Mobile Devices for Clinicians: One Size Does Not Fit All

Continuing evolution of mobile devices provide clinicians with lots of choices and pitfalls. There is no single solution that meets the diverse needs of every situation and supporting multiple devices is a serious challenge. What features/functions/capability really matter?

The Challenge

It’s hard to imagine a profession with more mobile computing and communication needs than a physician’s, nurse’s, or physician extender’s. Even those that practice primarily within a hospital constantly transition between sitting, standing and moving (running!). Although many hospitals have attempted to solve computing access by placing a workstation in each exam room or every few dozen feet down the hallways, challenges of signing on and off, having to wait in line for someone to finish, and not being able to stay connected during travel drive many users to at least occasionally use mobile devices. The debate over whether a laptop, tablet, PDA, smartphone or the latest hot device is the right choice is moot – they each have their strengths and challenges and no one device is right in all care settings and for any one individual at all times (e.g., providers sometimes wear gloves). In addition, user preference and computer proficiency levels vary. Application vendors, focused on software revenues, may not offer much help. That being said, what are the major considerations and tradeoffs to empower mobile clinicians?

Will You (Not “Can You”) Carry It?

The shelves of CIOs’ offices are filled with laptops and notebooks that were tried and rejected over the years. Despite the primary advantage of these devices in having relatively large screens and keyboards for extensive text-based data entry - and operating systems that could run a clinical vendor’s programs without (or with minimal) modifications, their primary inhibitors of high weight, limited battery life, poor durability, excessive heat, and lack of processing power distinguished many of the early models. Tablet PCs (either without a keyboard or with an optional keyboard to reduce weight) only helped some as many clinicians do not like to type on a virtual keyboard (or use an active stylus) or be potentially slowed down for longer text entries using handwriting or speech recognition. These larger form factors also had another primary disadvantage – they would not fit into a lab coat. And there was not always a convenient spot to place them when interacting with the patient. Locking them to a cart eliminated most of their mobile advantages as the carts were hard to navigate into exam or patient rooms. Dockable/removable units at least offered some flexibility.

There is also the issue of durability. For most units, one trip to the floor meant a trip to the recycling station. Also, they had to be protected from blood, coffee spills, and worse (biohazard issues). Those devices that were designed for ruggedness and sealing (which also helped for cleaning them for infection control) made them often too heavy and expensive. To address these shortcomings, a few years ago, Intel’s digital health group attempted to design the best possible medium size mobile reference design – their “mobile clinical assistant” tablet PC was adopted by a number of leading companies such as Motion Computing (C5) and Panasonic (Toughbook H1) – and these offerings are currently state of the art – especially for nurses, with such features as a built-in bar-code scanner, an integral carrying handle, etc. However, lighter and less expensive would make the units more desirable.
At the other end of the continuum of device size are the PDAs and smartphones. With a pocket-sized form factor, these smaller devices were great for on-the-go applications such as clinical content lookup (e.g., ePocrates). In particular, converged/multi-purpose devices (offering voice, data, touchscreen, bar-code scanning, etc.) in rugged sealed designs have established a substantial foothold—especially with nurses for such applications as bar-coded medication administration. If they had one major drawback, it was battery life – they couldn’t last a whole shift – although if there were enough charging stations around, this was not a show stopper. However, at three times the price of consumer devices and with added bulk, they were never going to catch on with physicians more enamored with sleeker consumer devices they could slide in a shirt pocket and which could double as their personal smartphone.

The latest generation of smartphone devices running operating systems such as Android and iOS as well as the upcoming Blackberry OS 6 and Windows Mobile 7 provide for easy application navigation and are changing the game. The new iPhones have been such a hit with physicians (considered treasured possessions!) that clinical application vendors are diverting critical development dollars into supporting these devices. Although it is now possible to view digital medical images, watch video training, take high-resolution pictures (that can obviate the need for a barcode scanner, or provide good enough pictures for dermatologists), and other such functions on such small devices, there is a caution here.

While well-understood workflows such as medication administration and ambulatory e-prescribing can be designed in more or less a step-wise fashion suitable for small screens, more complex workflows and decision support are best handled by larger screen devices where more information is visible at once. Although these devices feel solid in the hand, they are still not built to be dropped or to get wet.

The newest class of devices – midway between tablets and smartphones, are one of the biggest topics in gadget land today. Netbooks, at half the cost of full-function notebooks, are essentially compact notebooks with smaller footprints, no spinning storage media, and (with Intel Atom processors) much lower power requirements. Running Windows 7, they are an approachable target for healthcare IT vendors and particularly Software as a Service (SaaS) architectures.

The Apple iPad offers a brilliant touch screen large enough for serious clinical computing, weight that is not too onerous (24 ounces), the potential for full shift battery life, a relatively low cost and a compelling web and consumer application user experience (albeit without a physical keyboard). Another drawback for the iPad at this time, in addition to the lack of a physical keyboard, is the lack of native handwriting recognition. Currently the device technology has outpaced the healthcare application vendor’s ability to write to the platform and the race for vendors to more fully support this newer mid-size form factor is evolving (it is possible to run Citrix on the iPad to support Windows applications and to access many portal applications). One potential downside of these midsized devices is the need for accessories to carry and protect them since the devices are not rugged or sealed and still a bit too big for a clinician’s lab coat.
**Action Items**

- **Recognize that not one size mobile device fits all occasions** – Develop a strategy that balances evolving clinician user requirements, proficiency levels and application workflows with the number of IS-supported devices – how often will the clinician be sitting / standing / walking and talking / writing / typing – if device decisions are an afterthought, satisfaction and adoption will suffer.

- **Press software vendors to support multiple form factors and devices with device-independent application design (e.g., automatic font scaling, native support for various modalities)** - Although smaller devices may require different screen designs and workflow, overall look and feel of an application should be as similar as possible across platforms. The deployment of multiple applications on the same device helps to prevent “Batman” tool belts.

- **Pay attention to screen resolution** – Small fonts and consumer screen resolutions may not be adequate for older clinicians – even with their glasses

- **Manage batteries** – Some rechargeable batteries have a “memory effect” and must periodically be replaced.


- **Have a well-thought-out device replacement and data integrity process for broken or lost devices** – To safeguard against data breaches, mobile devices should not store patient-specific information – and if they do, it should be encrypted and adequately protected.

- **Ensure that Wireless Bandwidth is available** - Today’s mobile device are often packed with multiple radios for Wireless Local/Wide Area Network (WLAN/WWAN) and Bluetooth—potentially competing with telemetry, Voice over Internet Protocol (VoIP), security systems, etc. Depending on how the devices and applications are designed and configured, they can eat up lots of bandwidth to the detriment of performance and access.

- **Address potential medical device interference** – A one meter operating policy (three feet) from sensitive medical devices is a good starting point.