Investigating the Use of Mobile Technology in Healthcare and Clinical Education

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Introduction

In 2011 Marc Andreessen, cofounder of Netscape and venture capitalist backing Facebook, Groupon, Skype, Twitter, Zynga and Foursquare, stated that we are on the verge of a new time, in a moment of change, disruptive change that is altering the landscape. Andreessen’s view is that healthcare and education are next in line for fundamental software-based transformation.¹ In 2010 the International Telecommunication Union reported expectations of five billion mobile phones subscriptions worldwide;² the Horizon Report (2011) stated that 80% of people will access the Internet from a mobile device by 2015, based on estimates of mobile manufacturer Ericsson.³ These mobile devices include laptops, smart phones, and tablet PCs. According to Pew Research, the number of US consumers owning tablet PCs jumped from 11% to 19% in December 2011. Combined with wireless networking capabilities, tablets make it easy to execute applications, engage in communication and collaboration, give immediate access to research sources, and offer ways to create and interact with content.⁴ As the world rapidly embraces technology as a new way of being, it is inevitable that the environment of healthcare and by extension the delivery of healthcare services would follow suit.

The adoption of new technologies, particularly mobile devices, has changed how many healthcare professionals engage in their daily work and care for patients. This change has migrated through the education of professional healthcare students, into their performance while on internships and fieldwork placements, and ultimately in their work as healthcare providers. This report is an introduction to mobile devices in healthcare education and the future potential for its use in both education and healthcare delivery.

**Clinical Education**

In education, mobile computing has the potential to expand the classroom and to further engage students in opportunities to learn through the ever-increasing array of mobile tools and applications available today. The ability of healthcare students to use new technologies in their education is also demonstrated in their performance during fieldwork or internship opportunities. In these opportunities, healthcare students are expected to apply the knowledge learned in the classroom with clients and provide service in their respective healthcare fields. This intersection of education and clinical delivery of services creates the opportunity for healthcare professionals to use new technology tools, learn new clinical skills of intervention in order to improve patient health, and develop a more efficient delivery of services.

Mobile technology is transforming the college experience, providing impressive ways to learn, research, communicate, and collaborate. These skills are transferred to the workplace where clinicians and graduates are integrating these skills into their daily interactions with clients. Dan McNally, associate professor and chair of the Science and Technology Department at Bryant University, stated that tablets are easy of use, and visual richness. In a study reviewed in Archives of Internal Medicine, researchers found that medical residents were saving, on average, an hour of work per day due to faster and easier access to patient records through the use of tablet devices. At the University of Chicago Medical School, doctors-in-training use the power of tablet computers as a tool for efficiently ordering tests and coordinating care for patients.

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7 Lenovo et. al. (2012) Instructional.
8 Lenovo et. al. (2012). Success Stories; Lenovo et. al. (2012) Instructional.
This study was conducted with 115 internal medicine students and presented results that indicated that tablets allowed four out of five students to be more efficient; 68% of the participants said that they avoided delays in patient care.

**Use in Clinical Settings**

Yan Xiao of Baylor Health Care Systems believes that there is a trend towards the integration of personal computing devices with electronic health records. Dr. Bhakti Patel, the lead author of the study at the University of Chicago, stated that this trend is driven by healthcare students and clinicians who are frustrated with the inability to spend more time with clients—the use of mobile devices allows them to be more accessible to clients instead of being bound to desktop computers.

In rehabilitation medicine, many therapists are using mobile devices on a regular basis especially when healthcare systems recognize the cost-benefits of technology use. The use of mobile devices allows the therapist to improve efficiency of documentation, and increase access to information for the best patient treatment option. Mobile devices also allow for the direct utilization of applications as interventions, such as organizational applications for memory supports, and visual perceptual applications for perceptual remediation. One example of an organization that adopted mobile technology was Holy Redeemer HomeCare, a Pennsylvania-based nonprofit healthcare provider. This organization purchased smart phones for all therapists and integrated this with a cloud-based system for accessibility. The applications on the smart phone included a “pathways” feature that enabled therapists to retrieve information on a critical pathway based on the patient’s condition and symptoms. A St. Louis hospital-based rehabilitation center, Rehabcare, adopted iPhone and iPad technology. Prior to incorporating this technology, the hospital reported that patient pre-admission screening was very time consuming, with multiple forms, and lengthy questionnaires. Jamee Ragland, an occupational therapist and director of operations, reported that “using a mobile technology device at point-of-care saves time.” On September 2, 2011 Apple launched an “iTunes room for Healthcare,” listing 50 apps for healthcare professionals. Apps used on the iPhone or iPad are the most common technologies used in the clinical field. Some examples such as Dragon’s Speaking allow the translation of the spoken word into printed form for those clients who have difficulty writing and the use of the video features to create visual sequence boards to adjunct organization and executive function skills.

11 Ibid.
The use of mobile applications as an intervention tool in therapy and rehabilitation is a new approach to intervention. Davis and Rocchio consider the range, diversity, and creativity of the mobile apps to be astounding, but consider the energy and speed at which the apps are being developed to be as equally astounding. Therapists are innovating their way to interventions with the use of apps confirming Davis and Rocchio’s statement that we have reached the tipping point and applications are now being self-generated by the community.\textsuperscript{12} The autism advocacy organization Autism Speaks has sponsored courses featuring innovative technology for autism at universities around the country since 2004. Students taking these courses learn to create new ideas and apps for interventions for autistic children. Examples of apps that were created were storytelling about real life experiences, a virtual-reality, Internet-based intervention and assessment service to people in rural areas, and bio-sensing wireless technology for use in the clinic setting.\textsuperscript{13} There has been various terms used to refer to the use of technology in healthcare. Telehealth, telemedicine, or telerehabilitation are the most commonly used terms referring to the delivery of services across a distance. E-health (electronic health) or m-health (mobile health) have also been used and most simply refer to the ability to use technology such as computers and mobile devices to manage health. These include a variety of health services that are not limited to: Online support groups, online health information and self-management tools, email and online communication, electronic health records, remote monitoring of vital signs, video or online medical visits and the use of the mobile device in the implementation of interventions.\textsuperscript{14}

Challenges of Integration

The challenges to integrating mobile technologies in healthcare delivery are complex. Twenty-one Oregon health provider sites received a subsidy from the Federal Communications Commission in December of 2010 to support telemedicine and telehealth applications. $20.2 million has been allocated to Oregon Health Network as the fifth largest award of the FCC rural health care pilot program to provide for full deployment of the infrastructure necessary to build the first statewide, broadband, telehealth network in the state. For an individual healthcare provider the challenges are more specific. The integration of any and all technologies must always consider the requirement that healthcare providers, and comply with the Health Insurance Portability and Accountability Act (HIPAA, P.L. 104-191). This requires all healthcare providers to maintain client confidentiality of all records and interactions, including the use of telerehabilitation to send or receive data. This also includes using HIPAA compliant channels such as encrypted portals.

While the benefits to integrating technology in patient intervention, in particular mobile technology, may surpass even our current imagination, caution should be taken when using this as an intervention. We need to ensure that the client provides informed consent and understands the implications or consequences of the use of this modality, just as they would with any other intervention they receive. Healthcare providers and students entering healthcare should remain diligent and compliant with HIPAA regulations even with the implementation of mobile technologies. Practice in the United States often presents a dilemma as states have different laws, therefore careful consideration should also be paid to the following:

- Reliability of the technology to ensure continuity and effectiveness of the intervention.
- Regulations of each professional state practice act and those of any other state which may be transcended through the implementation of technology. The laws of all states included in the interactions will apply.
- Remain up to date with the latest literature regarding interventions and the implementation of services when considering a distance location, always consider potential for harm for the client.

16 Brewer
• Take responsible steps for supervision of the client, research the approach of intervention, and training of personnel who may be involved in care.
• Monitor effectiveness of the intervention and ensure cultural competence in delivery. ¹⁸

**Conclusion**

This project started as an exploration of mobile technology and its use in healthcare. The findings were intended to inform educators about the healthcare market and the future implications for preparing students to enter into this rapidly evolving market. Students are influencing the integration of mobile technology in the delivery of healthcare as they bring their own skills and creativity to the field as clinical interns. It would be beneficial to follow this trend in future research projects to investigate the number and type of apps created and implemented by students while on internship for education preparation.

Professional organizations such as the American Occupational Therapy Association (AOTA), American Physical Therapy Association (APTA), and the American Speech and Hearing Association (ASHA) are all preparing students to become more skilled and competent in the use of mobile technologies as healthcare providers. National conferences, such as Assistive Technology across the Lifespan and Telemedicine Conference 2012, offer educational opportunities for healthcare professionals to develop and improve their competency in mobile technology. Professional healthcare student education must also offer preparation for use of these technologies in service delivery.

Marc Andreessen stated that we are on the verge of a new time, in a moment of change that is altering the landscape. ¹⁹ This article presents the current trends and challenges of integrating mobile technology into healthcare. The information gathered offers thoughts on the potential for future creation and innovation as mobile technology is fully embraced in healthcare delivery and education. In order to best prepare healthcare professionals to be successful in the rapidly changing market, it is important that future research remain current and understand the application of innovations.

¹⁸ Ibid.
¹⁹ Mills, B. (2011)