

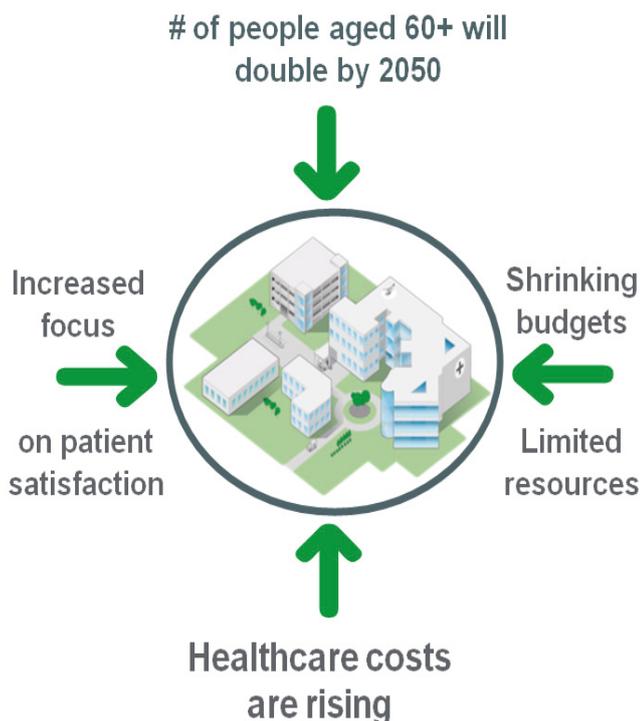


Using Mobile Applications for Improved Hospital Efficiency and Patient Satisfaction

Today's consumers are mobile app users who expect the same level of technology in the healthcare environment. By providing automatic and on-demand information to the right user at the right time, mobile applications designed specifically for the healthcare environment can help all stakeholders — patients, nurses and physicians, facility managers, and administrators — realize greater staff efficiency and improved patient satisfaction.

Introduction

By 2050, according to the United Nations, the world's population aged 60 and over will double (from 841 million in 2013 to 2 billion)¹. This rapidly aging population will place unprecedented demands for services on healthcare facilities, outpatient clinics, and aged-care facilities around the globe. Diseases and chronic illnesses that are more prevalent among older age groups, such as cardiovascular disease, cancer, diabetes, hypertension, and chronic obstructive pulmonary disease, require more care, lead to more hospitalizations, and are more costly to treat². Yet as healthcare costs continue to rise, hospital budgets are shrinking. And as healthcare facilities struggle to serve ever more patients with increasingly limited resources, patient satisfaction is placed at risk.



Patient satisfaction surveys are conducted to evaluate patients' perceptions of their hospital experience. For good or ill, patient satisfaction is critical to a hospital's ability to attract patients, promote loyalty and recommendations, and strengthen patient engagement. These ratings are also important to a hospital's financial health, as they are a key component of pay-for-performance metrics. In addition to patient satisfaction, healthcare facilities are also in a constant struggle to improve staff efficiency, communication between staff and patients, and patient care in order to stay competitive and reduce staff turnover.

One of the greatest opportunities for healthcare facilities, from small local healthcare clinics to large healthcare organizations, to improve patient satisfaction is to enable patients to stay connected to and in control of their facility experience, even while confined to a hospital bed, via mobile apps. Today's healthcare consumers are increasingly using mobile apps to give them more control over their healthcare decisions at home, and they expect the same level of control when they are patients in a hospital. Unfortunately, many healthcare facilities are still in the digital slow lane when it comes to adopting mobile connectivity between their staff and hospital in-patients. Although it's common to see physicians with a tablet in hand at a patient's bedside, and most patients are allowed to use their own mobile phones and tablets, patients must still push the nurse call button on their beds to request help with even the most mundane tasks, such as drawing the blinds, repositioning the television set, or turning down the thermostat. The result could lead to frustration for the patient, who cannot immediately meet his or her basic needs, and additional work for nurses who are already overwhelmed with the demands of a heavy patient load. This can have a severe domino effect that starts with patient and staff discontent and leads to lower hospital satisfaction ratings and higher staff turnover.

Similarly, facility managers need immediate access to infrastructure information to ensure the comfort and safety of patients, staff, and visitors. Hospital building systems are far more complex than in other types of facilities, with exponentially more moving parts. Often maintenance personnel are not even aware of a system issue or malfunction until someone enters a work order. This not only delays response time, but frustrates facility staff by placing them in perpetual "catch-up" mode.

Mobile apps, as part of an "intelligent" hospital infrastructure, enable hospital staff to stay in constant contact with patients and among peers anytime, anywhere. Intelligent infrastructure integrates traditionally separate systems (power, building management, IT, security) so that they can "talk" to one another, leading to faster, more informed decision-making and improving overall staff efficiency.

This paper discusses how mobile apps designed specifically for the clinical environment within a hospital can improve patient satisfaction and boost efficiency for physicians and nurses, facility staff, and administrators. Mobile apps that focus on healthy living and prevention, provide health reference education, review and rate physicians, facilitate filling prescriptions, and assist patients to adhere to their prescribed treatment are outside the scope of this discussion. The focus of this paper is on mobile apps that access facility infrastructure data and adapt to specific healthcare end-users, such as patients, nurses, facility managers, and administrators.

¹ United Nations, Department of Economic and Social Affairs, Population Division, "[World Population Prospects: The 2012 Revision, Key Findings and Advance Tables](#)" (2013).

² National Academy on an Aging Society, "[Chronic Conditions: A challenge for the 21st century](#)" (1999).

Mobile is the new normal

Today's healthcare consumers are mobile technology users immersed in the world of integrated, interconnected networks characterized as the Internet of Things. The use of mobile apps for everything from depositing checks to renewing a driver's license has made life more convenient—and instantly gratifying—for millions of people.

Mobile apps have changed the way we live and work, and there is no going back:

- Portio Research estimates that 1.2 billion people worldwide were using mobile apps by the end of 2012. Their analysts forecast that number to grow nearly 30%, to 4.4 billion users, by the end of 2017³.
- There are nearly 7 billion mobile subscriptions worldwide, according to the International Telecommunication Union (ITU)⁴.

“Rapid technology development has landed us in the middle of a mobile movement. The “internet of things” and mobile devices have changed the way we live, and provided us with an opportunity to be more efficient.”

- Research2Guidance forecasts that 1.7 billion people will have downloaded healthcare-related mobile apps by 2017⁸.

However, despite the growing popularity of consumer healthcare and wellness mobile apps and the emerging use of patient information apps, mobile applications are still underutilized in healthcare facilities:



1.7 Billion people will have downloaded healthcare related apps

Figure 1

More than two-thirds of healthcare apps available on the Apple Store are consumer-oriented vs. health care professional (HCP)-oriented.⁹

The mobile app trend has correspondingly manifested itself in the healthcare field.

- 44 million health-related smartphone apps were downloaded worldwide in 2011⁵.
- Approximately 97,000 mobile health apps are available in 62 app stores, according to a March 2014 report from industry analyst firm Research2Guidance. Among the top 10 apps in this category, there are as many as 4 million free and 300,000 paid apps downloaded daily⁶.
- A recent policy brief on mobile health by the Robert Wood Johnson Foundation, published in the journal *Health Affairs*, cites that industry experts predict the number of mobile health apps to increase by 25% a year for the foreseeable future⁷.

- According to a recent study of 17 UK healthcare organizations, 70% of participants said mobile technology resulted in greater patient involvement and improved the quality of visits.¹⁰
- 66% of the survey participants without mobile technology said they thought it would improve their work routine and patient care.¹¹
- A 2013 technology survey showed that in the United States over 50% of interviewed physicians used smartphones in their practice and roughly 35% used tablets.¹²

Although mobile apps for healthcare facilities are still considered a novelty, industry analysts at Ernst & Young predict that within the next five years, usage of mobile apps within facilities will be mainstream¹³. Adaptable

³ Portio Research, “[Mobile Applications Futures 2013-2017](#)” (2013)

⁴ International Telecommunication Union, “[The World in 2014: ITU Facts and Figures](#)” (2014)

⁵ Ernst & Young, “[mHealth: Mobile technology poised to enable a new era in healthcare](#)” (2012)

⁶ Research2Guidance, “[Mobile Health Market Report 2013-2017](#)” (March 4, 2013)

⁷ “[Health Policy Brief: mHealth and FDA Regulations](#),” *Health Affairs*, (Dec. 5, 2013)

⁸ Research2Guidance, “[Mobile Health Market Report 2013-2017](#)” (March 4, 2013)

⁹ IMS Institute for Healthcare Informatics, “[Patient Apps for Improved Healthcare: From Novelty to Mainstream](#)” (Oct. 2013)

¹⁰ eHealthNews.edu, “[Lack of Real-Time Information Affects 88% of Community Healthcare Workers' Ability to Do their Jobs](#)” (June 11, 2014)

¹¹ eHealthNews.edu, “[Lack of Real-Time Information Affects 88% of Community Healthcare Workers' Ability to Do their Jobs](#)” (June 11, 2014)

¹² Physicians Practice.com, “[2013. Technology Survey Results](#).”

¹³ Ernst & Young, “[mHealth: Mobile technology poised to enable a new era in healthcare](#)” (2012)

Patients have a wider range of research for choosing their hospital



In Person



Online



Reviews



Social Media Comments

70%

According to a recent study of healthcare providers of participants said **mobile technology** resulted in **greater patient involvement** and **improved quality of visits**



mobile apps in particular — i.e., those tailored to provide automatic and on-demand information to the right user at the right time — are designed specifically for a hospital's unique need to close the gap between clinical activity and the environment in which patient care is provided can help all healthcare stakeholders achieve a higher level of efficiency.

Healthcare providers have a number of options to address these scenarios, but not all are financially or logistically realistic. Building separate outpatient and surgery clinics and restricting hospital care to critical patients, for example, would help keep hospital nurses' focus on patient care rather than non-essential, comfort-related tasks, however, this requires an often prohibitively large investment. Setting up a transformation plan to improve patient flow is a possibility, but it's not easy to implement or sustain. Mobile apps, however, are a relatively simple and financially reasonable solution to some of these problems. Many healthcare facilities have already implemented standard mobile applications for patient administration. However, these apps are usually restricted to admissions, drug administration management, patient safety initiatives, and other clinical processes.

The missing piece of the puzzle for healthcare facilities is the availability of mobile apps that connect staff, patients,

What are adaptable mobile apps for healthcare facilities?

The following scenarios illustrate the all-too-common communication disconnect among hospital facility stakeholders — staff, patients, and facility management — and its potential impact on hospital reputation and financial loss as shown in the graphic below.

How is your hospital affected?



Challenge: Your patients have to call the nurse every time they are too hot, too cold, want to close their window blinds, or turn off the lights.

Impact: Patients will go to other facilities where they feel more comfortable and have more control over their environments, causing your hospital to lose revenue.



Challenge: Your nurses spend too much time completing tasks unrelated to patient care (adjusting room light, temp).

Impact: Clinical staff will also seek out other facilities where they can focus on patient care and have the technology they need to be successful.



Challenge: Your facilities staff don't have access to the information they need, anytime, anywhere.

Impact: Facilities staff will struggle to keep up with infrastructure monitoring and maintenance which could lead to wasted budget and resources.

and the environment itself, while providing more visibility and control over the facility's infrastructure. Implementing adaptable, à la carte, mobile applications is the simplest and most effective way to improve patient satisfaction and empower staff to be more efficient and productive.

"Adaptable" mobile apps get their name from their flexibility to adapt to each individual healthcare facility's goals and environment. Simplified and immediate access to information enables workflow efficiency gains, and adaptable mobile apps allow personalised access to that information based on the end-user's role. The information they receive and use is "adapted" to function within the healthcare environment. For instance, nurses might want to see and control room temperatures and nurse call events, while facility engineers need to be able to resolve an issue with the room temperature when it arises. All users access the same system, but in different ways and for different purposes.

An adaptable mobile app for healthcare facilities has the following characteristics:

- A simple-to-use customized user interface designed for specific users and tailored to their individual roles (patients vs. nurses vs. physicians vs. facility managers)
- Delivered through hospital-provided devices
- Provides users access to monitor and manage the systems and equipment relevant to their individual roles (nurses vs. physicians vs. facility managers)
- Expands site system access to occupants beyond the facility's technical personnel
- Broadens visibility of patients' basic needs within the hospital infrastructure and enables quicker reactions to simple day-to-day tasks

In healthcare facilities, 80% of users are non-technical: clinicians, nurses, health administrators, etc. Adaptable mobile apps aim to allow access to information not readily available to other users who aren't engineers. They seek to illustrate important information about the environment of care, in a simple way that clinicians, and other non-technical users can understand and act upon. For example, if the temperature range in a patient room is known and visible to the clinician, he or she can determine if the setting is suitable for a specific patient diagnosis, and make the decision to adjust the temperature without having to call an engineer.

How mobile apps benefit various stakeholders

As part of an "intelligent hospital" initiative, the deployment of adaptable mobile apps delivers tangible benefits to all stakeholders – patients, medical staff, facility staff, and administrators.

Mobile app	User	Benefit
Control of patient room environment	Patients	<ul style="list-style-type: none"> • Improve patient comfort • Improve patient satisfaction • Improve hospital ratings and reimbursement
Nurse call	Patients, nurses	<ul style="list-style-type: none"> • Improve patient satisfaction • Improve nurse / patient relations • Improve nurse response time • Improve job satisfaction
Patient information-sharing	Nurses, physicians, patients	<ul style="list-style-type: none"> • Avoid delays in patient care • Reduce average length of stay • Improve medical decision-making • Improve patient satisfaction
Non-medical care tasks	Physicians	<ul style="list-style-type: none"> • Avoid delays in patient care • More efficient time management — up to 1 hour/day • Improve job satisfaction
System/infrastructure status	Facility managers	<ul style="list-style-type: none"> • Improve response time to malfunctions • Improve job satisfaction

Table 1

Mobile apps adaptable to the hospital environment

Patients

Thanks in part to the rise of healthcare mobile apps, today's consumers are more proactively involved in their own healthcare decisions. They have come to expect the same degree of involvement and control when they are in-patients in a hospital.

When integrated with intelligent environmental systems for managing hospital infrastructure, an adaptable mobile app, accessible from a patient bedside terminal, gives patients the ability to immediately view and change their room environment. Various widgets allow patients to adjust temperature, humidity, lighting, entertainment systems, and more, without needing to call a nurse or involve facilities. In the past, hospitals have tried to give patients the ability to control their own room temperature with up and down arrows on their pillow remote. However, the patient had no proof that the temperature was actually changing; thus it reduced "nuisance" calls to the nurse, but had no measurable effect on patient satisfaction. By allowing the patient to not only control their own room temperature, but also see the temperature in their room change on their bedside tablet or phone, facilities give patients a greater sense of satisfaction that their needs are being met. And with the Affordable Care Act in the US and similar legislation around the world, hospitals are paid or not paid their full requested amount based on the patients experience and comments on patient satisfaction surveys. A very satisfied patient will net the hospital more money in insurance reimbursement than a patient that is even just slightly dissatisfied.

The patient mobile app can also include a nurse call widget, as well as similar request buttons for cleaning and food services. This allows the patient to direct their request to the appropriate person. For example, if a patient needs a glass of water, they can use their bedside terminal to request food

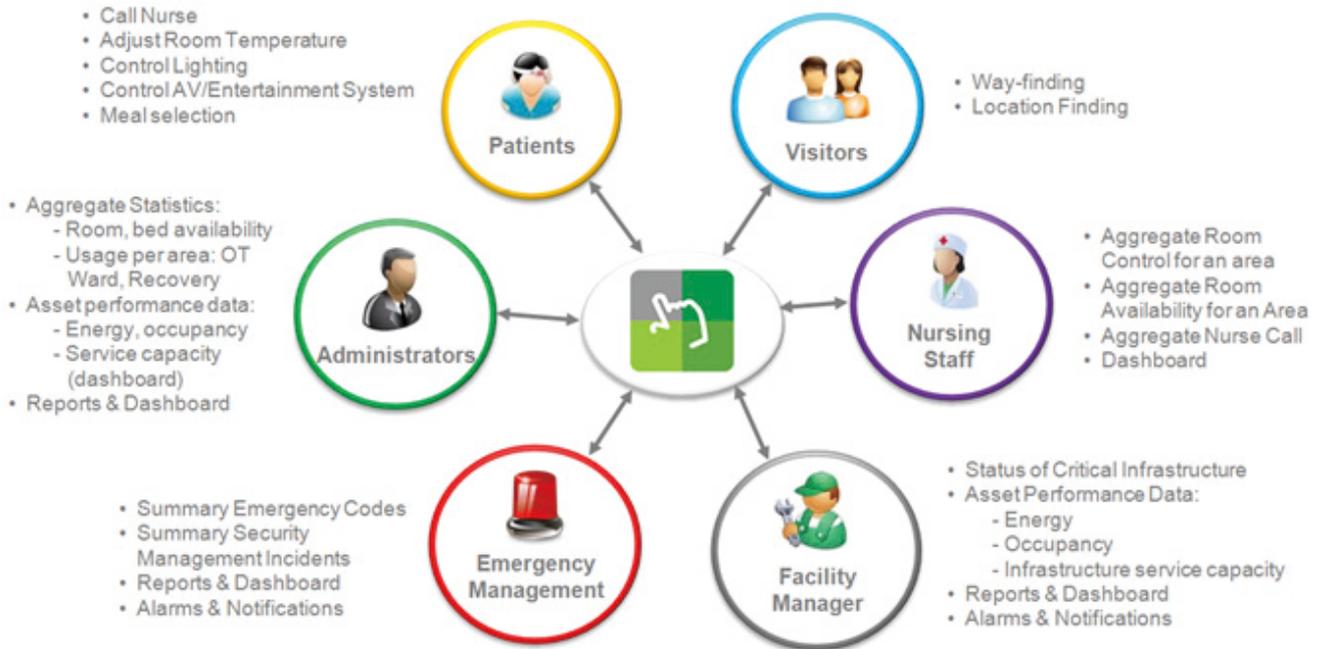


Figure 2
A family of apps aggregates systems and services most relevant to an individual user's day-to-day functions

service, instead of calling a nurse and taking her attention away from other patients in need of care. Directing information to the right user can greatly improve patient satisfaction as well as staff productivity. In fact, [a St Francis Medical Center study](#) found that by directing some calls to aides rather than nurses, nurse time freed up by 22% and improved response time to critical calls.

The apps are hosted via hospital-provided mobile devices, so patients are able to use familiar mobile technology even in an unfamiliar hospital setting, which leads to better patient comfort and overall satisfaction.

After Gateway Medical Center, in Clarksville, Tennessee, implemented integrated environmental controls for patient rooms, a hospital study found that patients requested 20% less pain medication due to the stress reduction that accompanied more comfortable rooms. Average length of stay (ALOS) was also significantly reduced. Patients were able to control the room temperature and solar blinds to increase the amount of natural light in the room. Furthermore, the room-based environmental controls also facilitated more effective cleaning (as blinds are located within window panes), resulting in improved infection control.¹⁴

“Nurses’ spending more time with patients is directly related to improved recovery rates and reduced ALOS [average length of stay].”

Nurses and physicians

Adaptable mobile apps reduce the number of tedious non-medical or “nuisance” tasks nurses are required to do, resulting in improved workflow, increased productivity, efficiency, and job satisfaction. For example, by providing the patient with the ability to control their own window blinds, nursing staff no longer need to be called to perform these tasks. By removing these non-medical responsibilities, nurses can focus on what matters most—patient care. Apps can be deployed on nurses’ workstations, smartphones, tablets, and patient bedside terminals, and can be designed to receive alerts from patient rooms, report room conditions, such as temperature and occupancy status, or include any hospital-wide specific communication, such as for code blue or lock-down situations. Rather than having to spend time on administrative or support tasks, nurses can spend more time at the patient’s bedside or otherwise directly caring for the patient.

Research confirms that mobile devices and apps help hospital staff save time and respond to patient needs more quickly. According to a study published in the Archives of Internal Medicine, internal medicine residents at the University of Chicago were given iPads and instructed to use them for tasks they would otherwise do on a computer — specifically, indirect patient care work, such as updating medical charts, documentation, and ordering tests. Four months later, 90% of the residents were still using the iPad. Over three-quarters of the users indicated that they saved approximately an hour each day on daily tasks, with 68% finding that the iPad helped them prevent delays in patient care.¹⁵

¹⁴ Graeme Robertson, “Effect of Intelligent Technology Infrastructure on Hospital Operating Costs and Patient Care” (Schneider Electric, 2013)

¹⁵ Archives of Internal Medicine, “Impact of Mobile Tablet Computers on Internal Medicine Resident Efficiency” (March 12, 2012)



There are some concerns accompanying the use of mobile applications for storing sensitive patient information, such as medical charts—it is imperative that doctors and nurses maintain patient confidentiality and compliance with HIPAA and similar laws around the world. However, mobile app developers are fast becoming better at data encryption and information security, and hospitals can count on these technologies only becoming better in the near future, meaning patient information should stay safe and secure, and physicians and administrators alike should easily be able to meet these regulations.

Facility managers

The integration of an adaptable mobile app within an intelligent infrastructure control system can improve the communication and connectivity between facility managers and staff by providing virtual access to monitor and control the intelligent hospital infrastructure. Whether on a desktop, tablet or smartphone, facility managers can receive alerts and notifications related to the widgets within the app, as well as access dashboards for electrical, hydraulic, and mechanical infrastructure. For example, the facility manager might receive alerts regarding upcoming scheduled system maintenance, equipment failures, energy use, or electric power status.

“Forrester forecasts that mobile apps will have an especially huge impact on improving the customer experience.”

An adaptable mobile app tailored to the needs of facility managers increases efficiency by alerting facility staff to infrastructure events and malfunctions as they happen, resulting in faster response times and less frustrated staff. Staff can also generate and monitor service calls and check the status of incidents anywhere, at any time. As a result the facility management team can work more efficiently and reduce the need for a large amount of paperwork for each work order. These time and efficiency gains translate to significant operational savings, as well as improvement in employee job satisfaction.

Hospital executives/administrators

According to a 2014 Forrester research report on mobile trends, organizations are looking to mobile technologies as a catalyst for transforming their business and providing added value. Analysts forecast that deploying mobile solutions throughout the organization will have an especially huge impact on improving the customer experience and increasing return on investment. It is that “mobile moment” when healthcare providers or patients realize that they have the right content, information, and access to services at their fingertips on a familiar mobile device.¹⁶

What is that right information? Through mobile apps, administrators can keep tabs on aggregate statistics and such as room and bed availability, and performance data in areas like occupancy and energy, and they can monitor all hospital activity in real time. The immediate and convenient access to this information that mobile apps provide—keeping it literally at administrators’ and executives’ fingertips—can allow these individuals to ensure they’re always making informed business decisions and addressing any problems or concerns that arise. Administrators looking to increase staff efficiency, reduce staff turnover, and attract more patients can pick and choose the widgets in the

¹⁶ Thomas Husson and Julie A. Ask, “Predictions 2014: Mobile Trends For Marketers” (Forrester, 2014).

mobile app that will best fit the needs of their facility staff and patient demographic — resulting in improvements to both the patient and caregiving experience. These apps can also be customized with personalized “skins” featuring the hospital logo and other corporate identification to keep the hospital’s brand in front of patients and visitors at all times.

Additionally, the previously discussed visible benefits of adaptable mobile app usage, such as staff efficiency improvements and reduced patient ALOS, help administrators achieve high marks in the healthcare industry and their individual communities for low staff turnover and patient safety and satisfaction.

Conclusion

Adaptable mobile apps tailored to the specific needs and environment of healthcare facilities will drive the next generation of patient care. And the time to adopt this technology is now, especially in light of escalating healthcare costs, the surge in mobile app usage, and the growing trend of healthcare consumers wanting more control over their environment and experience when hospitalized. Providers who remain behind the curve in this area risk losing prospective patients to other healthcare facilities that have joined the mobile movement.

There are a number of practical steps that providers can take to begin the movement toward integrating these applications into their technology infrastructure. Forrester advises organizations to seek out IT team members and vendor partners with strong mobile talent and technology expertise. Analysts suggest selecting partners with flexible mobile solutions to support the organization’s mobile strategy for the long term as mobile technology expands and evolves.

Adaptable mobile apps are the natural, seamless extension of sharing information across multiple systems in the intelligent hospital. Healthcare facilities have the opportunity to take their technology infrastructure to the next level, while also making a name for themselves as leaders in the world of mobile health and patient/staff satisfaction. And in the long run, providers who adopt these applications will undoubtedly find themselves better equipped to deal with the new care challenges waiting on the horizons of the health world.

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