An Innovative Technology Profile:

**Mobile Clinical Decision Support**

One of the greatest obstacles a provider faces is the availability of proper information at the point of care, whether it is in a primary care, ambulatory care or other setting. This becomes especially critical if the patient is in an emergency condition. Clinical decision support systems (CDSS) have repeatedly been suggested as a useful tool for improving guideline adherence and mobilizing evidence-based knowledge into daily clinical practice. Mobile solutions may help to further facilitate this process.

Mobile clinical decision support tools are more frequently being leveraged to provide clinical decision support for physicians. For example, cell phones are loaded with the latest clinical decision support to aid physicians in making better diagnoses for patients in all care settings, and mobile and web-based clinical decision support resources provide physicians with easy to access information on appropriate treatments. Mobile technologies can assist clinicians to reduce preventable hospital readmissions, prevent medical errors and reduce adverse drug events.

A representative sample of these tools includes Health eVillages, Clinical Pharmacology Mobile and NaviNet Mobile Connect.

**Use Case**

- Mobile clinical decision support tools are targeted to physicians, but could also be used by nurses, retail pharmacies, managed care agencies, pharmacy benefit managers, pharmaceutical manufacturers and others.
- There are a number of mobile clinical decision support tools currently represented in the marketplace, all of which have similar but slightly different foci.
  - Mobile and Web-Based: Several tools use mobile and web-based clinical decision support resources to provide physicians with easy access to the latest information on evaluation, diagnosis, clinical management, prognosis and prevention.
  - Smartphones: Smartphones and other mobile devices, loaded with medical texts, drug guides and other reference tools offline, are used by health professionals in low-income regions of the world.

**Clinical Benefit**

It has been well-established that clinical decision support systems can facilitate clinician decision-making and guideline use by generating preventive reminders, ensuring the use of appropriate orders and assisting in diagnosis.\(^1\)\(^2\) CDSSs have resulted in improvements in clinical performance through increasing screening and vaccination rates as well as clinician knowledge and adherence to guidelines, among other improvements.\(^3\)

Handheld devices and smartphones have demonstrated limited but early successes in providing mobile clinical decision support that improve guideline adherence and mobilize evidence-based knowledge.\(^4\)\(^5\)\(^6\)\(^7\)

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• In 2009 a Randomized Control Trial (RCT) found that a handheld decision-support system improved diagnostic decision-making for patients in emergency departments with a suspected pulmonary embolism (n > 1,000).8
  o Using a mobile CDSS led to significantly greater improvements than use of paper guidelines, increasing the proportion of patients who received an appropriate diagnostic work-up by 19.3%.
• Another RCT in 2009 looked at the proportion of obesity-related diagnoses in clinical encounters documented by nurses with and without obesity decision support features and found positive results (n=1,874).9
  o The experimental group encounters had significantly more obesity-related diagnoses (11.3%) than did the control group encounters (1%) and a significantly lower false negative rate (24.5% vs. 66.5%).
• Independent studies of web-based drug information databases in 2008 and 2007 found that one of these tools scored highest for clinical dependability, completeness of information and highest overall composite score.10,11

While clinical decision support systems are well-known to provide clinical benefits, there are still a number of mobile clinical decision support systems where the evidence is not yet clear, as published results were not yet available.
• In 2011 one of these tools was offered to physicians in order to provide them with mobile access to electronic health record and patient management data (n > 2,000).12
  o Data from this tool is being mined on a weekly basis and is compared against thousands of evidence-based care guidelines that have been adopted within the medical community as the standard of care.
• Some of these tools that use smartphones have been piloted internationally, including in Haiti, Uganda and Kenya, as well as here in the U.S., in impoverished and underserved Gulf Coast communities.13
  o One nursing school brought six Haitian nursing professors to the U.S. to train them on smartphones, and the professors then brought their newfound expertise back home to teach other nurses.14
  o Smartphones have also been provided to volunteer nurses at a clinic in one country, and based on their successful use of the technology, additional devices were sent there to expand upon their initial work.15


Getting to Value: Eleven Chronic Disease Technologies to Watch
Financial Analysis

- Although a number of studies have clearly shown the clinical benefits of CDSSs, the current evidence on return-on-investment (ROI) and overall cost-effectiveness of CDSSs is not as clear.\textsuperscript{16,17}
  - Studies in 2008 and 2005 found that CDSSs improved medication adherence for congestive heart failure and high cholesterol, and cost-savings per member per year ranged from $4 to $35, respectively.\textsuperscript{16,19}
  - A recent 2011 study, however, found that implementing CDSSs is not a cost-effective way to treat patients with Type 2 diabetes, as researchers found that the system costs about $160,845 per quality-adjusted life year and noted that it would need to cost less or deliver better results to be cost-effective.\textsuperscript{20}
- There has been almost no research done on ROI and cost-effectiveness of mobile CDSSs.
  - One 2004 study did, however, find that mobile clinical decision support tools can reduce operational costs by saving up to $15,700 per year, per physician, via automating prescriptions.\textsuperscript{21}
- These tools have the potential to reduce preventable hospital readmissions, prevent medical errors, and reduce adverse drug events.

Barriers to Adoption

- **Ease of Use Issues:** Smartphone apps and web-based interfaces could be confusing for those not as technologically savvy or those without internet access. Additionally, most CDSSs are standalone products that lack interoperability with reporting and electronic health records.\textsuperscript{22}
- **Limited Data:** Studies have shown the clinical benefits of CDSSs, and a few studies have demonstrated promise for mobile CDSSs. However, research on the clinical and financial benefits of mobile CDSSs is severely deficient.
- **Cost of Devices:** Smartphones and other hand-held devices could be cost-prohibitive to physicians and organizations working in impoverished and rural areas.
- **Reimbursement Issues:** Widespread adoption is dependent on the reimbursement model. If these tools are not covered by insurance, it is unlikely that clinicians will purchase them out-of-pocket, as they are expensive.
- **Behavioral and Cultural Change:** These tools require a concerted effort on the part of providers and organizations to fit these new technologies into their workflows.
- **Lack of Clinical Guidelines:** CDSSs have been shown to improve clinical outcomes, and mobile CDSSs show promise as well; however, there is a lack of standardized clinical guidelines on how mobile CDSSs should be used.

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Next Steps to Implementation

1. Develop Meaningful Use Criteria Strategies for All Systems: In an environment of Meaningful Use (MU) criteria, a fundamental question is how smaller delivery systems can adhere to these criteria without the financial support and technologies that are available to larger systems, such as access to electronic medical record (EMR) systems that are capable of performing the required functions. This is particularly a question for community health clinics, visiting nurses, and small primary care clinics. Strategies should be developed which focus on the integration of MU criteria into these often forgotten but equally important delivery systems.

2. Look Ahead to Reality of Meaningful Use Requirements and Create Appropriate Use Cases: Strategies for the successful adoption of mobile CDSSs should also have an eye to the not-too-distant future of MU requirements. Stage 1 of MU requirements (2011 and 2012) sets the baseline for electronic data capture and information sharing, while Stage 2 (expected to be implemented in 2013) and Stage 3 (expected to be implemented in 2015) will continue to expand on this baseline and be developed through future rule making. As a result, strategies here should be forward-thinking in the development of future use cases for these technologies.

3. Opportunity for the Safety-Net: Through the development of MU criteria strategies for all systems and the creation of appropriate use cases for the future, there is a significant opportunity here to specifically focus on the safety-net population and build the use case for safety-net providers going forward.