Reap quality care, cost savings, staff retention, recruitment, and regulatory compliance

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The use of mobile information technology (IT) by most healthcare professionals in making treatment decisions at the point of care is expected to improve quality, safety, and efficiency of care delivery. Added value from these applications is extremely interesting for the growing number of facilities who are independently aging in place in the best possible environment possible. Early adopters of mobile IT systems in long-term care environments are beginning to realize benefits in resident care, clinical support, and administration.

Resident care benefits

The potential for IT to enhance resident care is immense through better and faster decision support. Clinical decision support uses electronically stored clinical information to help clinical staff make faster, more informed, and more timely decisions that might otherwise be missed in a paper record. Providers can be alerted through the decision support system through wireless email, messaging, pager systems, and other electronic means. The wireless capabilities of IT allow healthcare providers to be alerted about potential resident problems from anywhere.
Another benefit of technology to long-term care residents is the ability to provide better quality of service and improved safety. Quality is improved through IT because it makes the resident the center of care. IT reduces documentation time and allows staff to spend more time focused on meeting patient needs and providing activities. Furthermore, IT enables staff to communicate from virtually anywhere without having to make physical connections, thus improving efficiency and effectiveness of the point of care.

Aside from mobile hardware, another example is the mobile IT sensor network. Mobile IT sensor networks support resident care by enabling remote monitoring of elders by providers while ensuring continuous maintenance of necessary living environments and greater convenience. The mobile network is being piloted through the cooperative partnership in an independent living facility called TigerPlace and researchers at the University of Missouri in Columbia.

The mobile sensor network being installed in residents' apartments at TigerPlace allows the healthcare providers to remotely monitor sensing activities in apartments, including motion, physiological vital signs (pulse, respiration, heart rate, and alertness), temperature, kitchen activities, etc. The sensor system architecture is composed of non-wearable sensors, with a short-range wireless interface for communication with control devices, and a data manager that collects data from the sensors. The time-stamped data are then sent to a secure server as a binary stream stripped of resident identification. The network is capable of performing data processing tasks through clinical decision support modules to notify providers of early changes in resident conditions that would be unnoticed in apartments without sensors.

One benefit to residents using this sensor system is that it unobtrusively monitors their daily activities of living. Monitoring these activities allows remote providers to gain access and observe trends in daily activity patterns which, in turn, are unnoticed, might result in poor health outcomes, placement in more restrictive environments and greater expense. An example of how our sensor system detected a change in daily activities might include an increased amount of time a resident spends in an area of their bed. If a person is showing difficulty breathing while lying in bed, resulting in increased difficulty breathing, and the resident moves into a recliner to sleep, our sensor system is able to detect these changes and notify a provider of the changes.

The residents with sensors installed in their apartments, as well as nurses and physicians, were interviewed and showed the data interface. The interviews were instructive: Residents had difficulty viewing the data and graphs, and explained information overload and difficulty with understanding the terminology. Nurses and physicians used the data, however, to interpret clinical information and watch for warning signs, such as increased movement changes in activity levels, and changes in patient status, thus alerting them to an adverse event, such as a hospitalization.

Mobile IT sensor technologies are being explored to determine their capability of supporting notification of clinical support services when adverse events occur. Typically, residents who have an independent living don't qualify for facility-provided clinical services because they are stable and living active lifestyles. However, these residents often experience periods of decline in their health that might be reduced in length and frequency if attended to in early stages. Periods of decline in health can be detected by the mobile IT sensor technology through decreased resident activity levels being monitored by the sensors. Also, through the clinical decision support system, clinical support services such as nursing, physical therapy, and social services could be alerted to the changing activity levels and prompted to check on the resident. Early recognition of these events could lead to earlier intervention, reduced hospitalizations, and fewer placements in facilities having more restrictions.

Clinical support and EHR

The Institute of Medicine has outlined several key capabilities of electronic health records (EHR) with functionalities that should be implemented for long-term care by 2010. Strategic goals for long-term care include more emphasis on IT applications that support clinical support. These include technologies to support results management, such as automated reporting of laboratory, radiology, and pathology results; computerized provider order entry (CPOE); computer management that can facilitate ordering of resident supplies, electronic prescribing of medications, and other treatments; and electronic communications with external trading partners, such as insurers, outside pharmacies, or other suppliers.

Although few long-term care settings have implemented IT for clinical support services, it's important that users can access records from having such a system. Increased connectivity through IT allows for electronic monitoring of lab results and ordering of specific lab tests on a routine basis without the use of paper-based tracking systems that can be error-prone. For example, a clinical IT system that would provide laboratory clinical support would automatically be able to notify a lab when to run specific tests for a particular resident versus medical record which had to be pulled up by lab technicians at a facility.

Administration benefits

From an administrative standpoint, adoption of mobile IT can impact the quality of resident care and add cost savings. The healthcare information exchange and
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Interoperability (HIHL) concept discussed by Walker et al. describes various levels of information-sharing among providers and independent laboratories, radiology centers, pharmacies, payers, public health entities, and other providers. The ultimate application of this technology would be to create a seamless, integrated system, with access to both remote and local records.

Cost-benefit data for improved HIHL were developed, according to this study, using a panel of experts and a review of the literature—which was unfortunately limited by the lack of real-world implementations of standardized, interoperable systems in healthcare. Based, however, on available information, projections of an annual national benefit of $1.8 billion between hospitals and laboratories have emerged. When other factors, such as avoided tests and improved efficiency of provider transactions, were considered, a technology center, pharmacies, public health departments are factored in, the net value of HIHL becomes $7.8 billion per year. Moreover, authors of this study suggest that the clinical benefits of improved patient safety and quality of care could dwarf the financial benefits projected.

Benefits, challenges
Implementing such an information system would require a wide level of consensus, significant expense, and thorough training for staff, imposing both the personnel and financial management responsibilities on administrators. The payoffs for all this would be, however, that for what has been described as the most regulated industry in the United States, the availability of such information could aid administrators in regulatory and legal compliance.

There can, of course, be resistance to change among even the most learned stakeholders in any system impacted by new technology. Certainly, despite the numerous potential benefits of the technology, providers have demonstrated resistance to such changes. Providers have been wary of such potential drawbacks as small over- or under-estimation of the patient's relationship, and risks to information security. On the other hand, along with national attention being paid to rising healthcare...
cases, concerns remain over issues such as preventable errors leading to patient injury or death and the uneven quality of care across the United States. Medical IT allows critical medical information to move with the patient, providing secure, current treatment information to all caregivers. In addition to long-term care providers, such technologies could allow close family members the opportunity to monitor residents' activities, leading to better family connections and better quality assurance in general.

**Important goals**

The application of IT to provide telemedicine in rural areas is helping to bring parity in quality of care and cost savings. Administrators in long-term care may find that the ability to give high-quality care provided by those advancements will aid staff recruitment and retention. Beyond this, mobile IT can aid administrators in achieving the important goals of improved quality of care, sound financial management, and better regulatory compliance.

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**References**


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