Mobile Learning in Medicine and Healthcare: Professional Education Applications

Gary Woodill, Ed.D.
Senior Analyst, Float Mobile Learning

Chad Udell
Managing Director, Float Mobile Learning
# Mobile Learning in Medicine and Healthcare: Professional Education Applications

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Mobile Learning in Medicine and Healthcare: Professional Education Applications

Introduction

Mobile learning has invaded the fields of medicine and healthcare. While both healthcare professionals and patients took a relatively long time to learn how to use the Internet to gather information, the use of mobile devices for the same purpose has occurred over a much shorter time span. Merrill (2011a) reports that smartphones and medical apps are now used by 80% of doctors in the United States.

Not surprisingly, the first uses of mobile learning technologies in medicine and healthcare were to reproduce the same kinds of activities found in traditional training environments. Marshall McLuhan once said, “We look at the present through a rearview mirror. We march backwards into the future” (McLuhan and Fiore, 1967).

Starting in the 1990s, the earliest applications of mobile learning included the delivery of courses, putting lectures and videos online, note-taking, reading books, keeping track of class lists and schedules, and providing quizzes and tests, while tracking all this activity with a learning management system (LMS). This approach does not look much different than teaching in a classroom, which, for the most part, immobilizes students in desks so that they will pay full attention to the instructor at the front of the room. In the same way, eLearning on a desktop can involve looking for hours at a screen where experts present their knowledge in the form of narration, slides, video, or graphics. While this type of presentation by experts will continue to be used both online and in classroom, mobile learning offers a number of interesting possibilities of learning in a different way.

Although the first definitions of mobile learning were mostly technology driven, focusing mainly on the fact that mobile devices were being used, what is radical about mobile learning is that the learner is able to engage in learning from any location at any time, especially when there is a particular need for a specific piece of information. This realization is forcing a reexamination of what mobile learning really means for the learner. It’s becoming clearer now that mobile learning is learning in context, at the point of need. At the same time, mobile devices enable learners to remain connected to a wide variety of information sources and communications facilities. The technology facilitates the mobility, but the learner drives the activity. This is a pull, rather than a push.
Although it seems that the use of smartphones and tablet computers in healthcare medicine has arrived suddenly on the scene, in reality it has been building over a ten-year period. Some of the important factors that have driven adoption of mobile learning in medicine and healthcare include:

- **The tremendous growth of mobile phones in all sectors of life.** There are now almost 6 billion mobile phone subscribers worldwide. In the United States, over 83% of all adults have a cellular phone. In 2011, over 50% of the phones sold are classified as smartphones.

- **The rising popularity of tablet computing.** Although tablet computers have been in use for at least 15 years, the Apple iPad and its many competitors have created a new set of opportunities for companies to create medical and healthcare applications (“apps”) for mobile learning. This shift in form factor and user experience has created a renewed interest in the tablet as a medical device.

- **Globalization and the hypercompetitive nature of business today.** People working in all sectors of the economy are looking for ways to increase efficiency, security, reduction of errors, and compliance with regulations, while increasing competitive advantages wherever possible. This included finding more efficient and effective ways of offering training to employees.

- **A changing workforce.** The demographic bulge of the baby boomer workforce is making its way through medical and healthcare settings, with many boomers approaching the age of retirement. At the same time, a new technologically savvy group of young people is entering the workforce. As well, many people now work from home or in nontraditional workspaces.

- **A more mobile population.** Compared to 50 years ago, people travel more and relocate many more times during their lifetime. Often they need attention from medical or healthcare professionals when they are away from their home base. At the same time, people have been empowered to look for their own solutions and share their experiences through the phenomenon of the Internet.
Our conceptions of both teaching and learning have also shifted. This, in turn, has influenced what we think of as mobile learning. Mobile learning can be broken into at least four major categories:

- **Learning from materials created by instructors.** Formal learning will continue to have a major role in the education of medical and healthcare professionals. Presentations will continue to be built and required to be watched by students. Expert instructors will continue to create learning materials for patients and the general public. Where the awarding of credentials is involved, learning management systems, knowledge management systems, and content management systems will all still be used. We’ll continue to use technologies for organizing our schedules and for managing people in distance education. Curation remains an important part of creating authoritative repositories of knowledge.

- **Information retrieval at the point of need.** Because of the immense wealth of information available on the Internet, we have come to expect that almost any question can be answered through a simple query using a search engine. With mobile devices in our briefcases and on our belts, we are becoming used to finding the information at the point of need, at the instant of need, and we are looking for specifics that will answer our questions, not lengthy courses or irrelevant materials that don’t solve the immediate problem at hand. We are assisted in this endeavor by “smart” technologies that know our location, our preferences, and our relationships. These can be all used to deliver more personalized answers to questions that are both “just enough” and “just for me,” and which augment the experience of the surrounding reality for the mobile learner.

- **Information creation and sharing.** Unlike most eLearning and face-to-face presentations, mobile learning technologies allow the learner to create and share their own knowledge. Because mobile devices are bidirectional, one person’s experiences can yield information and data for many others. Mobile devices can track locations, behaviors, interactions, sounds, images, and video. Users can also add value to information that they send by tagging it, rating it or commenting on it. Sensors attached to mobile devices can provide additional data without the active intervention of the person carrying the device.
Communicating, interacting and networking while learning. Because the mobile devices that we use are networked, collective learning is now possible. People can learn while collaborating on projects, playing games, using simulations, or navigating through virtual worlds. They can use text messaging, various forms of social media, their own media productions, or coaching activities to support others in their learning. Mobile technology is enabling a person’s personal learning network to be accessed far more easily than once was possible.

To do all this, mobile learning is supported by an intricate complex ecosystem of technologies that are largely hidden from the average user. Mobile learning can be implemented using a wide variety of devices connected to many different kinds of networks. Mobile devices used for learning by the general public can include:

- Digital cameras (still and video)
- Electronic voting systems (also known as “clickers”)
- Handheld gaming devices
- Internet radio or video players
- Media players, such as iPods and MP3 players
- Miniature projectors
- Mobile phones, including smartphones, and programmable SIM cards
- Navigational devices based on GPS
- Personal digital assistants (PDAs)
- Tablet computers running full desktop operating systems (OS) (typically requiring styluses for input)
- Tablets, such as the iPad (currently the predominant choice of healthcare professionals)
- Tagging systems (such “QR codes” or RFID technologies)
- USB storage devices
- Wearable devices, including various sensors

In addition to the above list of devices, a significant number of special-purpose mobile devices have been built for the medical and healthcare markets over the past few years. For example, there have been tremendous advances in mobile video communications systems that allow frontline medical personnel to wear lightweight wireless audio, data and video technologies in order for doctors to keep in touch with them as they interact with a patient at a remote location. Other examples include the Motion C5V Tablet PC – a ruggedized-tablet that is fully sealed for infection control, Vscan – a battery-operated pocket-sized general purpose ultrasound imaging system, and camera-based microscopes that can transmit images for
analysis from remote locations. While many of these devices have been invented and built to improve patient care, they also can be used as mobile learning devices.

We are beginning to see mobile learning apps that simulate traditional medical equipment, allowing students to practice without the purchase of expensive medical devices. For example, there are now “virtual stethoscopes” for training that mimic many medical conditions. Similarly, “virtual microscopes” allow medical students to use laptop or tablet computers instead of a real microscope to analyze electronic copies of slides; students are able to “...load/unload specimens, to navigate to any point on that specimen, to change magnification, to adjust image parameters (contrast and brightness), to change focus, to analyze elemental composition, to measure features, and to render data in three dimensions. Additionally, the interface allows experts and laypeople alike to annotate specimens and/or load previously-created annotations.” (The Virtual Microscope, 2005) Other specialized scopes are also starting to hit the market now, such as the FotoFinder Dermoscope peripheral and app for iPhone.

Of course, each of these types of mobile devices is used in the context of a complex infrastructure that includes a large number of telecommunications carriers worldwide, different standards and interconnected systems for mobile communications, and a variety of operating systems, tools, and types of applications. But, in spite of the complexity and issues involved in setting up a mobile infrastructure for learning, there are many compelling reasons to do so.
Benefits of Mobile Learning

There are many benefits of using mobile learning in medical and healthcare settings. These include benefits of mobile learning in general, as well as specific uses of mobile learning in this context. In comparison with classroom type training, mobile learning offers portability of information, connectivity at any time and any place, and access to networked information resources that can lead to better learning and improved job performance. For example, Flannigan and McAloon (2011) describe a study where medical students using information accessed using smartphones outperformed seasoned medical consultants in prescribing emergency drug infusions. The use of augmentation in a performance support role is clearly effective in the healthcare field.

Mobile computing in medical and healthcare settings has the potential to alter and improve the health care professional-patient relationship. Using a tablet computer to display images that can be shared with the patient may facilitate the understanding that a patient has about his or her own condition. Here is an example from Huff (2011):

Viewing, and then sharing, a computed tomography (CT) scan image is as easy as pulling it up on a tablet and then leaning across the bedside, said John Halamka, MD, an emergency physician and chief information officer at Beth Israel Deaconess Medical Center. “It invites the patient and the doctor to share data and images together,” Dr. Halamka said. “Have you walked into a hospital ward and noticed the number of doctors sitting in front of computers instead of being in patient rooms?” ...If a patient has a question, such as a cancer patient who wants to know his latest white cell count, the answer is only a few keystrokes away. “It makes patients feel like they are participating more in their care.”

Having a tablet device available while doing rounds with patients can also be useful for teaching purposes. After rounds, Dr. Aineet Arora at the University of Chicago frequently compiles interesting studies and articles for teaching purposes. “With the help of the iPad, she can now quickly pull them up to show residents the next day. Then she can forward along the documents immediately with an e-mail blast.” (Huff, 2011).
Residents are not the only potential beneficiaries of the use of mobile devices in medical settings. There are numerous examples of “telementoring” taking place, where a non-experienced medical practitioner can be guided by an experienced person using a mobile phone or table. (e.g., Crawford and Tiruta, 2011). The fact is that use of mobile devices makes clinical processes more efficient, resulting in improved healthcare.

Medical practices and hospital settings often used desktop computers, which can take up a lot of space, including the need for desks and chairs, compared with staff using mobile devices. Desktop computers typically have higher initial purchase costs and support needs than mobile devices. And, if medical personnel are to use images and text on a screen while engaged in a procedure, then small mobile devices can be much more easily maneuvered compared with even a laptop computer.

Then, there’s the issue of infection control. Infection control in a treatment room is difficult to achieve using a conventional computer since wiping down its keyboard with disinfectant risks disabling its circuits. Tablet computers and smartphones without keyboards that are well sealed are much better for healthcare settings, although only a few purpose-built tablets have been certified as being suitable for infection control.
In spite of the benefits of mobile learning, it does have a number of issues and challenges when used within a medical or healthcare setting. These include:

- Small screens that limit the amount and type of information that can be displayed.
- Limited memory and storage capacities for mobile devices.
- Batteries that have to be charged regularly. (Though admittedly less frequently than laptop computers)
- Mobile devices are often more fragile than other types of computers and can more be more easily stolen or lost.
- Intermittent connectivity occurs as networks are not completely reliable throughout large healthcare facilities.
- Interoperability among different operating systems for mobile devices is difficult.
- Links to learning management systems and other enterprise IT systems are primitive or non-existent.
- Existing e-learning applications need to be adapted for mobile devices at considerable expense.
- Network access costs can be significant.
- Proprietary medical visualization technologies may not be compatible with all mobile platforms.
- Mobile device hardware may not be sufficiently powerful to process large datasets or images that may be present in all medical applications.
- Security is a major issue due to the device’s newness and some unanswered questions from information technology professionals.
- Compliance with regulations can make the use of mobile devices difficult in medical settings.
- Mobile technologies are continually changing at a rapid pace. (Adapted from McLean, 2003)

In addition to these general issues, there are specific challenges for the use of mobile devices in medical and healthcare settings. For example, Wu and his colleagues (2011) studied the interactions among staff in a large Toronto hospital after smartphones were introduced into the work environment:

Over a 24-hour period, nurses sent on average 22.3 emails to the physicians mostly through the “team smartphone,” the designated primary point of contact for a specific medical team. Physicians carrying the team smartphone received on average 21.9 emails and 6.4 telephone calls while sending out 6.9 emails and initiating 8.3 telephone calls over the 24-hour period. Our analyses identified both positive and negative
outcomes associated with the use of smartphones for clinical communication. There was a perceived improvement in efficiency over the use of pagers for clinical communication for physicians, nurses, and allied health professionals. In particular, residents found that the use of smartphones helped to increase their mobility and multitasking abilities. Negative outcomes included frequent interruptions and discordance between what doctors and nurses considered urgent. Nurses perceived a worsening of the interprofessional relationships due to overreliance on messaging by text with a resulting decrease in verbal communication. Unprofessional behaviors were observed in the use of smartphones by residents.
Quality of Information in Mobile Apps

The quality of information available on the Internet is another issue that needs to be addressed. Much content consumed on mobile devices comes through the use of websites. There is a lack of regulation in the development of medical/healthcare apps and downloadable information. Consumer-focused websites such as WebMD and others may further cloud this issue.

Rosser and Eccleston (2011) argue, “The lack of regulation or guidance for health-related apps means that the validity and reliability of their content is unknown.” In their review of 111 apps on dealing with pain, they noted the distinct lack of healthcare professionals involved in their creation and distribution. They conclude, “Pain apps appear to be able to promise pain relief without any concern for the effectiveness of the product, or for possible adverse effects of product use. In a population often desperate for a solution to distressing and debilitating pain conditions, there is considerable risk of individuals being misled.” Similarly, in a study of apps for alcohol addiction, Cohn et al. (2010) state, “…few apps addressed alcohol-use behavior change or recovery. Aside from tracking drinking consumption, a minority utilized empirically based components of alcohol treatment. Some apps claimed they could serve as an intervention; however, no empirical evidence was provided.”
Patient Privacy

The security and privacy of patient and professional information on mobile devices is of paramount importance. According to Jackson (2011), just days before the death of Apple’s Steven Jobs on October 5, 2011, “…following a long battle with pancreatic cancer, Apple announced a possibly ground-breaking development—a security configuration that would make the now-ubiquitous iPad HIPAA-compliant. The implication: Healthcare providers now can use the FaceTime video chat function to securely talk to patients and other clinicians.” Dala-Ali (2011) suggests that we need “electronic shredding software” for wiping images and documents from mobile devices used in medicine.

While a large number of Mobile Application Management (MAM) and Mobile Device Management (MDM) systems are available at the enterprise level, the compliance and certification of these products from a governmental regulatory standpoint is largely unknown.
Mobile Learning in Medical Education

Over the past three years, doctors, nurses, and other healthcare professionals have heavily invested in smart phones and or tablet computers in order to be able to obtain information and learn from these devices. A 2011 survey of more than 2,000 practicing physicians showed that 30% had already purchased an iPad, and 28% plan to do so within the next six months. By 2012, it is forecast that a majority of physicians will be equipped with these devices.

With iPhones and iPads being the overwhelming favorite choice of healthcare personnel, it is not surprising that the most popular apps for medical education are those developed for the Apple iOS platform. As of late 2011, there were well over 10,000 medical and healthcare apps available in Apple's iTunes App Store. As well, courses delivered through iTunes University are another source of medical education that has become popular. Lectures, exams, textbooks, and interactive programs, such as simulations and games, are readily available on almost all medical specialties.

During the past ten years, many medical schools have required incoming students to own a laptop computer, as a necessary tool in learning about medicine. Now, many of these institutions are starting to require that incoming students purchase an iPad or an iPhone to be used in their studies. For example, the University of Chicago Medical Center bought an iPad for each of its internal medicine residents. Stanford University provides an iPad for each of its first-year medical students, and the Beth Israel Deaconess Hospital in Boston has several thousand iPhones and iPads connected to its network, most purchased by medical personnel themselves. As explained on the University of Ottawa's website, “We want students to be able to use computers for two main reasons: to access the online medical curriculum...and to develop skills in using information technology to help treat patients.” Sanders (2006) presents several possible uses of mobile devices in undergraduate medical education, including:

- Sending course announcements and reminders
- Providing access to short text and image based learning materials
- Collecting assessment data, photos, and videos and sending them to a secure location
- Providing easy access to collaborative tools such as discussion boards
In support of undergraduate medical education, it is not surprising that many medical textbook publishers are moving to convert their textbooks to a mobile format, particularly for reading on e-readers and tablet computers. For example, GYLO (GetYa Learn On) and Cambridge University Press have announced a partnership to produce multiple medical books as interactive apps for iPhone, iPad, and iPod touch devices. These were released in the iTunes App Store in June, 2011. Readers of these texts can personalize them by adding notes, highlights, and bookmarks. “Finding content will be easy using a hyperlinked ‘Table of Contents’ and ‘Index,’ with a search tool for finding instances of a specific word or phrase. Navigating the app, turning pages and customizing the user interface are made using simple gestures.” (GYLO Press Release). Future versions of the app are expected to have even more interactivity.
Podcasts

One very popular mobile innovation for medical education is the use of podcasting. A podcast is an audio file, or a combination of audio and video files, that is distributed on the Internet, and played on a mobile device such as an iPod or an MP3 player. Some podcasts are available for free, and others require a subscription. Many medical schools make lectures available in the form of podcasts, which can be listened to whenever a student has time. However, there are limitations on the use of podcasts – it is difficult to skim through a podcast, add your own notes, or place hyperlinks in the middle of the file. Dr. Betsy Jones and her colleagues at Texas Tech University Health Science Center have developed a series of podcasts that, among other topics, include diagnosing and treating conditions and how to write patient notes. She believes that podcasts are a way of making good use of the limited time available to residents while taking advantage of their comfort with mobile technologies. Podcasting is particularly useful for healthcare professionals learning English as a second language (ESL) or a foreign language. Long and Edwards (2010) list some of the pros and cons of podcasting:

Pros

- Information may be reviewed repeatedly by learners.
- Podcast subscriptions and automatic downloads save time.
- MP3 players are easy-to-use.
- Mobility of listening to podcasts is convenient and flexible.
- Information can be quickly disseminated to learners.
- Short podcasts enhance absorption of new information.
- Large numbers of learners can be reached through podcasts.
- Podcasts are excellent media for auditory learners.

Cons

- Podcasting can be costly and time-consuming to produce.
- MP3 players must be recharged periodically.
- No two-way communication can take place.
- Some faculty and students are unfamiliar with the podcasting process.
- Some research correlates multitasking with decreased information retention.
- Hearing-impaired learners cannot benefit from podcasting.
- Podcasts are not searchable. It is difficult to find a specific piece of information on a podcast.

(Adapted from Long and Edwards, 2010)
The increased use of smartphones and tablet computers (usually Apple iPhones and iPads) in medical schools means that developers have been busy creating new medical applications (commonly known as “apps”), that run on these platforms. For example, first- and second-year students at Weill Cornell Medical College are being provided with new iPads, which will be synched with Electronic Medical Records for training purposes. “The iPad 2 will serve to replace students’ printed course notes and texts allowing them to download course materials, see video or hear audio recordings of lectures, submit electronic course evaluations, access their grades and collaborate with other students.” (Merrill, 2011b). They will also be able to download thousands of medical and healthcare apps from the Apple App Store, as Merrill (2011b) explains:

For instance, students will use interactive apps on their iPad tablets to see animated 3-D molecular models of different proteins and compounds. The device’s advanced graphics allow students to view molecular structures with depth, rather than as a flat illustration on a sheet of paper, helping them to better understand how the structures function in the body.

An app called “Unbound Medicine” is a medical database for diseases, medications, and diagnoses. Such reference applications give students the ability to have the most up-to-date medical facts and findings with them at all times, and without lugging around heavy printed materials.

Of the thousands of medical apps available, several have garnered significant numbers of users. In a recent article, Dolan (2011) listed the five most popular apps for students at Harvard Medical School.

- **Dynamed** – Students and physicians can use this clinical reference tool created by physicians for point-of-care situations.

- **Unbound Medicine uCentral** – This app serves as a portal bringing popular medical publications to students’ iPad with the tap of the screen. The app includes 5-Minute Clinical Consult, A-to-Z Drug Facts, Drug Interaction Facts, and others.

- **VisualDx Mobile** – VisualDx provides physician-reviewed clinical information with thousands of medical images showing the variation of disease presentation through age, stage, and skin type.
• **Epocrates Essentials** – The app is an all-in-one mobile guide to drugs and disease with an integrated disease database with conditions, plus over-the-counter medications and hundreds of diagnostic and laboratory tests.

• **iRadiology** – A learning tool for medical students and residents, iRadiology provides quick reviews of classic radiology cases and images.

There are many other apps that are useful for medical students in their professional training, and the number is growing dramatically month by month. Many of these new apps are for medical specializations, with professional bodies of each specialty often leading the way. Examples include:

• **Image Display Apps** – New software allows doctors to look at X-rays, ultrasounds, and CT and MRI scans on mobile devices such as mobile phones and tablets. For dermatological training, images from a microscope can be transmitted wirelessly to a group of iPad devices in the same room. For radiology training, students can load scans on their iPad tablets and easily access the images wherever they go (Merrill, 2011c).

• **Surgical Simulation Apps** – Several companies are producing simulations of surgical procedures for iPads and other tablet computers (Dala-Ali, 2011).

• **Teleconsultation Apps** – Healthcare personnel can photograph or video injuries or lesions with a mobile device, then use the same device to carry out a consultation with a senior colleague on a course of action.

• **Diagnostic Assistance Apps** – A number of companies are producing expert systems for mobile devices that can offer alternative diagnoses based on symptoms entered into the device. These apps can remind doctors in training about ideas for treatment that they had not yet considered.
Five years ago, Burger and Greer (2006) noted that web-based continuing medical education (CME) was growing at a rate of 11.1% while traditional meetings and conferences were declining by -14.6%. But, they predicted then that “the robust growth of mobile CME indicates it will overtake both classroom and web-based CME in the next ten years.” This is indeed turning out to be the case, as more and more CME is offered through mobile channels. And, even if health care professionals go to a medical conference, they are now being offered conference support through mobile apps. As an example, the Pfizer Engage Mobile app is intended for health care professionals who have attended, or plan to attend, pharmaceutical congresses.

In 2010, Pri-Med, the Boston-based continuing medical education provider, launched Pri-Med Mobile, offering clinicians medical education and information through featured experts, live meeting content and patient cases – many of which are available for free CME credit. Each piece, lasting no longer than 10 minutes, is designed for easy and clear viewing on a smartphone or other mobile devices.

Continuing medical credits (CMEs) are also available through podcasts. There are several sites where medical professionals can visit to get CME podcasts. Two examples are cmepodcasting.com, and peerviewpress.com. Finally, many journal articles are available through podcasts, for healthcare personnel who don’t have enough time to read paper-based journals. Two examples are the New England Journal of Medicine, and the science journal Nature.
Mobile devices can be considered as “boundary objects” between professional training and work placements (Akkerman, 2011). That is, they can be used to support students in placements, but also can help students negotiate differences between practices and theory that they encounter in the medical school classroom and the real world of clinical settings. Young et al. (2010) describe how the use of the short message service (SMS) can provide additional support for healthcare students in practice placements, enabling collaborative learning and encouraging creativity and self-expression.

Having presentations available on a mobile device can be very useful in bridging a gap between two learning environments. Stuart Smith (2009) tells the tale of a hairdressing student who did her practicum in a salon that had a different methodology from the college in which she was studying.

“She explained there was usually a tension between the college method of hairdressing and the salon’s. The college and the salon rarely met, so the focus for this tension would often be on the student who was corrected in the use of the college method by the salon and vice-versa by the college. Having her learning materials in-depth on her iPhone meant that she could show the salon manager in detail what she had been learning. The manager could then see why or how different methods were being applied and put her workplace learning into context. The relationship between college, student, and workplace was transformed, and she felt her learning improved.”

It's easy to see how a similar interaction could take place between a medical student, the instruction they receive in the classroom, and the mentoring and instruction they receive in an internship or residency.

The result of using mobile learning for students is often improved communications with instructors, in that mobile devices provide a number of options for communications that may lead to more flexibility for instructors to contact students and vice versa (Kenny et al., 2009).
Conclusions

With the development of powerful smartphones and the high-resolution tablet devices, the world is undergoing rapid change in the technologies that are available for teaching and learning. One of the fields at the forefront of this shift is education and training for medical and healthcare personnel. While the first uses of these new mobile devices in medical education has been to put lectures, presentations and texts on the screen, the repertoire of what is available in terms of new uses of these devices is rapidly expanding.

Many factors, including a changing workforce and a more mobile population, are driving this change. The result is a variety of ways for doing mobile learning in medicine and healthcare. These methods include studying learning materials created by experts, retrieving specific information as needed, creating new information and sharing it with others, and communicating, interacting and networking with peers, instructors and mentors. To do all this, a mobile infrastructure needs to be in place, along with the availability of appropriate mobile devices.

These developments have created a market for medical and healthcare apps, which now has grown to over 10,000 programs, available mostly on Apple iOS, Android, and Blackberry platforms. This rapid growth in mobile learning for medicine and healthcare has created its own set of issues and challenges, including technical issues, unevenness in the quality of information, and concerns about security and patient privacy.

In light of this, there seems to be no stopping this movement towards the use of mobile learning in medical and healthcare education. Many medical schools are requiring incoming students to buy a tablet device (most often, specifically an iPad) for their studies. Medical textbooks are moving on to these platforms, while podcasting has become a well-established method for delivering lectures and presentations to students on the move.

The development of mobile learning in the professional education of medical and healthcare personnel is likely to continue through the rest of their careers. Continuing medical education credits are available through both smart phones and tablet computers, and both medical offices and hospitals are using mobile devices for the management of information and patient interactions. Finally, mobile devices are being used to bridge the gap between what is taught in medical schools and what students see in real life settings.
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