth, telemedicine and other technology-based services, which may be conceptualized as a telemental health (TMH) spectrum of care (6). E-mental health (eMH) is a term that is relatively new and it has been defined as “*mental health services and information delivered or enhanced through the Internet and related technologies*” (7). However, there is no agreement on a field-specific definition. The terms TMH and telepsychiatry (TP) have typically been used for traditional MH care services provided synchronously by videoconferencing, or asynchronously (8,9). A review of the literature on eMH through 2010, with most of the research (76%) from the USA, Australia, or the Netherlands, found four primary areas of eMH service delivery: information provision; screening, assessment, and monitoring; intervention; and social support (10).

Globally, Internet use has grown dramatically over the past decade, with a jump up to 44% of the population in the USA (6); Africa, the Middle East, and Latin America are the fastest growing populations of use. Online health and MH information varies in quality and readability (11), but it has helped people by enhancing coping strategies, empowerment, and self-efficacy. Users report reduced feelings of anxiety and isolation, enhanced connectedness in the doctor-patient relationship, and ability to make decisions on health-related behaviors (12-14). The Internet and other technologies may be used as a primary option or may complement regular MH care services.

Two areas that are growing exponentially are mobile MH apps and social networking after a somewhat slow uptake of MH apps attributed to MH organizations being ineligible to receive federal start-up for IT infrastructure. Mobile MH apps offer: (I) portability for access anytime, anywhere, regardless of patient geography and transportation barriers; (II) an inexpensive option versus traditional desktop computers; and (III) additional features, e.g., context-aware interventions and sensors (15) with real-time feedback. MH app demand is high across census-designated areas, generations, and, to a degree, age, with less use by older adults (15). Stress reduction programs using an app are increasing due to popularity and economical impact (16). Some of these enhance social networking, which is typically defined as web-based service that allow individuals to construct a public or semi-public profile within a bounded system, share a connection with specific users, and traverse

other connections of others (17). Health behaviors have been shown to change with this medium (18).

MH providers need a framework (6) to meet the challenges and requirements that are emerging in care-related complex interactions between consumers, patients, caregivers and other participants (*Table 1*). MH providers face many challenges with these emerging technologies, and they, like many others in society, may fear the trends (19). First, providers are encouraged to screen what technology is being used, how, and when—and to keep up with the slew of new options patients are using. Second, they need to evaluate how good MH or psychiatry apps are (i.e., evidence-based?) for smartphones and if they are used in an evidence-based approach (20). Third, clinicians and patients need to decide if any or all of the technology is instrumental and monitored in clinical care; this may include long-term planning. Fourth, clinicians may need to help the patient use the “right” service at the “right” time (e.g., not using social media when expressing suicidal ideation)? Fifth, clinicians and patients should weigh the advantages (empowerment, in-time learning, increased self-efficacy) versus the liabilities? And, finally, clinicians may need document use of MH apps as part of treatment plans.

This paper will:

- (I) Define mHealth, elucidate its roots in medicine, describe its philosophical approach, and link its components with service delivery and outcomes particularly related to mobile mental health (mMH);
- (II) Compare and contrast mMH to a range of eMH services including TP, and describe how one employs it within a service delivery system—and how healthcare may be built around it;
- (III) Provide an approach to clinical care, education/training, administration and evaluation so that quality care is provided and participants adapt well to incorporation of new technologies.

mHealth, mobile MH and MH/psychiatric apps

An overview of mHealth

The definition of mHealth has shifted from “unwired e-med” (21) to “emerging mobile communications and network technologies for healthcare systems” in 2003 (22) to “wireless communication technologies that transform health, healthcare and public health” (23,24). Recent data suggest that more than 90,000 consumer smartphone health

Table 1 Mobile health on a continuum of e-mental health services: goals, pros/cons and suggestions for clinical care

| Level | Source/entry | Initiator goals/aims | Pros | Cons/liabilities | Comments/suggestions |
|-------|--|--|--|--|--|
| 1 | Website information | Obtain health information and read 'in-time' or follow-up on physician's verbal instructions | Get information, understand how to approach a problem and triage problem | Quality of information varies Inaccurate patient self-diagnosis | Better if referred to a site by clinician who made appropriate diagnosis |
| 2 | Support/chat groups or "communities" | Gain support, answers, tips and perspective | Get a sense as to what are others doing for treatment and to cope; feel part of a group | The patients may or may not be similar; quality of information varies | Support in group format is nice for some |
| 3 | SM | Person/patient/caregiver: additional option for interaction; clinician: skeptical unless known commodity | Feeling understood, heard; more 'in-time' | Not HIPAA compliant, no time for this for most clinicians, significant boundary issues (e.g., self-disclosure, invading patient privacy) | Clinician should ask what platforms patient uses, but not promise to participate or track, triage acute issues to phone or in-person |
| 4 | Self-directed assessment by using screening tools with feedback | Person/patient: good habits, reflection tips; caregiver: reflection tips, tools to assess loved ones; clinician: refer patients to tips on clinical care | Customized to learning preference/style; make progress outside of a clinic; reduced clinician time demand | Not all problems can be self-assessed; some illnesses affect insight; quality of assessment varies | Good for motivated persons and even better if referred by clinician who has checked it out |
| 5 | Formal educational materials | Person/patient: education; caregiver: education, supports, and advice; clinician: CME | In-depth and evidence-based education; document progress in learning | Less interaction with instructors compared to in-person; may not fit all learning styles | Tend to be higher quality, but may cost money to obtain |
| 6 | Self-care decision-making options by one-time assessment by a professional | Person/patient/caregiver: additional options; clinician: skepticism unless known commodity | Customized preference/style; empowered; increased self-efficacy | What if the path of steps is not clear: should I do A or B? | Using members of an interdisciplinary team in a stepped care approach is better; linked to clinician |
| 7 | Email/text | Person/patient: common and fabric of life; apps 'log' experience and give data to clinician; clinician: used and incorporated into EHR | Patient gets quick advice, details on routine matters; convenient easier for teen patients: prefer texts to calls? | Occasional use for acute issues; HIPAA compliance issues if not secure; patient may expect future response | Better if email is within EHR; HIPAA compliant; things taken out of context; and miscommunication |
| 8 | Mobile health, psych apps, sensors and other technologies | Access, mobility, and low cost option. apps 'log' experience and give data to clinician; clinician: better integrated, longitudinal assessment | Convenient improved cueing of patients (i.e., to appointments); good narrative by ecological collection of data | HIPAA issues for compliance may be more complex; patient may expect future response; data integration issues are complex | Better if integrated within HER; can systems to monitor respond 'in time'? Private and public data may not be integrated |
| 9 | Synchronous, traditional or TMH care | Person/patient: it really works and is much more convenient; clinician: if patients like it, it is a good option | There is no shortcut to synchronous decision-making (patient-clinician; primary care-psychiatry) | It always has to be scheduled (and paid for) | A great option; not always needed due to lesser, easier options |
| 10 | De facto hybrid care (synchronous and asynchronous technology) to technology-based integrated care | Person/patient: I connect in-person and via technology; clinician: a team leader in a true system of care | A multi-modal approach for patients, clinicians and programs is a start; progressive healthcare systems are doing this | Linkage with interdisciplinary staff helps discussion, prioritization and planning | Not always available, but eventually folks will shift if healthcare financing shifts; paradigm shift is needed. |

SM, social media; CME, continuing medical education.

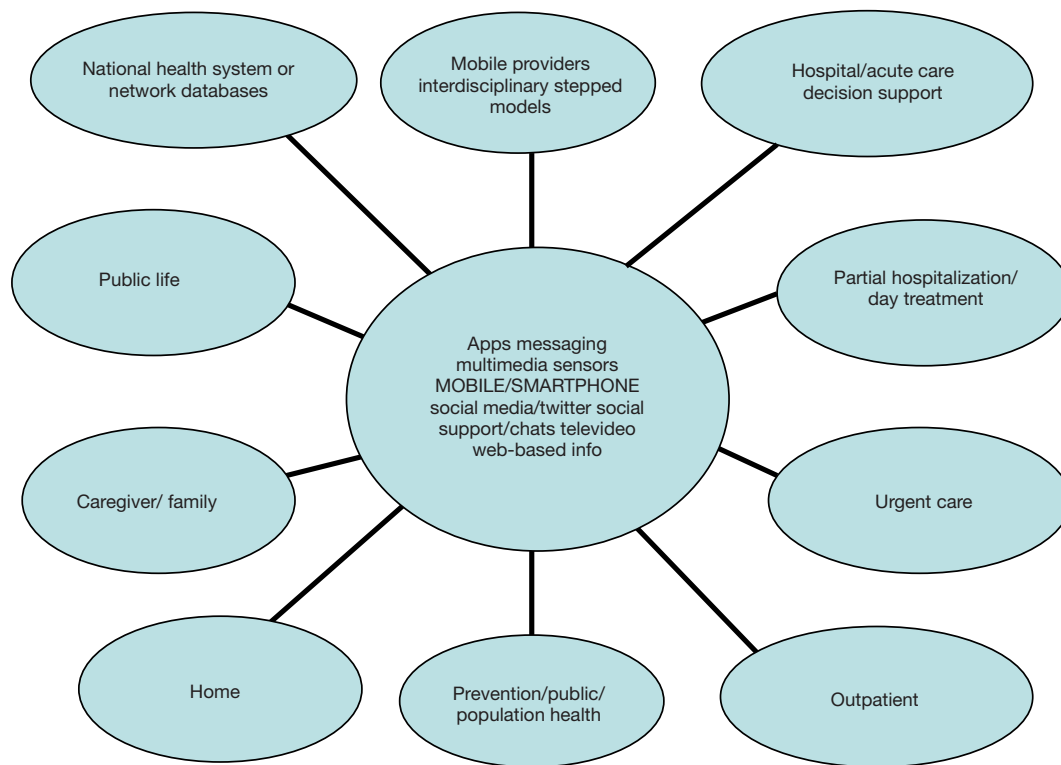


Figure 1 Integration of information in the technology age through the mobile/smartphone and other technologies.

applications (“apps”) are now available for download (25)—many of these are for MH. Few of these have been scientifically studied for benefits or potential risks or submitted to USA Food and Drug Administration for review or approval (25). An estimated 69% of the USA adult population track at least one health indicator (e.g., activity, weight, symptom), but only about 20% of track it long-term (26). Patients in primary care have comparable or greater rates of using mHealth options as the general population (e.g., smartphone ownership 55%) (27).

mHealth has two major foundations: flexibility; and integration (28). First, it is able to incorporate qualities often associated with conventional health communication methods, such as personalization, tailoring, interactivity, and message repetition at a relatively low cost. SMS text messaging, for example, is used for scheduling, automated responses, and monitoring. Second, a good example of using mHealth for system integration is the linkage of: a national health network, hospital and other acute care centers, home-based care, and mobile devices (26). Key features include:

(I) Voice/video calling: convenient way for clinicians

and patients to remotely communicate;

(II) SMS and multimedia message services (MMS) with video clips/sound files for education;

(III) Multimedia functions for a range of learning opportunities;

(IV) Inbuilt touch, motion and GPS sensors that simplify clinical assessment and enhance lifestyle and social activities;

(V) Device connectivity: practical and less error-prone than manual data entry.

Since that system is too elaborate for many, the smartphone or tablet PC is the core device that links clinicians with patients in their own environment (*Figure 1*) and helps patients to self-manage their diseases via bi-directional flow of information. Even better, wireless monitoring devices gather data from sensors, input that data into a mobile medical app on the smartphone, relay the information to a network (26) and prompt clinical decision support. Flow of information becomes 24 × 7, with feedback on progress, as well as reminders of healthy behaviors, scheduled appointments and medications. Many patients like SMS text, educational videos or motivational short

video clips from providers.

Ecological momentary assessment (EMA) is a particularly promising method for mMH care, in capturing more accurate accounts of a client's emotions, functioning, and activity related to mood anxiety and smoking (29-31). This method involves the repeated sampling of naturalistic behaviors and experiences—in other words, it enhances assessment. EMA has evolved from paper-and-pencil diary methods (e.g., medication calendars) to current use of smartphones that capture immediate self-reports while respondents carry out their daily lives.

Examples of EMA commonly used are daily diary methods, signal-dependent reporting, and event-dependent reporting. Daily diaries report on events and mood at the end of the day and are subject to bias from recall and social desirability. Signal-dependent reporting involves the client reporting on symptoms at random intervals during the day in response to an alarm. Event-dependent reporting has the client report on symptoms after predetermined interpersonal or challenging events during the day. Of the three, signal-and event-dependent reports are more accurate and yet, they demand a level of engagement and motivation that may exceed the capacity of some participants (32). Smartphones and wearable sensors have better potential to capture an accurate picture of a patient's symptoms in real time and are less intensive.

mMH and MH/Psych apps

Once again, trends in mHealth point to how things develop for mMH, but the latter's evolution may be similar and/or different. A review of mMH studies showed that text messaging was used in a wide range of mental health situations, notably substance abuse (31%), schizophrenia (22%), and affective disorders (17%) (33). Text messages were used in four ways: reminders (14%), information (17%), supportive messages (42%), and self-monitoring procedures (42%); and in combination. Most papers described pilot studies, while some randomized controlled trials (RCTs) reported improved treatment adherence, symptom surveillance, appointment attendance, and satisfaction with management and health care services. SMS text messaging cannot be used as a remote counseling tool like other telemedicine devices (7), but even a few words and a simple message can have an important impact. Personalization, caring sentiments, and polite text are associated with more successful preventative messages (34).

EMA is particularly well-suited for and widely used

in mMH. A predictive analytic approach and functional data analysis applied to EMA data connected changes in affect with subsequent risk of suicidal ideation (35). Once more predictive models are developed and validated, self-management interventions could assist individuals or their caregivers in responding to future risks. Patients with bipolar disorder, schizophrenia, and other serious mental illnesses accept and are capable of participating in EMA studies, even if they are not users of mobile devices; study completion rates have been high in these samples (36). A good example is greater concordance between smartphone-captured mood ratings and clinician-rated affective symptoms than between paper-and-pencil mood ratings and clinician ratings (37). More complex systems that elicit data on multiple aspects of symptom and present summary feedback to respondents in graphical form facilitate self-management. Moreover, repeated data collection also enables modeling of within-person trajectories and temporal sequences of behavior (38).

Psych apps are used for many functions, including to: (I) communicate with other patients, caregivers, social supports, or providers; (II) augment psychotherapy and medical support with journaling, diaries, symptom tracking tools, and psychoeducation between clinic appointments; (III) (smart) monitor, that is, to use tools to predict relapse behavior or worsening affective symptoms, through sensors and data activity; (IV) to practice self-assessment and care through reflection about their symptoms; (V) make learning more interactive than traditional paper homework; and (VI) organize long-term activities, moods, and therapy homework (20,39,40). Since patients often forget key events between visits, logging “symptoms, affect, behavior, and cognitions close in time to experience” helps with reporting of symptoms (41).

Various mobile apps, especially those focusing on self-help in dealing with anxiety disorders, wellness and stress reduction, have been adjusted so that various patient groups may benefit from them (42). One example is a “Fear Fighter”, computer guided self-exposure approach to treat phobia/panic developed at the end of last century (6). Exposure therapy is effective for phobia/panic but qualified and trained therapist resources are scarce. By using a computer-guided approach that makes most of the treatment suggestions, and still achieves formidable results, both patient and clinicians achieve benefits by saving time and enhancing health care efficiency. An app called PTSD Coach (<http://www.ptsd.va.gov/public/pages/PTSDCoach.asp>) has been designed by the National Center for

Telehealth and Technology to help veterans learn about and manage symptoms that commonly occur after trauma (6). It also has direct links to support and help; such apps are not designed to act as a substitute for treatment.

Psych apps are used to supplement or complement psychotherapy. Journaling, diaries, symptom tracking tools, and psychoeducation add to in-person clinic appointments. These encourage self-assessment, reflection about symptoms; and make learning more interactive. Apps are both empowering and reinforce action toward illness-specific education, treatment resource location, and tracking of treatment progress (43). Soldiers prefer to complete psychometric measures [e.g., Patient Health Questionnaire (PHQ) or PHQ-9] and other military population measures by iPhone rather than paper or computer due to its interface, portability, and convenience (44).

One promising area is supporting patients in attendance to treatment, which is a common reason psychiatric treatment fail to produce intended outcomes. Unfortunately, only about half of all patients obtain psychiatric treatment (45) due to stigma and poor insight. Direct or remote education, motivation and support may increase attendance (i.e., treatment readiness), recognition of treatment benefits, and enhance collaboration between care providers—all contribute to a positive psychiatric treatment (46). Recent patient-centered strategies that increase patient attendance and adherence to treatment include simple mail, telephone or SMS reminders (47).

A search revealed 166 and 240 psychiatry apps on the Apple and the Android stores, respectively. Medical students (N=185; 66.7%) have between 1–5 medical smartphone apps, used mainly for classroom and clinic purposes; 95.2% of the students indicated that having a psychiatry smartphone application would be useful, preferably with textbook contents and clinical videos embedded (48); there is a scarcity of high-quality, comprehensive, textbook grade e-learning materials (48). App designers are rarely clinicians or trainees, but if they were, there may be better accuracy of the content (49) and buy-in to use apps (50). The barriers for clinicians are typically anxiety/fear and a lack of technical skills (e.g., coding in computer programming language) and time. As with the implementation with electronic health records (EHRs), the role of physicians is cursory input on workflow or employing a leader such that he/she may then influence peers; companies who are more progressive may include them for better design (and perhaps for marketing purposes).

Internet and other technology-based options for patients, caregivers and clinicians

The eMH spectrum of how people, patients, caregivers and providers use technology (6) (*Table 1*) and particularly the internet began long before the advance of, but now overlaps with, the evolution of mHealth. The spectrum provides context, though, and data on its components informs mHealth, particularly mMH. While it technically might not matter if people/patients access this material while stationary or mobile, it may be helpful to research the trends in this and understand the differences.

The users of the Internet are mostly female (86% *vs.* 73% of men) and seek information on diseases or medical problems, treatments or procedures, doctors or other health professionals, hospitals or other medical facilities, food safety or recalls, drug safety or recalls, and pregnancy and childbirth (8). Caregivers (a term used for adults who provide unpaid care to a parent, child, friend or other loved ones) usually have access to the Internet (79%) and of those, 88% look online for health information. One's education affects use (89% of those with a college degree *vs.* 70% with a high school degree *vs.* 38% without a high school diploma). Income is a predictor as well (95% with household income \$75,000+ and 57% with ≤ \$30,000).

A systematic review of 18 studies of the effectiveness of young people aged 14–25 seeking online MH help (N=18) reported high satisfaction and higher use by females (51). A key avenue is consumer driven sites where individuals connect with others in the community who are experiencing similar medical issues [e.g., PatientsLikeMe (<http://www.patientslikeme.com/>)]. Young people with developmental challenges may have few traditional care options and feel more comfortable sharing experiences and trying to learn new behaviors anonymously or at a distance (52). Comfortable with Internet-based chats and groups, they may even express ideas of self-harm, negative affective states, or pessimistic cognitions of other peers (53). No studies have been done to see if these concerning declarations are to be taken literally and if they are shared with parents and/or professionals.

In a community sample in France, young adults were assessed for eMH patient-related factors, use of eMH care and the impact on use of conventional services for MH care (54). Factors were organized into: (I) predisposing factors (age, sex, educational attainment, professional activity, living with a partner, children, childhood negative events, chronic somatic disease, parental history of

depression); (II) enabling factors (social support, financial difficulties, parents' income); and (III) needs-related factors (lifetime major depression or anxiety disorders, suicidal ideation, ADHD, cannabis use). Overall, 8.65% (105/1,214) of participants reported seeking eMH care in cases of psychological difficulties in the preceding 12 months and 15.7% reported psychological difficulties. The likelihood of eMH care was positively associated with lifetime major depression/anxiety disorder and lifetime suicidal ideation; the predisposing factor of childhood life events was negatively correlated. EMH care did not hinder traditional care, but was associated with face-to-face psychotherapy.

Support groups and participation in a “community”

Most support groups are for consumers and patients, based on the following premises: (I) knowledge affects changes in behaviors; (II) peer support/feedback may induce such changes (or in some cases, the opposite); and (III) even informal contact by e-mail, chat or telephone with a health care provider feels personalized and affects such changes. Internet-mediated support groups can include specialized groups for individuals with disabilities or unique modes of experience (55).

Web-based support has coalesced in MH around certain consumers, patients and other (e.g., caregiver) populations. A summary of these populations (6) includes:

- (I) Individuals with stigmatizing or rare illness with social isolation;
- (II) Schizotypal personality disorder patients, who have interest in social interaction on the Web (6) and interpersonal relationships without the usual in-person difficulties;
- (III) Military personnel re-entry into regular life, whose fear of stigma reduces help-seeking and who prefer technology-based platforms (e.g., 33% of personnel were more willing to use a technology-based platform for MH care than talk to a counselor in-person);
- (IV) In about 2/3 of studies, caregivers who use Internet-based services have significantly reduced stress and improved quality of life for MH disorders (14). They use interactive communities to bulletin board therapy groups. Family caregivers located in rural areas found e-health support to be beneficial in comparison with conventional caregiver support (56).

Structured information and tools for self-directed habit, lifestyle or illness changes

These tools typically target good habits/health promotion, disease prevention, and informal management of symptoms or problems. Techniques might include use of a diary, a questionnaire or survey to provoke reflection or “stepping back” to re-evaluate one’s assumptions in a conclusion. Exercise and substance (i.e., alcohol) logs are popular, mood assessments (MoodyMe <https://itunes.apple.com/us/app/moody-me-mood-diary-tracker/id411567371?mt=8>), and those that map behavior patterns across time, including triggers, diet, sleep and other related factors.

Young people may benefit from structured health information, web-based screening and assessment, and online treatment options—across many settings—as free-standing promotion sites, programs at school, and combination home/primary care settings or home/MH specialist settings. Many Internet interventions have been developed to provide broad MH promotion in children and adolescents: Kindertelefoon (www.kindertelefoon.nl), YooMagazine (www.Yoomagazine.net), Ciao, ReachOut (www.reach-out.org) and Walkalong (www.walkalong.ca).

Informal advice from health professionals without guidance

A common misconception is that psychotic patients are not eligible for remote consultations and they do not use of technology, in general. This is attributed to stimulus overflow and inability to deal with the abundance of information, difficulties with concentration during psychosis, lack of energy, paranoid ideas and fear of symptom provocation. However, they successfully use the Internet for information related to their illness and medication (e.g., side effects and the hope of finding better medication) (57,58). On the other hand, patients may feel the need to guard themselves against excess information that Internet frequently offers. Health promotion strategies are typically at freestanding websites.

Some of the above options, while not considered “care”, involve some oversight by MH providers (e.g., depression). This usually involves bulletin boards with occasional comments or steering by professionals. For example, in an asynchronous chat group with education, the provider can participate periodically (e.g., paper, video or other) based on the discussion to provide information, corrections of misunderstood concepts or distortions, or review of self-

report measures with a follow-up piece of advice. The “best” outcome of one of these forums is when a patient is referred to see a professional when things are not simple or there is a perception by the facilitator that too many concurrent problems are at-hand.

In a recent study, researchers reviewed the public social networking accounts of college students to assess for symptoms of depression, finding that 25% exhibited depressive symptoms based upon the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) criteria, and 2.5% met the criteria for major depressive disorder. Online reinforcement from their friends may have made them more likely to discuss their depressive symptoms publicly via social networking sites (59).

Support and self-help programs are delivered via Internet especially to rural areas but also within urban environments—for patients and caregivers. These allow anonymous questions, offer relevant treatment ideas, and provide self-help interventions without stigma (e.g., severe mentally ill or individuals with drinking problem) (60). The range of initiatives for support for caregivers includes hotlines for consultation on key decisions (i.e., decision support), psychosocial/CBT (individual or group), problem solving training, coaching for positive parenting skills (e.g., Internet- or app-based follow-up assessment and engagement of treatment), and use of formal questionnaires to self-diagnose and refer loved ones (e.g., patient health questionnaire for depression; hospital anxiety and depression scale).

Traditional clinician-assisted decisions, telepsychiatric care and other evidence-based options

The least structured of these options is patient-doctor correspondence integrated with clinical care and the EHR. As the Internet increases level of knowledge and information amount regarding specific illness, the users may easier talk to their doctor regarding their specific conditions and potential treatment options (13). Schizophrenic patients especially perceive the shift in hierarchy to a more equal relationship. This may be attributed to a sense of partnership or shared decision-making, which equalizes the informational and power symmetry between doctors and patients—both parties share information and develop consensus in a decision (61). A study about active discussions regarding continuation or discontinuation of an antipsychotic depot medication in patients with schizophrenia led to 87% of 96 patients continuing

medication—a very high rate. In this respect, a specific advantage for patients with psychosis is not having to face another person, but still being able to gain information and interact with others without feeling devalued or unsafe (58).

Internet-based cognitive behavioral therapy (ICBT) and other evidence-based treatments are most often for patients with depression and anxiety based on a new review (62) and past summaries (8). ICBT appears to be effective when delivered in clinical practice (i.e., guided by a qualified therapist (63,64). Effect size and recovery rates were comparable to, or somewhat superior to, in-person CBT (65). Internet-based cognitive therapy (CT) is often combined with text messages (mobile cognitive therapy; mCT) and therapist e-mail and telephone contact—this prevents relapse in depression, is acceptable and is feasible for both patients and therapists (66). Online MH interventions are also as effective as traditional in-person therapy for disorders such as depression and anxiety (67-69). In a 30-month study using CBT for social phobia research, the long-term effects of in-person delivered CBT was comparable to Internet-based treatment (68).

Asynchronous telepsychiatry (ATP) to primary care is feasible, valid and reliable in English and Spanish-speaking patients in primary care (9). Similar methods are used in radiology, dermatology, ophthalmology, cardiology and pathology. One ATP model uses a basic questionnaire for screening by the provider of the patient, video capture of that interview, and uploading of patient histories for a remote psychiatrist for review in a HIPAA-adherent manner (9). Diagnosis and treatment recommendations are made and PCPs implement care successfully about 80% of the time and the model is cost-effective.

Synchronous TP (STP) or TMH models of clinical care and education have pros and cons (6,7), including their level of overall intensity, cost, feasibility and depth of the relationship between the eMH provider, the PCP and patient. A range of low to high intensity models from tele-education to videoconferencing has been described (70-72). A systematic approach funded by a grant in the USA developed a multi-specialty phone and email teleconsultation system for adults and children with developmental disabilities (6).

The adult practice guidelines for TMH health and other such practice parameters cover the approach, scope, clinical, administrative and technical aspects of services for adults and a new one for children and adolescent patients is in progress. This is needed as child and adolescent mental healthcare clinicians contend with specialized populations

(e.g., developmental disorders), family and systems work, a variety of treatment modalities (e.g., parent management, play therapy) and settings (e.g., corrections/juvenile hall, school). These guidelines, though, do not cover all the new nooks and crannies of technology innovations (e.g., communications between professionals and clients or patients via texting, e-mail, chatting, social network sites, online “coaching” or other non-MH services). They do offer suggestions as a starting place to consider adjustments and control quality for the new technologies (e.g., licensing, emergency management, mandatory reporting and ethical issues). For new technologies, verification of provider names, credentials and sources to check the information on the professional and the patient is even more important to avoid security breaches.

Clinical care, training/education, system administration: approaches and preliminary guidelines

Technology integrated into clinical practice

The new application of telehealth modalities to one’s practice must be carefully selected, discussed with patients, and adaptable to the rapidly changing literature (*Figure 2*). When first selecting which modalities to add or subtract from one’s practices, recommendations should be considered, as is with the addition or change of any medical protocol. Considerations when applying a new model include the following:

- (I) The patient. Depending on comfort, familiarity with technology and/or the provider, the individual patient may have varying degrees of receptiveness to a specific telehealth model. The patient’s willingness to engage and favorable opinion is a key factor to the success of implementation and efficacy on improved healthcare delivery. Evaluation should also consider which technology is accessible, practical and feasible given the patient’s access to electronic products. The patient’s familiarity may also play into the patient’s view of the clinician as a professional (i.e., some may prefer in-person interactions; others may feel they are receiving higher quality of care through technological adjuncts). When adding technology to one’s practice, it is key to be aware of primary and secondary languages of the patient, and when

differences arise, an in-person or telephone-based interpreter may be needed. For asynchronous communication—which often involves “short-hand” or abbreviated words and/or symbols, the cultural context is also important.

- (II) The disease. The technology modality chosen must be appropriate and effective for the natural history of the disease. Chronic diseases may have a severe impact on quality of life that may benefit from the support of an online support group chat. Chronic medical conditions requiring constant monitoring not feasible through in-person visits, such as diabetes mellitus or hypertension, could benefit from the use of wearable devices and/or the submission of data to the practitioner. For all diseases, patient understanding of pathophysiology and/or treatment regimens may be improved by the adjunct of at-home reading done by the patient through online portals. Thus, the appropriate technological modality should be applied to maximize individual patient benefit and avoid difficulties.
- (III) The provider. Before offering contact, communication and “care” via additional technologies, the provider must ensure that he/she has the time and resources to provide and maintain the quality and consistency of care. It is suggested to discuss expectations of the new modality and if the telehealth modality is offered in replacement of some in-person services (i.e., synchronous technology, at-home reading rather than in-person educational sessions) or as an additional adjunct. Frankly, it may or may not be possible to provide the same level of care via the technology being added.

Training and education

To date, only TP competencies have been published (73) but there has been a call for social media, mHealth, psych and MH app and other competencies (6) (*Figure 3*). The TP were based on ACGME and CanMEDs, but simplified into three levels that better fit learner levels and across disciplines:

- (I) Novice or advanced beginner (e.g., advanced medical student, early resident, or other trainees);
- (II) Competent/proficient (e.g., advanced resident, graduating resident, faculty, attending, or

Fundamental issues and components of evaluating care

Keep it simple by picking 1–2 foci to evaluate (e.g., depression as a diagnosis; the impact of one technology like mobile apps)

Use a known standard of evaluation (i.e., PHQ-9 for depression; adapt a telepsychiatric satisfaction instrument for a mobile app)

Customize patient outcome targets (e.g., social engagement if that had lessened due to depression; how the mobile health helped)

Measure satisfaction with an existing 5 to 10 item survey for regular care and one technology options (e.g., a chat room or a diary for depression)

Contextualize the evaluation with a specific population or clinical setting

Age or population (e.g., for patients over 60; outpatient; use of substance by screening with the AUDIT)

Disorder-specific (e.g., plan for tracking suicidal ideation for a depressed patient, in general, or if a teenager due to high risk)

Employ a log/diary by the patient and the clinician about

The experience, overall

How and what technology was used and the relative frequency, too (e.g., texting 3 times/week)

Questions, reflections and considerations for patients

What am I seeking when I choose to view a website, visit a chat room, get an informal suggestion or work with a clinician directly?

What are my means: time, \$, and other resources?

What is my learning style: alone vs. group of learners, reading versus doing something, prefer a little versus a lot of instruction?

Do I experience my provider the same or differently at a distance, and what expectations did I have that I was not fully aware of?

How intensive of a treatment do I want and how much should I “connect” in-person and online?

How do I choose a clinician based on information on the Internet, screening them by phone or in meeting them?

How do I pick the “best” technology option?

Clinical care issues for the provider related to patient care.

Do the new technologies and associated behaviors affect the therapeutic relationship, clinical approach and treatment plan?

Is tradition care complemented by technology-based options that are patient-driven?

Is there a shift in my action (e.g., am I doing things ‘outside’ the regular ‘hour’?), is it paid for, and what are the unanticipated consequences?

Did I do things better/worse than expected, what are my technology-based strengths and did I have any unusual reactions?

Did the patient and I talk about the options, work together to select the plan, and how should be continue to discuss this?

Questions for clinical, program and system administration

Are we using a standard approach or was it left to chance or played out spontaneously?

What are we measuring and what is the best way to do it?

How often are participants “checking in” offline, is it spontaneous/cued, is it tracked/reviewed, and are the important points fed back into the process of care?

What are the outcomes we are measuring for patients, family, clinicians and systems?

Can the technology help us use resources better, as interdisciplinary teams help us in providing a range of services in stepped care?

How does technology affect folks from the care coordinator to those with the most complex clinician roles and responsibilities

What additional resources (i.e., time, \$, staff/manager/medical director/administrative director, trainings) are necessary to use new technologies?

Figure 2 Tips on clinical, program and system issues, outcomes and evaluation related to new technology options. PHQ, Patient Health Questionnaire; AUDIT, Alcohol Use Disorders Identification Test.

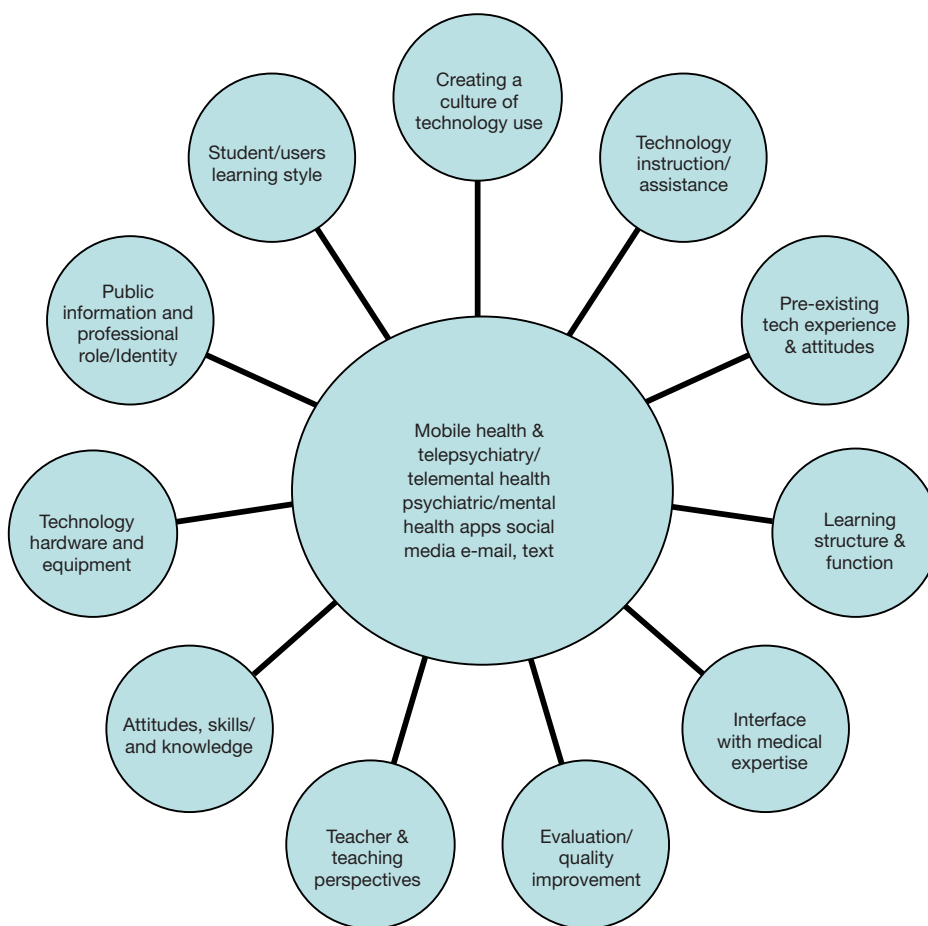


Figure 3 Creating a culture of technology use for patients, students, clinicians and administration.

interdisciplinary team member);

- (III) Expert (e.g., advanced faculty, attending, or interdisciplinary team member).

The areas described in the TP competencies are patient care, systems-based practice communication, knowledge and practice-based learning. An interdisciplinary group has developed a framework for TMH health competencies (74).

Several strategies help providers to build and maintain competencies. Providers and trainees may complete self-study in many ways. There is a range of online resources that provide dynamic information on the changing telemedicine landscape: (I) professional organizations (e.g., American Telemedicine Association); (II) telehealth resource centers; (III) federal resources; (IV) grant-supported resources; and (V) private companies. Increasingly, training programs are incorporating TMH health rotations and seminars to teach technological approaches to health care.

Developing an administrative approach

An approach to clinical care, training/education and system administration includes setting patient-centered goals, evaluation, quality improvement and many other steps for healthcare with a new technology-based (Figure 2). Program evaluation with contributions from all participants has become increasingly important to meet program, patient, provider, and externally driven administrative (e.g., Joint Commission) and reimbursement [e.g., Center for Medicaid and Medicare Services (CMS)]; more accountability is expected by both consumers and payers. The Institute for Healthcare Improvement (IHI) is assisting healthcare systems in their transformation to higher-quality systems (75). For example, one of its initiatives is the Triple Aim, which consists of: (I) better population health; (II) better patient experience of care and better quality

and safety of care and (III) reduced cost. Contemporary program evaluation and outcome work is a substantial shift in philosophical approach for some, from seeing what happens with planned services to planning the outcomes and then designing the services—in advance. Now, it is patient- and outcome-centered, whereby the end product determines what is built or put in place—hence assessment includes satisfaction, technology, cost, clinical, process of care, and other outcomes—iterative feedback, adjustments and further study make it useful.

Parameters and methods fall into three basic frameworks that naturally overlap with one another: (I) research measures, in the form of feasibility, validity, reliability, satisfaction, costs and outcomes; (II) clinical care measures (e.g., mood questionnaires; habit diaries; utilization of health services); and (III) customized measures for technologies. Suggestions:

- (I) Pick 1–2 things to measure rather than trying to measure everything (e.g., an app for substance); how frequently is the app used, frequency of near misses of or actual use of substances;
- (II) Pick an outcome that has high heuristic value (e.g., substance relapse; averted suicide; frequency of increased visits cued by using an app);
- (III) Adopt standardized measures already used in the literature; they typically have undergone multiple iterations, levels of review and psychometric testing;
- (IV) Use a readily available, easy to use self-report instrument or program;
- (V) Collect data prospectively rather than retrospectively, with some exceptions;
- (VI) If possible, pick a regular evaluation interval (e.g., beginning and then 3-, 6- and 12-month).
- (VII) Follow guidelines, but assess their liabilities to anticipate problems, take corrective actions, and generalize findings among different patients;
- (VIII) Identify who has the responsibility to prevent, identify, and correct the issues: patients, providers, or programs? If patient care requires increased responsibility, are clinicians ready, and what support do they need? If providers have to adjust roles and responsibilities, do it proactively, too.

Guidelines

Guidelines tangibly help by providing clinical criteria, protocols, algorithms, review criteria, and other

components—all aimed to help clinicians make the best clinical decisions, avoid bad outcomes, and to provide an approach in uncharted circumstances. The need for an evidence-based guideline on the use of medicine-related apps has been suggested by several parties (76-78). When dealing with apps, different aspects apply and these depend not only on the context, but also on the different “levels” one needs to consider. Therefore, the proposed guideline is subdivided into three sections: level 1 considers the global app level, that is, its purpose, where it fits in or provides an alternative, conflicts of interest, and registration (if any); level 2 focuses on content and process based on evidence-based systems and reporting [e.g., PRISMA (79); so pre-selection of studies provided by an app should not be classified as a systematic review with extracted information prepared in a “take home” summary]; and level 3 considers structured, formal assessment with outcome data (77). The Healthcare Information and Management Systems Society (HIMSS) has created assessment guidelines for mobile technologies (80).

A summary of suggestions on how to use e-mail, social media, and other technologies (*Figure 4*) may be helpful, and though they are not evidence-based, a number of them have come from prominent organizations internationally (81-85). They fall back on sound in-person ethical, legal and other administrative procedures from in-person and technologies used for some time (e.g., telemedicine). For example, requests for contact between visits (e.g., texts, e-mails) are increasing due to time online, and if responded to, they should be sent during regular working hours to attend to expectation and boundary issues (6). Asynchronous written or email language is good for answering yes/no questions, trading a piece of information (e.g., confirming appointment, medication side effect); these methods do not afford vocal nuances and accompanying body language, which may lead to misinterpretations and other unexpected consequences. Other preliminary guidelines discuss concerns about patient privacy, professional image, confidentiality, and defined expectations for use in general. Many organizations have specifically made recommendations about professionalism and social media [e.g., The American College of Physicians, Canadian Medical Association (6)].

Discussion

Perhaps no emerging technology development both fits with PCC—and provides challenges to providers—than

General

Maintain professionalism at all times—follow institutional policies, “assume that all information exchanged is public and posted in a medium no different than a newspaper”, and maintain a disclaimer

Be authentic, have fun, and do not be afraid—“the only way to create meaningful relationships over social media is to be genuine”

Ask for help—pay attention to “how people interact (e.g., etiquette)” and “mimic the social media service and community’s practices (so long as they are professional)”

Traditional EMH or TMH/TP care guidelines

The adult ATA TMH Guideline

AACAP Practice Parameter and steps toward a formal guideline (81)

Key considerations for website health information, texting and e-mail

Health information on the Internet for persons, patients, and caregivers is rarely regulated. When possible, seek out information from organizations/institutions/businesses that have some oversight/expertise (e.g., the National Institutes of Health; specific disorder agencies like the Depression and Bipolar Support Alliance)

Be cautious, due to unclear privacy/confidentiality issues, about use of new digital communication from one user to another user using standard protocols (i.e., e-mail, SMS text messaging, MMS messaging, and instant messaging. The issues appear to be similar for proprietary networks (e.g., Twitter direct messages, Facebook Messenger, Epic MyChart electronic medical record messaging, my HealthVet electronic medical record messaging)

Requests for other contact between visits (e.g., texts, emails) with asynchronous modalities are good for some things (e.g., answering yes/no questions, trading a piece of information) but not other things (i.e., emergencies, complex decisions). Attend to expectation, boundary and nuances in communication of one mode versus another

Use e-mail, text, instant messaging only for patients who maintain in-person follow-up

Social media

Be mindful of privacy, professional image, confidentiality, and expectations for use in general and for social media (82); follow institutional policies

Consider pros/cons of gathering information about patients: intent, use and implications

Physician-produced blogs, microblogs, and comments: “pause before posting” and “step back” to consider what is conveyed to the public about the physician and the profession

Professionalism beyond social media

Contextualize decision-making in terms of professionalism and follow the lead of organizations have specifically made recommendations about professionalism and social media (e.g., The American College of Physicians, Canadian Medical Association, and British Medical Association) (83)

Separate personal and professional life (84), if it can be done

Contextualize approaches based on education/training/supervisory issues

Internet-based videoconferencing guidelines

The American Telemedicine Association Practice Guidelines for Video-Based Online Mental Health Services cover teleMH (TMH) services (85)

Follow state (e.g., licensing laws), federal, and other regional

Verify provider and patient information

Figure 4 Synopsis of guidelines for the eMH spectrum of service. MMS, multiple messaging service.

mHealth. Patient participation, leadership and sharing of preferences, experiences and outcomes are becoming a standard in healthcare and it is a great opportunity for patients and providers to collaborate. The eMH spectrum provides some orientation to changes in technology and yet mHealth is moving so fast that it may outdate this conception. For clinicians, there are a variety of goals to integrating new technology into one's practice and the question will be how fast is too fast to apply changes to one's practice in order to avoid hasty changes and the need to have a plan, procedure and/or protocol.

Competencies for clinicians are needed for mHealth, social media and other new technologies in the eMH spectrum, similar to those in TP (73). Clinicians have to become aware of, adapt to, and clinically oversee some or all of these new technology options in order to provide the best care—this means adding to or upgrading all parts of clinical care (e.g., review of decision-making, new advisory roles to patients, greater complexity of care, hybrid models of care). This also impacts standards for professionalism, privacy/confidentiality, tracking of data, evaluation and general practice management. It is critical that clinicians increase their awareness and understanding of mHealth options to understand patients' concerns, changes in the therapeutic relationship, and potential positive/negative effects on outcomes. MH providers may soon practice in-person, virtually, or both, but how they spend their time may change (e.g., 1/2 traditional, 1/4 review of tech results, and 1/4 interdisciplinary team leadership). Clinicians, clinical managers and administrators need to shift their philosophy—from seeing what happens—to designing the services in advance to achieve outcomes.

More research is needed on the application of new technologies to clinical care, with attention to methods, outcomes and linkage (if any) with other care options, particularly in the form of randomized trials and study of health service delivery models with an emphasis on effectiveness. Relatively few studies assess outcomes, compare in-person and eMH care, and or compare technology-based care options to one another; hybrid models of care have emerged, but have not been studied. A number of studies and projects are well underway to demonstrate the utility of combined mobile data collection to improve our understanding of psychopathology (86). ICT-4Depression, a European 7th Framework Program for Research and Technological Development (FP7) project, is collecting EMA through a combination of mobile phone and web-based self-report assessment, using wearable

sensors and recording electrophysiological measures (87). An algorithmic computation of the data to predict a patient's current and future mental health states occurs through a monitoring program with real-time support to patients through smartphones and the Internet (87). It is also likely that EMA data collected electronically and be tied to EHRs to enhance our knowledge regarding who responds to some treatments and who responds best to others.

A dilemma exists, currently, in which neither public nor private, top-down nor bottom-up and country-specific nor international approaches related to apps is providing a framework to develop, evaluate and regulate to mHealth care. The result is a chaotic mix of apps of varying degrees of usefulness, quality, effectiveness and danger. A common vocabulary and set of quality standards for the review of health apps would benefit both end users, industry participants and governments by encouraging developers to secure favorable ratings by meeting the standards. Creation and adoption of review standards by an international, interdisciplinary consortium could reduce many of the barriers currently keeping mHealth technologies from becoming routine in providing healthcare worldwide. Ideally, such a consortium would be open to all who are involved in healthcare, including consumers, clinicians, academia, business, technology, education, professional and advocacy organizations (88). Such a consortium could initially coalesce around developing definitions, standards and quality assessment methods, such as a toolkit for app review (89), along with ethical standards (90).

Conclusions

mHealth, telemedicine and other services are considered part of a TMH health or eMH spectrum of care. mHealth offers excellent access, portability and low cost options. Like web- and Internet-based resources, the options are remarkably popular with the public, patients and providers—this is a new era of medicine. Patients are empowered by increased access to information and their providers. Exploring options as part of the initial and longitudinal care helps patients initiate, participate and steer their care. Clinicians have to become aware of, adapt to, use sound clinical judgment, and serve new advisory roles to patients, as we are all challenged to keep the best of MH care while making it more accessible. Prioritization of outcomes and evaluation in the provision of clinical services is important—any time that participants start to try some new technology.

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Footnote

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