the PROBLEM

In the mid-twentieth century, doctors' panels usually covered three or four hundred patients and the doctors still made house calls. It was possible for some patients to have the same physician from cradle to grave. Today's world is wholly different. Doctors typically have one or two thousand patients, same day appointments are hard to accommodate (even with the patient traveling to the clinic), and the average in-patient sees at least six doctors during a two-day stay.

However, this additional burden on clinicians also means greater patient access to healthcare. It has been achieved through workflow efficiencies, facilities improvements, and the application of technology. With the technology of today, healthcare providers are more often seen carrying mobile devices such as laptops, tablets, and smart phones that have the potential to revolutionize the industry and help provide stellar patient care to even larger panels. The question is how to apply these technologies to the current and future medical environments.

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the HISTORY

Since the introduction of saws and clamps, medical treatment has incorporated the latest in technological advances. Since the late 1970s, computers have been applied in medical situations and proven themselves reliable diagnosticians. With the advent of health care reform (the Affordable Care Act of 2010) the federal government has mandated further integration of technology and medicine through health information exchanges and electronic medical records. Accessing the data stored within these systems is more often done through capable mobile devices.

In 1978, a study was done that proved computers could effectively diagnose disorders given enough input. Since then, the field of computerized scientific research has sky-rocketed. Additionally, more mundane processes like registration and pharmacology have been made more efficient through computerization. Mobile devices have also gotten into the act. Smartphones are used as mini laboratories to process samples in the field. Laptops are used to provide video-conferencing sessions that allow a specialist to review a patient thousands of miles away. Tablets are used to collect demographic and other indicators to track outbreaks before they become epidemics.

As mobile technology becomes more ingrained in day-to-day life, consumers expect to have greater access and control in their environment – this includes their healthcare. Owners of wirelessly connected mobile devices can make restaurant reservations but not doctors' appointments. They can access social networks, but not review notes from their providers. Physicians can't easily pull up medical records, check for drug interactions, and prescribe medications though they can file their taxes from their smartphones.

As people on both sides of the healthcare line continue to see strides in technology that make

their lives easier and their work more efficient and accurate, there will be an even bigger push to incorporate such devices into health care. Such improvements encourage better patient accountability and follow-through and allow larger panels for practices thereby increasing patient access to quality care at a reasonable price.

the SOLUTION

The answer to this new technology push must be device independent. Every week, new cell phone and tablet devices are released that are better than their predecessors. Keeping up with Moore's law and the ever-changing landscape of hardware specifications is a losing game. The real solution is standards-based applications built on secure portal technology. By focusing on application development that utilizes leading standards, such as iOS and Android, and building robust and secure portals for physicians and patients, the rapid advancement of hardware-based technology will directly improve the general healthcare experience rather than throwing it into obsolescence.

Currently, many medical applications are built for stand-alone computers with large monitors, a mouse, and full-sized keyboard. This allows providers a great amount of control and interactivity with necessary records. However, mobile applications of today may simply reuse the same code for the mobile device, making it nearly impossible to efficiently use something designed for a 22" monitor on a 10" screen.

Consumers have grown fully accustomed to using their mobile devices for many aspects of their lives, but are still reticent to use them for highly confidential processes like financial and medical activities.

By developing portals with high security and applications with high mobility, a bridge can be built that allows providers the level of technological freedom they want while promising a certain comfort level for consumers that hesitate to trust wireless technology. The judicious application of in-transit encryption, regular patch updates, and a robust data model could offer unheard of levels of patient satisfaction, access to quality care, and physician job satisfaction.

One side of the coin, patients, is important to continued revenues and a supportable business model. Keeping patients happy and healthy is the goal of any self-sustaining medical institution. Technology can play a huge role in this endeavor. Imagine the path a patient takes when they begin to feel symptoms:

- A quick web search on their mobile device brings up an A.D.A.M. page hosted by their local hospital. After confirming a few of their symptoms, the consumer clicks a button to request a provider lookup. After entering their insurance information, the website tells them where a facility is that a) is nearest to their GPS location, and b) has a physician that specializes in their symptoms, and c) is covered by their insurance.
- Now, the consumer can click the button beside the provider's name to request an appointment. The information from the provider's scheduling system is synched up to the consumer's mobile device and new patient paperwork, if needed, is partially auto-filled by the device's current store of individual data for the device owner.
- By clicking the 'navigate' button, the consumer can now be guided turn-by-turn to their appointment. Upon arrival, the

consumer (now patient) can swipe their mobile phone (armed with Near Field Communications) over a reader to be automatically signed in at registration.

- While waiting to be called back, the patient will use their mobile phone or tablet to fill in the few remaining bits of information on the new patient or registration forms and click a button to send the data to the provider's practice. The practice database will be updated and move into a green status, preventing automatic reminders to the patient down the road.
- As the patient is being walked back to an exam room, their insurance information is being automatically verified and updated, their co-pay is being automatically withdrawn and their EMR is being updated with the latest info.
- In the exam room, equipment in use transmits data via Bluetooth to the patient's mobile device and EMR simultaneously, updating weight, blood pressure, body temp, and pulse automatically. Instructions from the doctor and prescription information are also updated on the patient's device automatically.
- Upon discharge, the patient will receive a virtual receipt with diagnostic codes that link to more information when clicked. A wave of the NFC-enabled smartphone checks the patient out and verifies that co-payment was received.
- Follow-up reminders are sent as needed to the patient, and prescriptions are filled automatically, with everything being tracked and updated in both the patient's personal record and the official EMR.

On the flip side of the coin is the practitioner. With less and less time available to spend with each patient, it's imperative that the basic processes be handled quickly and accurately so that the physician can focus on the actual problem the patient presented with in the beginning.

- Before entering the exam room, the physician will use their tablet to review the EMR and current vitals. By running a diagnostic application, they can even narrow down some possible diagnoses. Once in the room, all data consumption and creation happens on the mobile tablet.
- The physician can pull up test results, x-rays, and referral notes while conferring with the patient. Injuries or visible symptoms can be photographed with the tablet and added to the EMR. Audio notes can be taken and automatically transcribed. The physician can even let the patient know which recommended procedures are covered by the patient's insurance and which are not.
- Instructions and prescriptions entered on the tablet will be automatically sent to the patient, the EMR, and the pharmacy, along with electronic referrals to other specialists as needed.
- The physician can then click the next name on the list and start over in the next room. Alternatively, they might step into a privacy booth and pull up a video conference application to provide telemedicine services to a distant patient that can't travel. The tablet may flash and play a sound announcing a code blue in the waiting room or to notify of a nursing conference.

By combining the latest technology with the right approach, mobility in healthcare can transform the industry for patients and providers alike.