Interactive Mobile Health and Rehabilitation
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iMHere is a mHealth platform for providing clinician guided self-care to patients with chronic diseases or for real-time assessment/intervention to individuals as they go about their daily lives. The system connects patient apps with a web-based clinician portal over a secure two-way Internet bridge. Clinician customized treatment plans (regimens, assessment/intervention) are remotely delivered to patient smartphones. The smartphone, in turn, delivers reminders to patients to perform self-care routine tasks while gathering information regarding complications and progress from the patient. Information is continuously shared between portal and smartphone, delivering up-to-the-minute correspondence between patient and clinician.
iMHere’s Role

The monitoring and maintenance of chronic diseases requires constant vigilance on the part of the patient. It has been shown that guided self-care can produce remarkably improved outcomes for these types of patients. Traditional face-to-face methods for delivering guided self-care face a number of limitations. The radius of care for a particular clinician is limited to the range that is convenient for patients to travel. Patients with chronic disease may find traveling any distance burdensome. Additionally, overseeing the individualized care plans of multiple patients is a time consuming endeavor without the proper tools. iM-Here seeks to overcome these limitations by providing clinicians with a system to remotely deliver and efficiently monitor customized self-care plans to patients, and providing patients with reminders to follow those plans.
What Makes iMHere Unique

What separates iMHere from other selfcare reminder apps and web-based portals is its unique communication architecture. iMHere not only connects patient and clinician through care-plans; the system keeps them in continuous “live” contact. Clinician/Patient interaction occurs in real time: new instructions are received by the patient moments after the clinician enters them, and patient responses are immediately available for clinician review. Patients may report problems to their clinician, and the clinician can immediately make adjustments. iMHere forms a continuous, secure, internet based communication bridge, between patient and clinician platforms, that spans any distance. On the patient side there are disease state specific smartphone apps, and on the clinician side there is a web-based portal.

- Behavioral Modification
- Self Management
- Adherence to Regimen

Patient - APP

Clinician - Web-portal

Internet Bridge

Real-Time Two-Way Communication
The Patient Apps

Each chronic disease comes with its own set of challenges. Via smartphone, iMHere provides patients with apps that target the self-care needs of specific chronic diseases. For example, a suite of apps for spina bifida patients would address skincare, bowel and bladder management, and other concerns unique to spina bifida, whereas a diabetes suite would contain apps for nutrition and glucose monitoring. The apps remind the patient to perform specific self-care tasks or record periodic data points (such as glucose level), while collecting and organizing information about compliance and complications for the clinician portal.
The Clinician Portal

The clinician portal is a web-based tool for clinicians (typically a nurse coordinator or case manager) to schedule self-care plans and review feedback from many patients at once. It is designed to quickly locate patient responses that require attention by means of the dashboard. iMHere gathers daily input from multiple patients regarding multiple areas of self-care. The dashboard organizes this large quantity of information in a way that can be quickly reviewed by a clinician. The portal performs a preliminary “triage”; categorizing, flagging, and organizing all patient responses based on need for attention. The portal dashboard allows at-a-glance review of all patient activity, provides comprehensive data on every patient, and analytics services for an individual or aggregate patients.
The iMHere Bridge

At the heart of iMHere is the two-way, dynamic, real-time communication bridge between patient apps and clinician portal. All communication between apps and portal is encrypted and securely communicated via the internet and wireless broadband. In addition to its real-time capabilities, which require uninterrupted wireless data service to the patient device, iMHere is capable of delivering its full spectrum of features even in areas with a spotty data service. With iMHere the patient always has local access to their apps, their schedules, and all of their data.

<table>
<thead>
<tr>
<th>Feature</th>
<th>iMHere</th>
<th>Health Portal</th>
<th>Apps</th>
<th>Reference Apps</th>
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<tr>
<td>2-way Real-time Communication</td>
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<td>Treatment plans sent directly to App</td>
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<td>App Sends Monitoring data</td>
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<td>Apps work without data connection</td>
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<tr>
<td>Advanced Security Features</td>
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</table>
The iMHere Bridge

iMHere accomplishes this by storing data both on the client and server side of the platform. When iMHere apps detect that no connection is available, patient activity is stored and queued for synchronization. Synchronization between app and portal occurs as soon as a new connection is established. Likewise the clinician portal always shows the connection status of each of the registered patient clients. This affords the patient the best of both worlds: uninterrupted use of iMHere apps regardless of current connection status, and up to date portal synchronization the moment connection is resumed. Because patient data is stored locally on the patients’ device, as an additional security feature, the patient’s device is able to wipe all of its sensitive health information data in the event the device is lost. The communication architecture of iMHere is what truly sets it apart from other mHealth applications.
iMHere Applications

There are many benefits intrinsic to the iMHere platform. The always-on and always-on-hand nature of a smartphone make it ideal for delivering routine reminders. The continuous, two-way, real-time communication enables the platform to exchange information between patient and physician when timeliness is of the essence. The extensive media capabilities of a smartphone give it vast potential for exchanging photos, video, and audio between patient and clinician. The utility of iMHere emerges though the development of applications that match specific patient needs with iMHere capabilities. This is best illustrated with specific examples of iMHere in action.
Complicated drug regimens are a characteristic of most chronic diseases. Conventionally, such medication schedules can be difficult to follow for the patient, and compliance is nearly impossible to determine for the clinician. The MyMeds app uses the iMHere platform to address both of these concerns. It keeps track of the patient’s medications, providing reminders to take the medications as prescribed. As patients respond to the reminders it tracks and reports adherence to the web-based portal, providing the clinician with alerts to missed doses, and tools to monitor overall medication compliance. Clinicians may set up drug schedules remotely from the clinician portal, or they may be entered or modified directly from the patients’ smartphone. This is an important feature as it allows patients to adjust their medication schedule to fit in with their lives, increasing adherence. The MyMeds app seeks to improve outcomes by giving patient and clinician a set of tools to evaluate, monitor, and modify drug regimens to maximize compliance.
Skincare - Media Enabled

Skin problems are characteristic of many chronic diseases. Any disease associated with impaired mobility or compromised circulation has this shared concern. The Skincare app allows patients to track the progress of skin problems by taking photographs with the smartphone’s digital camera. The app provides reminders to take photographs at regular intervals for comparison, and separate skin care incidents are organized case by case for both for the patient and clinician to review. Along with each photo the patient is prompted to choose descriptions of the skin’s current condition in terms of size, color, and thickness from drop down lists. These choices are used to red flag developments that demand immediate attention from the clinician. The skincare app provides the clinician with chronological photo-histories, whose severity has been classified by the patient, while providing the patient with support to perform routine self-monitoring of skin problems. The Skincare app applies the full spectrum of iMHere capabilities to achieve better outcomes for patients susceptible to skin complications through clinician directed and monitored preventive selfcare.
iMHere Applications

SmartCAT – Instant Intervention

SmartCAT is an app for treating and assessing teen anxiety. The “CAT” in SmartCAT stands for Child Anxiety Treatment. Traditional clinical assessment of anxiety is limited in that it relies on the patient relaying episodes of anxiety after the episode has occurred. This type of reporting has several limitations: is highly susceptible to recall bias, and it is not effective at determining how the anxiety changes over time or in various contexts (Shiffman, 2007). Ecological Momentary Assessment (EMA) is a method that seeks to overcome these limitations by repeatedly sampling the patient’s anxiety, in their natural environment, as they experience their everyday lives. Similarly, Ecological Momentary Interventions (EMI) are treatments administered to patients in their natural environments as they experience their anxiety.

SmartCAT facilitates EMA by routinely delivering reminders to take assessments, and conveniently collecting and reporting the data from these assessments. SmartCAT facilitates EMI by delivering interventions at the moment the patient is suffering an episode of anxiety. The patient can be in immediate contact with their clinician at the moment they are experiencing anxiety, and the clinician can send them multimedia interventions (such as relaxing videos) on demand. In addition to its technological capabilities, the smartphone offers an added benefit to EMA and EMI for teens suffering anxiety, its inconspicuousness. The smartphone is not only suitably portable, but virtually invisible in a world where cell phones are ubiquitous. SmartCAT empowers teens to participate and benefit from Ecological Momentary Assessment/Intervention in a way that is critically timely, convenient, and unobtrusive to their everyday lives.
Value Proposition for Stakeholders

iMHere seeks to provide continuous clinician oversight of the self-care of patients with chronic diseases and mental illness. Diligent and supervised self-care has been shown to dramatically reduce secondary complications associated with chronic illness, and shorten the duration complications that emerge in all populations. The result is increased wellness and reduced healthcare costs for the patient receiving this kind of care.

iMHere not only empowers patients with clinician enhanced preventive self-care, but it does so on a large scale; remotely and efficiently. The smartphone, by design, is a device that you can have with you, and powered on, at all times. The web-based portal provides a convenient clinician interface that can be accessed from anywhere. Together they make an ideal mHealth platform for continuous remote patient/clinician interaction. The portal allows many patients to be reviewed by a single clinician (nurse coordinator, case manager, wellness coordinator, or patient advocate), and in turn many front-end clinicians to be organized under one physician, thus minimizing the use of clinician resources and cost. The portability and remote connectivity of the smartphone permits patients to be located nearly anywhere, and have access to the system at any time, maximizing patient exposure to the system. These factors combined will facilitate nearly continuous remote acquisition of patient data, in a time and cost efficient manner, generating an unprecedented level of health information granularity, and individualized care. iMHere provides a new kind of preventive mHealth solution; improving outcomes, reducing costs, maximizing availability, and strategically targeting populations who stand to benefit the most.
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