



Imaging on mobile devices

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Medical and health care apps are the third-fastest growing category for iPhones and Android phones.

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Let's face it, most radiologists like their technology toys. We are mostly geeks at heart. Being surrounded by monitors, radiology workstations, and imaging modalities all day long is just not enough. We have to have our eReaders to read our journal articles, our smartphones to stay in touch with friends, family and colleagues, and our tablet computers to at least appear to stay productive and connected 'on the go.'

But what about *real* work? Are we actually reading studies on our iPads, yet? Is that even right? Ever since the FDA cleared the first diagnostic imaging application on a mobile device,¹ new diagnostic imaging apps for smartphones and tablets have flooded the wireless airwaves. The imaging vendors are on a warpath to develop ways to embrace the mobility fever and feed the consumer-driven frenzy.

Some may have expected the mobility frenzy to die down, especially in radiology, where clearly, most of our actual work really does need a full set of applications and technologies (eg, picture archiving and communication systems (PACS), radiology information systems (RIS), computer-aided detection (CAD), and voice recognition) that can only be provided by our diagnostic workstations in the reading room. However, the mobile maelstrom shows no signs of calming. According to Gartner, mobile computing in 2013 poses more challenges than ever for CIOs who will struggle with hundreds of new smartphones and tablets, face business demands for ever-more-sophisticated apps, and fight to secure corporate information on employee-owned devices. In fact, physicians are 250% more likely to own a tablet than are other consumers, with 80% of doctors found to be using

smartphones and medical apps.² Indeed, mHealth is poised to explode even further. There are about 320 million mobile phones in the United States, and an estimated 1.7 million hospital beds—that's about 185 phones for every bed.²

So, onwards and upwards we go!

Quick, choose two out of the following: Cost, quality, access

It is an often-quoted fallacy that from the triecta of cost, quality and access, we can at best, just achieve 2 out of the 3. Most health care executives would never ignore costs, and most clinicians would never disregard quality. So in this presumed 'battle,' access loses out. The reality of course is that all 3 are critical. Mobility enables wider access to clinical content, such as information from the electronic medical records (EMR) and images from the PACS. Indeed, as we push ahead with the paradigm of coordinated care, access becomes increasingly important not just for the radiologist, but also for the ordering physicians, the ancillary clinical staff (eg, radiology technologists, PACS administrators, nurses) and even for the patients themselves. *Especially* for the patients.

Mobility, after all, is a trend that is clearly consumer-driven. And as health care organizations grapple with enterprise mobility strategies, it is critical to ensure that patients are not left as an afterthought. Engaging patients in their own care is critical to ensuring compliance, and the correct path forward is really in empowering patients with access to their images and reports, including all priors, as well as related educational materials around their procedures, medical conditions, and other support-related, curated medical content.

Embrace mobility with purpose-driven use cases

It is futile to “do” mobility just for the sake of checking a box and moving on. Some imaging vendors choose to do the bare minimum so they too, can tout that they have access to their content via mobile devices. While there is tremendous value to simplicity in designing imaging apps for mobile devices, vendors should place much more emphasis on function and clinical workflow enhancement. This is true for information technology (IT) departments and hospitals trying to address the mobility needs of their groups. As opposed to tolerating radiologists’ demands to support mobile devices, IT departments should take the opportunity to look at the solutions as part of a larger enterprise mobility strategy, not just a departmental one. This is especially true for hospitals and medium- to large-sized health care organizations.

Dissecting the entire trail of the imaging workflow reveals specific opportunities to add value in a number of areas—and these include study ordering, scheduling, study capture, storage, image distribution, interpretation, report distribution, clinical image viewing, patient education, charge capture, image sharing, and many more.³ There are also perfect-fit opportunities for mobility in ancillary support around the radiology department, such as for technologies, quality control tasks for PACS administrators, and for scheduling and protocoling. So clearly, the opportunity is so much bigger than just creating one more app that no one will really use more than once.

Embracing the mobile form factor opens up additional purpose-driven use-cases, such as for reviewing images and related clinical data for stroke management, and enabling care coordination leveraging voice, video, and more. Telehealth, too, offers ideal scenarios for mobility, especially in being able to offer quick consults and wet reads, as well as leverage the camera or cameras available in mobile devices for engaging patients and end users in conversation or to snap photographs of external lesions to further corroborate clinical indications and findings.

Health care organizations can also leverage mobility to rope in the patients and ensure that they are able to not just allow for easy access to their images and reports, but also allow for convenient access to patient portals and enterprise scheduling tied to the global positioning system (GPS) on mobile devices. Dispersing rel-

evant patient education materials and follow-up instructions via mobile devices will also go a long way to engage the patients in their health.

Mobile devices also offer a tremendous opportunity to extend workflow beyond clinical desktops and workstations, allowing for fluidity in workplace collaboration. It is predicted that by 2016, most collaboration applications will be readily and equally available across tablets, desktops, smartphones, and browsers, reinventing the way employees work.⁴ Done right, mobile devices could truly leverage unified communication (UC) and location awareness, enabling collaboration across care teams and specific to targeted clinical workflows.

Market dynamics

There is apparently never a dull moment in the market dynamics of the key mobile device and operating system (OS) vendors. Medical and health care apps are the third-fastest growing category for iPhones and Android phones.⁵ The worldwide mobile phone market is forecasted to rebound from recent growth standstill, increasing by 7.3% year over year in 2013⁵ and possibly resulting in more than 1 billion smartphone unit shipments for the first time in a single year. Google’s Android operating system remains the dominant smartphone operating system, with 75.3% of the market, much ahead of Apple’s iOS with a 16.9% market share. Apple clearly intends to change this paradigm with its recent announcement of a cheaper phone range and a refresh to their OS and flagship product. It is predicted that Microsoft Windows will gain traction and move from a 3.9% market share in 2013 to a 10.2% share in 2017, in part taking some users from the Blackberry OS, which moves from 2.7% to 1.7% market share.

Device manufacturers continue to innovate, and this can only be good for consumers. Apple will attempt to revamp their lineup of devices and refresh the now somewhat stale OS visually and functionally. Microsoft, with the acquisition of Nokia, seems to be serious about pushing ahead with innovation in the tablet and smartphone sectors, giving app developers a third ecosystem to consider building apps.

Enterprise challenges

The consumer-driven push to adopt mobile devices brings up interesting challenges for the health care enterprise. Most organizations are

starting to adopt or develop strategies around mobile device management and what is referred to as “bring your own device” (BYOD). A sound policy around device management has to be simple, yet clear. The ease of slipping in an Internet-enabled device that could potentially tap into PHI (protected health information) must not be taken lightly. Health care institutions need to start dictating expectations and standards to vendor partners as opposed to the free-for-all, first-come-first-served, let-see-how-it-goes mobility deployment frenzy we are seeing today.

Enterprises need to ensure mobile data security embedded into the core architecture, along with clear mobile policies that balance user demand and workflow needs with security requirements and enterprise control capabilities. BYOD controls allow the IT department to segment personal and corporate data. This means that in the event of a lost device, the device can either be wiped in full, or can just have the corporate data removed remotely.

Device manufacturers are trying to play to the needs of the enterprise, but Android, iOS, and Windows still have their own sets of challenges, and the more open nature of the Android platform often brings along additional concerns. Multiuser support, verification, device encryption, and malware-prevention improvements have to be made more robust inherently at the OS level. There is a growing role for enterprise mobility management vendors with managed mobile services (MMS) in providing health care enterprise users with mobile device provisioning, life cycle management, real-time mobile analytics, and helpdesk support.

Zero-footprint client viewers, and more

Over the past decade, radiology has seen a gradual series of transitions happening across various image viewing technologies, such as ActiveX, Java applets, client-server, and thin-client or server-side rendering applications. The rapid adoption of mobility in health care calls for a more consistent interface to the applications, especially in viewing of images across a broad spectrum of devices and form-factors (eg, laptops, tablets, hybrids, and smartphones, etc.). A zero-footprint viewer addresses this need while providing a platform for rapid iteration and better enterprise security using client-server visualization architecture and standard browsers, plug-ins, and even perhaps built-in hardware virtualization. Zero-footprint viewers do not need a client-side install or download and allow

users to view images and reports within their native web browser. The viewer typically utilizes AJAX (asynchronous JavaScript and XML) technology to interact dynamically with the server and loads document objects, such as images and reports, in real-time in a format understood by the user's environment and browser, thereby eliminating the need for any additional software or plug-ins.

We are seeing a spectrum of image viewers emerge in the market, with some PACS and 3-dimensional imaging vendors choosing to opt for a client-side install or download in order to provide added functionality. These unified viewers are getting better through rapid iterations and provide the promise of a more useful viewing experience for images on mobile platforms, whether via the native PACS or for imaging content stored in vendor neutral archives (VNAs).

Conclusion

The trend is for the continued push towards cloud-enabled, mobile-empowered workflows in the imaging department and beyond. Image exchange and remote image viewing workflows are enhanced as a result of these developments on the mobility front, and we are seeing the adoption of some of these in practice today. Across the enterprise, we need to not just simply *tolerate* the demands of the mobility movement, but *embrace* mobility with purpose-driven use cases. The goal should be to truly enhance the workflow around imaging and engage radiologists, ordering physicians, and ancillary radiology and clinical staff in a collaborative workflow that extends naturally beyond just the confines of our diagnostic workstations and enhances the overall value of imaging.

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