Touchscreen Check-In:
Kiosks Speed Hospital Registration

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I. Executive Summary

Adoption of kiosks is on the rise, and soon they will become a common sight in ambulatory settings and emergency departments.

PATIENT KIOSKS ARE INTERACTIVE COMPUTER STATIONS designed for self-service tasks, such as patient check-in and collection of co-payments. Kiosks can be freestanding (like those at the airport), wall-mounted (like bank ATMs), placed on a countertop, or they can be mobile (like a tablet PC). Interest in self-service kiosks is growing rapidly as hospitals seek to improve patient satisfaction and operational efficiency. Although fewer than 10 percent of health delivery organizations have implemented patient kiosks, the experiences of early adopters show that kiosks can be effective tools for meeting rising consumer expectations.

Hospitals are deploying patient kiosks in two main settings: ambulatory departments and emergency departments. In the ambulatory setting, the most common uses of kiosks are for patient check-in, wayfinding assistance, collection of co-payments and outstanding balances, updating patient demographics, and to ask patients basic screening questions. Some organizations also enable patients to sign consent forms and fill out real-time patient satisfaction surveys. In the ED setting, where there are fewer kiosk implementations industry-wide, kiosks are generally used to enable patients to sign in and provide caregivers with basic triage information.

Hospitals justify the implementation of kiosks primarily as a means to improve patient service, not strictly as a cost-savings measure. The experiences of leading organizations have shown that kiosks can increase patient satisfaction by reducing waiting times and offering greater convenience and privacy. Many organizations also achieve significant operational benefits, including increased patient throughput and improved accuracy of demographic data in patient records. However, kiosks are intended to supplement, not replace, staff.

The success rate for kiosk implementations is high. Compared to other technologies such as electronic medical records or clinical systems, patient kiosks are relatively uncomplicated to implement, require a small investment, and can be deployed selectively to the departments that are likely to benefit from their use. Choosing the

right type of kiosk to use and the right functions to deploy requires careful planning and consideration. Integrating the systems with scheduling, billing, and other existing systems also requires care in selecting vendors with the right type of expertise.

Occasionally, kiosk implementations have not succeeded. Sometimes there is not enough interest on the part of patients to use the kiosks, or the kiosks are not integrated closely enough with existing systems, diminishing the overall benefit. These risks can be minimized by adhering to a short list of best practices identified through researching kiosk implementations at a variety of leading organizations across the country. Best practices for kiosk implementations include:

System Selection

- Choose a kiosk with the physical location in mind.

- Consider purchasing more than one kiosk per area/department.

- Freestanding kiosks offer an important opportunity for branding.

Deployment

- Start with areas that have high numbers of repeat patients.

- Start with check-in and payments, then add functions as desired.

- Use a greeter during the initial rollout.

- Place the kiosks in an obvious location.

- Enable as many languages as you reasonably expect to use.

Policies and Procedures

- Make use of the patient kiosk voluntary.

- Assign basic oversight responsibilities for each kiosk.

In deciding whether and how to implement kiosks, it is important to understand the organizations needs and to consider the patient population that will use it. User acceptance is difficult to predict, but organizations can take steps to increase the likelihood that patients will have a positive experience. For example, hospitals can use signage and branding to communicate the purpose of the kiosk and convey trust. They can offer multiple languages, address privacy concerns by adding privacy screens and carrels, and provide staff greeters to help patients use the kiosks during the first few weeks of implementation. By following these and other best practices, organizations can develop a strategy to fit their unique circumstances and goals.

Adoption of patient kiosks is on the rise, and soon they will become a common sight in ambulatory settings and emergency departments across the country. As the experiences of early adopters have shown, success is less a matter of technological components and more about deploying kiosks in a way that is inviting, useful, and efficient. Properly implemented, patient kiosks offer a new way for organizations to meet rising consumer expectations for convenience and at the same improve the accuracy and usability of information systems.

II. Introduction

Patient kiosks are built on mature technologies that have proven successful in other industries.

AS HOSPITALS RESPOND TO HIGHER CONSUMER EXPECTATIONS and tighter budgets, many are looking to self-service technologies such as patient kiosks as a way to improve efficiency and satisfaction. Recent improvements in touchscreens, intelligent scripting, and high-resolution displays have made kiosks an attractive option for hospital ambulatory settings and emergency departments.

Self-service kiosks are being used to enable patient check-in, to automate the collection of co-pays, and to offer services such as wayfinding assistance and language translation. See Table 1. In some emergency departments, kiosks enable patients to sign in and provide caregivers with basic information that can be used for triage. Early adopters have reported increased patient satisfaction due to greater convenience and shorter waiting times, as well as efficiency gains from increased throughput and fewer errors in keeping demographic data up to date.

Patient kiosks are well-suited to many health delivery organizations as a way to supplement staff. They are built on mature technologies that have proven successful in other industries. Compared to many service-improvement projects, kiosks are relatively inexpensive, low-maintenance, and easy to implement. Organizations can control costs by tailoring the hardware and software they select. Kiosks also provide an immediate benefit that can be felt by patients and staff alike.

Table 1. Percentage of Hospitals Providing Patient Services through Kiosks

FUNCTION	
Wayfinding	13%
Preregister for services (includes check-in)	5%
Pay bill	4%
Update insurance information	4%
Schedule appointments	3%

Source: Hospital & Health Networks' Most Wired Survey and Benchmarking Study, 2008

This report outlines the use of kiosks in hospital ambulatory and emergency departments as a way to improve efficiency and increase patient satisfaction. It describes the features and functions of kiosks, early results, the industry landscape, and provides some insights on best practices. It concludes with case summaries of four organizations that have implemented patient kiosks in different ways and for different purposes.

What Are Patient Kiosks?

Industry analysts define a patient kiosk as an interactive computer-based system designed for self-service tasks. The user interacts with the kiosk through a touchscreen, keypad, or both. Optional accessories such as signature pads and fingerprint scanners can be used for input or biometric identification. These components integrate with software systems through custom-built interfaces or messages using a standard protocol.

The patient kiosks in use today involve minimal staff involvement and are considered semi-attended devices. This means that they are usually kept in the view of a staff member, but do not need to be watched continuously. While it is possible for a staff member to monitor a patient's transaction in real time through an activity log, this is rarely necessary. Most kiosks are configured to update the front-office system automatically and send a notice of the patient check-in directly to the person in charge of managing patient arrivals.

Wayfinding is the most common kiosk application offered by health care organizations currently. Users are assisted in getting from one place to another through turn-by-turn directions and/or a customized map. For example, a kiosk located in the building's lobby might provide wayfinding assistance to the right ambulatory office. A kiosk located in the waiting room might provide wayfinding assistance

Collecting Patient-Specific Co-Pays

Kiosk integration with clinical and financial systems has matured to the point where the user can be prompted to pay a co-pay amount that is specific to the features of his or her insurance plan. This is an improvement over earlier programs that asked for a standard amount—often resulting in under- or over-collection.

However, enabling patients to pay down outstanding balances may require that the organization use the same vendor for billing as for the kiosk software. Alternatively, the organization may need to develop a custom interface using its own IT department or a special system integrator vendor.

to the right post-visit laboratory or imaging center. Although kiosks typically offer static maps, some generate directions that avoid construction areas and steer patients around outdoor paths in bad weather.

One reason why wayfinding is common is because it can be implemented as a simple, standalone application that does not require integration with office systems. Some organizations start with wayfinding as a low-cost way to gain experience with kiosks before adding functions that require a higher level of integration.

Although wayfinding is the most common application for kiosks, the focus of this research is on kiosks as a more robust self-service technology for check-in, co-pay, and other advanced tasks. In the basic kiosk check-in scenario, the patient arrives, swipes a health plan member card or driver's license, and the system matches the person's name to the database in the administrative system. Almost all kiosks prompt the user for some type of identification verification—usually birth date and/or zip code. Many systems also prompt the user to confirm the reason for the visit (e.g., "Office visit with Dr. Smith at 10 a.m."). This allows the system to verify that the user has an appointment scheduled for that day, and

is in the correct location within the facility for that appointment.

After the identity of the user is verified, most kiosks are configured to present the user with the appropriate co-pay amount (including any past unpaid amounts) and options for payment on the spot, including credit card and debit card. Cash collection at kiosks is technologically possible—and indeed common in grocery stores, parking garages, and public transportation. However, this research did not uncover any health delivery organizations that have enabled cash collection at check-in kiosks. The main barrier to accepting cash is that it requires additional overhead to secure and process money. As an alternative, some organizations offer a "pay with cash" option onscreen, which then instructs the user to complete the transaction with the receptionist. Since cash payments are posted manually anyway, this scenario adds no risk of recordkeeping errors if a patient who chooses this option fails to make the payment with the receptionist.

Some organizations implement additional functions that are presented to the user after check-in. For example, the kiosk can screen users by asking such questions as "Is your visit related to an injury or illness that is work-related?" or "Have you had a flu shot this year?" Such information can be used for insurance purposes, or to offer patients reminders of other services that are available. Kiosks can also enable patients to update demographic information such as address, phone number, or emergency contact. The new demographic data are usually reviewed by a member of the front-office staff for proper formatting and completeness before being fed into the patient's electronic record.

Kiosks may provide an electronic signature pad that enables patients to read and sign forms such as general consent, patient rights, HIPAA privacy notices, and Medicare utilization forms. This can be an effective way to digitize an otherwise completely paper-based process, provided the consent forms are relatively brief and the text is readable on the screen. Electronic consent forms also save staff time. Some organizations have reported up to a 50-percent reduction in time spent scanning and filing the completed forms.[1]

Patient satisfaction surveys are another popular kiosk function. Organizations can incorporate brief patient surveys into the check-in procedure with little or no programming knowledge. These one-to-three-question surveys typically ask users about their visit experience with questions like: "Did you have an easy time finding parking today?" or "Did you like having the option of checking in with the kiosk?"

New patient registration can also be handled on kiosks, although this is not common as yet. Registration generally requires the patient to provide a substantial amount of personal information and a detailed medical history, which can be done more comfortably using a stylus or keyboard than a touchscreen. Furthermore, most organizations want the kiosk to remain a quick and expedient option for patients, and do not want users engaging in lengthy transactions while people wait in line behind them. Check-in kiosks are viewed as a "fast lane" option to provide added convenience—especially for returning patients and those who make frequent visits.

Nevertheless, in emergency departments, kiosks often do offer a brief, streamlined registration process for new patients, along with questions about condition and pain for triage purposes. In the few cases in which full registration services are offered, the common solution is to provide a mobile kiosk (sometimes called an "electronic clipboard") that the user can take back to a seat and work on at his or her own pace.

III. Forms and Functions

Patients who are not able to check in via any other method can be approached by a staff member, who uses the mobile kiosk to record the patient's information and condition into the triage system.

CHECK-IN KIOSKS COME IN THREE MAIN TYPES: FREESTANDING kiosks; countertop and wall-mounted kiosks; and mobile kiosks. Many of the components and capabilities are similar across all three forms, yet each is best suited for a slightly different use. The following section compares and contrasts these forms and functions.

Freestanding Kiosks

Patient check-in applications are predominantly handled by freestanding kiosks, which closely recreate the airline check-in experience that so many consumers have become comfortable with. Relatively slim in design, most are between 54 and 66 inches in height, have a small footprint of two to four square feet, and weigh between 275 and 850 pounds.

Freestanding kiosks are instantly recognizable as self-service terminals if they are placed in a conspicuous part of the lobby or reception area. Printed signage that extends above the main part of the enclosure can call additional attention to the kiosk. During the initial rollout phase, greeters can be stationed nearby to invite patients to use the kiosk and answer questions as they arise.

Most freestanding kiosks use the following components for user input and output:

- Touchscreen interface;

- Magnetic stripe reader (or optical card scanner);

- Electronic signature pad;

- Electronic number pad;

- Printer (receipt width or full-page width); and

- Audio speakers.

The touchscreen interface usually consists of a 15-inch or 17-inch display. This serves as the primary method of input, as patient kiosks generally do not have keyboards. The magnetic stripe reader enables returning patients to identify themselves by swiping a member card

or credit card. It also allows the collection of patient co-pays and outstanding balances via credit or debit card.

Other types of readers can scan the front and back of, for example, a driver's license, and then feed the image to software that extracts the information using optical character recognition (OCR). Additional user input components such as electronic signature pads and number pads are more common in ambulatory settings than in EDs. Number pads, such as the ones used on ATMs, are not strictly necessary, since the touchscreen can provide the same capability.

Onboard printers are an especially valuable component of kiosks, enabling patients to print a map for wayfinding or get a receipt after making a payment. Finally, speakers can be used to enhance the user experience by providing an audible welcome message, instructions, or other audio feedback. Despite the ability of kiosks to deliver a full multi-media experience, most organizations do not use kiosks to present educational videos.

Other optional kiosk components include privacy screens, which make it difficult for anyone other than the user to see the information on the screen; presence sensors, which recognize when a person has approached the kiosk and can trigger a welcome message; reduced-glare displays, which make the touchscreen easier to read in bright daylight; and antibacterial coatings, which can help keep the screen and enclosure free from germs. Some kiosks have their own internal surge protectors, cooling fans, UPS battery backup, and ballast for stability and security (a necessity if the kiosk is not bolted to the floor).

Freestanding kiosks can support a full range of functions, although at the present stage of adoption, some functions are more prevalent than others (see Table 2).

Table 2. Kiosk Functions and Prevalence

FUNCTIONS

Most Commonly Implemented

- Wayfinding assistance
- Patient check-in
- Collection of co-payments and outstanding balances
- Update and verification of patient demographics
- Confirmation of reason for visit
- Basic screening/patient questionnaire
- Multiple language support

Less Commonly Implemented

- Patient satisfaction surveys
- Consent forms
- New-patient registration

Presently Uncommon

- Future appointment scheduling
- Patient check-out

Finally, one of the most valuable features of kiosks is language access for those not fluent in English. The ability to offer multiple language options is a powerful way to improve the patient experience for organizations that serve diverse patient communities. It also potentially leads to delivering care that is safer and more effective. Organizations can use the language translation capabilities that come with the kiosk, or they can translate the information and instructions on the kiosk screens so that each language has its own custom-written script. While the former option is usually available "out-of-the-box," the latter option leads to better accuracy, as it ensures that the names of departments and medical terms are translated clearly and appropriately. Support for multiple languages is generally available on all types of kiosks—freestanding, wall-mount, countertop, and mobile.

Wall-Mount and Countertop Kiosks

For many organizations, wall-mount and countertop kiosks are a convenient alternative to freestanding kiosks due to reasons of space, security, or cost.
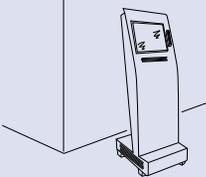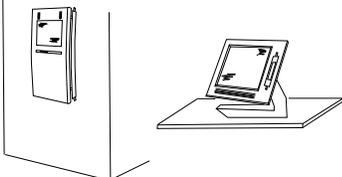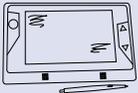
Wall-mount kiosks can replicate all of the functions found in a freestanding kiosk. Some organizations choose this configuration to save floor space. However, to install several wall-mount kiosks side-by-side requires a significant amount of uninterrupted wall space. Unlike freestanding kiosks, wall-mount units involve minor construction and wiring for networking and in-wall power. This makes them a slightly more permanent fixture than freestanding kiosks.

Countertop kiosks can replicate most of the functions found in freestanding kiosks, but without the stand or enclosure. They are installed on a desk, counter, or carrel. The most basic countertop kiosk is simply a display, limiting the user to the functions that can be accomplished using a touchscreen.

Onboard accessories and peripherals, including signature pads and mag-stripe readers, can be added for additional functions. Printers are typically not available on countertop kiosks, which makes them less suitable for wayfinding. Also, countertop kiosks are generally not available in custom enclosures, which can severely limit the opportunities for branding.

Popular uses of wall-mount and countertop kiosks include patient check-in, collection of payments, signing of consent forms, and patient surveys. Wall-mounts are slightly more common than countertop models in ambulatory settings for patient check-in, whereas countertop kiosks are more commonly used in EDs. This is because payments are rarely collected via kiosk in the ED, allowing organizations to forgo the optional mag-stripe reader, and select a very basic, inexpensive countertop system.

Table 3. Comparison of Kiosk Forms

	FREESTANDING KIOSKS	WALL-MOUNT AND COUNTERTOP KIOSKS	MOBILE KIOSKS
Location	Ambulatory and ED	Ambulatory (wall-mount); ED (countertop)	Ambulatory (by patients); ED (by staff)
Cost	$4,000 to $20,000 (or leased for $300 to $500 per month) Usually includes onsite service and maintenance	$2,000 to $4,000 (or leased for $250 to $350 per month) Usually includes onsite service and maintenance	$1,500 to $3,000 (leasing is uncommon) Does not usually include service and maintenance
Available Components	Full set of components are available	Most components are available (printers are less common on countertops)	Most components are available (no printers or number pads)
Space Required	2 to 4 square feet	Wall space or countertop space, and a place for user to stand	Small amount of desk space for docking station
Opportunity for Branding	High	Moderate (wall-mount); low (countertop)	Low

Mobile Kiosks

Mobile kiosks are essentially tablet PCs—laptop-size devices with a stylus instead of a keyboard—and are often "ruggedized" for enhanced durability and/or sealed to withstand repeated cleanings.

Although these kiosks can be outfitted with mag-stripe readers and other peripherals to recreate the full check-in experience, mobile kiosks are generally reserved for two functions—new-patient registration (in the ambulatory setting) and special assistance (in the ED).

In the ambulatory scenario, mobile kiosks enable new patients to register for services. Rather than being handed a clipboard with paper registration forms, the patient fills out an electronic version of the forms, using the stylus to fill in fields, check boxes, and add brief written comments as necessary. The mobile kiosk is well-suited to this function because it enables the patient to fill out the potentially lengthy medical history forms while sitting comfortably in the reception area (rather than standing in front of a kiosk). Using mobile devices in conjunction with check-in kiosks also helps keep the check-in kiosks available for other patients to use.

In the ED, mobile kiosks are used by hospitality officers and emergency room technicians to assist patients who cannot (or do not wish to) use a freestanding or countertop kiosk themselves. Patients who are not able to check in via any other method can be approached by a staff member, who uses the mobile kiosk to record the patient's information and condition into the triage system. The mobile kiosks in this scenario are, in effect, a backup option, rather than the primary way that ED patients are registered. Table 3 on page 9 summarizes the similarities and differences between the different types of kiosks.

IV. Industry Landscape

The general population is now quite familiar with and trusting of kiosks for self-service tasks.

ALTHOUGH KIOSKS ARE JUST STARTING TO BECOME PART of the mainstream in health care, the kiosk industry as a whole is well-established and full of highly mature technologies. Self-service kiosks are common in airports, banks, grocery stores, and other venues. This benefits health care organizations in three ways. First, the infrastructure has been put in place for hardware vendors to develop robust components at increasingly attractive prices. Second, kiosk vendors have accumulated substantial expertise in assembly, system integration, and other implementation details. Third, the general population is now quite familiar with and trusting of kiosks for self-service tasks. In short, many of the barriers typical of a new technology have already been broken down.

Interest in kiosks is rising across industries. A recent report on interactive kiosks indicated that 2007 sales exceeded 200,000 units and half a billion dollars, and that kiosk sales are expected to grow 22 percent annually through 2010.[2] In health care, although adoption of patient check-in kiosks still stands at less than 10 percent, kiosks are gaining visibility.[3] Another cross-industry report suggested that the market for kiosks in the health care industry is at least as large as that of education, although still significantly smaller than for other industry segments such as retail, photo, and transportation.[4]

Three main types of vendors have emerged in the health care kiosk field: hardware specialists; software specialists; and firms that provide both. Health care organizations have used vendors in differing ways to acquire their preferred kiosk solution.

Hardware Specialists

Hardware specialists design and sell the physical kiosks described earlier. While vendors in this category typically carry at least a small number of stock designs, their strength is their ability to custom-design kiosks that meet the exact specifications of the health care organization. Such vendors are generally very experienced, having served other industries for years, and can meet nearly any design requirement.

Hardware specialists are a good fit for health care organizations with unique needs that require special attention. For instance, many organizations believe that having the proper branding on a kiosk is critical to creating a fit with the organizational identity. In addition to selecting exactly the right technical components of a kiosk, branding influences the choice of materials, colors, and labeling on the enclosure. This is especially true for implementations in new buildings, where considerable care has been given to architectural considerations. Generally, branding is more important for freestanding and wall-mount kiosks than for countertop or mobile kiosks, which offer very limited space.

Hardware vendors can provide a complete, fully supported kiosk solution through the use of third-party system integrators or their own custom-developed interfaces. Although they do not sell their own front-office software system, they *can* configure the kiosk to interface with the one currently used by the hospital. Some hardware specialists have accumulated libraries of interfaces that are common in health care, a trend that is likely to increase as interest in patient kiosks rises.

Software Specialists

Software vendors specialize in developing the most complete self-service check-in software possible, regardless of the kiosk used. Firms in this category typically offer a much broader array of products than just kiosk check-in software. Some also offer practice management, scheduling, electronic medical records, and other programs.

Using a kiosk check-in system from a software specialist is a natural fit for organizations that already have systems implemented from one of these vendors. Organizations that use a software vendor for their front-office system may find that their vendor has a self-service module for kiosks.

Such a solution makes integration easy for handling patient demographics, financials, scheduling, and patient identification. Coordination can also be done between kiosks and online patient portals to achieve a consistent look and feel to the applications.

Reporting tends to work best when organizations use the same vendor for kiosk software as they do for other front-office systems. Staff can view usage metrics, survey responses, activity logs, and credit/debit card transactions without switching between multiple applications. In addition, languages can be better supported by software specialists than hardware specialists, who typically rely on the language modules within the operating system to do translation. Certain medical terms and proper names, for instance, can be translated more accurately by hand. Some software vendors support as many as 30 different languages out-of-the-box, and can custom-configure the kiosk to support even more. (Few organizations find it necessary to offer more than five to ten language options.)

A hospital could go to a hardware specialist for a custom kiosk, and to a software specialist for a new self-service check-in system. Alternatively, the hospital might simply use a software specialist and a stock kiosk from a mass-market hardware provider. The decision depends on the specific needs and goals of the hospital, and for this reason, software specialists work more closely with the client than with the kiosk vendor.

An added value of using a software specialist lies in the robust features and native integration with existing systems.

Combination Hardware/Software Providers

The third category is composed of vendors that supply both their own hardware (the kiosk enclosure and components) and their own patient check-in software. These vendors usually offer stock kiosks with a few options such as different screen sizes, but without the wide variety and custom-design services of a hardware specialist. The enclosures offered by these vendors are not branded, but the colors, logos, and fonts used onscreen generally can be matched to those used by the hospital. These stock kiosks tend to be less expensive than those offered by hardware specialists.

The software offered by these vendors has similar capabilities to that offered by software specialists, except that it is third-party software that is limited by the number of interfaces the organization wishes to purchase and implement. Common interfaces are available out-of-the-box, and other systems can also be integrated easily, provided they use the HL7 standard. Organizations can start with a basic set of interfaces (e.g., practice management) and expand to other areas (e.g., scheduling) after purchase.

Vendors in this category are quite experienced. Some started as providers of stand-alone wayfinding solutions. Others are former software specialists. As more software vendors see the opportunity for kiosks in the health care industry, the trend toward offering stock kiosks at more competitive prices is likely to continue.

Table 4 summarizes the different approaches that can be used to select the appropriate combination of hardware and software.

Table 4. Approaches to Selecting Hardware and Software Vendors

APPROACH	CONSIDERATION
Individual Hardware and Software Specialists. Purchase the kiosk from a hardware specialist and hire a software specialist to implement and integrate the kiosk software to the office systems.	Requires two separate vendors.
Hardware Specialist. Purchase the kiosk from a hardware specialist and hire the same vendor to write a custom interface to the office systems.	Availability of software services varies with hardware specialists.
Combination Hardware and Software Provider. Purchase both the hardware and software from the same vendor.	May simplify the software integration, but also may limit ability to customize hardware.
Hardware Specialist and Inhouse IT Department. Purchase the kiosk from a hardware specialist, and use the organization's inhouse IT department to build interfaces and scripts.	An option only if the appropriate inhouse IT resources are available.

V. System Integration

WHICHEVER TYPE OF VENDOR AN ORGANIZATION CHOOSES to work with, some level of system integration will be required in order to activate the more advanced kiosk features such as insurance verification, patient demographic updates, scheduling, and billing. All of the major capabilities of these systems can be extended to kiosks. For example, kiosks are connected into the financial system in order to look up the exact co-pay for a given patient and to check outstanding balances. One software specialist vendor is working on enabling kiosks to display and collect amounts that also incorporate the terms of the patient's deductible.

Each new level of integration adds cost, as more modules are enabled or more custom interfaces written. Not all organizations fully implement and integrate all of the functions that are possible. An organization may, for example, allow patients to print a list of upcoming appointments via the kiosk (a read-only function), but not schedule new appointments via the kiosk (a more complex read-write function).

A caveat pertains to integrating kiosks with self-developed systems such as scheduling or billing. Depending on the age of its system, the organization's IT department may have to write the interface. Another consideration is whether a home-grown system can support all of the functions that the organization wishes to implement. For example, one of the organizations interviewed for this report plans to allow patients to sign consent forms electronically, but cannot do so until its home-grown system is updated to be able to receive and store the JPEG image files. In this case, the limiting factor is the back-end system, not the integration.

Aside from integration with self-developed programs, system integration generally requires little involvement on the part of the hospital's IT department. Integration is usually available either out-of-the-box as part of the vendor's library, or interfaces can be custom-developed by the vendor. Some software specialists can achieve integration through the native application programming interface (API) in their software. Local IT needs are generally limited to integration testing and basic network administration (to manage the kiosks residing on the local wired or wireless network).

VI. Best Practices for Implementing Kiosks

Kiosks should be thought of as an express option for those who are comfortable with self-service technologies and desire the convenience and/or privacy.

COMPARED TO OTHER KEY HOSPITAL TECHNOLOGIES SUCH as electronic medical records, computerized physician order entry (CPOE), and e-prescribing, patient kiosks are relatively easy and inexpensive to implement. Kiosks in ambulatory settings and emergency departments complement staff resources by enabling patient self-service. Their purpose is not to replace existing staff.

Several best practices for successful implementation emerged from the research. They are based on the experiences of numerous organizations that have led the way in introducing kiosks into health care delivery.

System Selection

■ **Select a kiosk with the physical location in mind.** Countertop and wall-mount kiosks may appear to take up less space than freestanding models, but can require just as much space if a carrel will be used for privacy.

■ **Consider purchasing more than one kiosk per area/department.** While an incremental approach to deployment is wise, kiosks should not be under-allocated in the piloting phase. Vendors can supply a rule of thumb. For ambulatory settings, two kiosks equal about one FTE receptionist. For the ED, one kiosk per 25,000 patients seen per year is suggested.

■ **Take advantage of branding opportunities.** Clear and consistent colors, design, and logos should be used on large enclosures and freestanding kiosks. This signals to patients that the kiosk is intended for their use. It gives users confidence that the kiosk is safe and secure, and reinforces the idea of a consistent patient experience. Ultimately, branding also increases use. Branding has less usefulness in countertop and mobile kiosks, which have far less surface area to work with. For these kiosks, clear and consistent print signage surrounding the kiosk will suffice.

Deployment

- **Start in areas with high numbers of frequently returning patients.** Patients who come for regular visits will be most attracted to the speed and convenience that kiosks offer. Departments like oncology, physical therapy, and rehabilitation are excellent places to start because the benefit is likely to be the greatest and the learning curve the shortest.

- **Start with check-in and payments.** Although some hospitals enable consent forms and scheduling immediately, most organizations start with a basic set of transactions and add functionality later on. Kaiser Permanente, for example, started with basic check-in and co-payments, and now has plans to enable patients to schedule future appointments.

- **Use a greeter during the initial rollout.** Even with signage, it is highly likely that patients will fail to notice the kiosks or will not understand that the kiosks are intended for check-in. Allocate a staff member for at least one or two weeks to greet patients, encourage them to use the kiosk, and to answer questions.

- **Choose an obvious and convenient location.** Patients who do not use a kiosk often state that they did not notice the kiosk, or did not understand that it was intended for their use. Locate the kiosks near the place where the patient would normally go to check in. Additional signage can be used to invite patients to try the kiosk.

- **Enable as many languages as you reasonably expect to use.** Support of foreign languages is a major benefit for patients who do not speak English. Most kiosks can support at least three languages, and some offer many more. Usually, there is minimal cost associated with offering additional languages. Organizations may be required by law to offer particular language options if a certain percentage of its clientele speaks that language. Back-translations of all scripts must be done so that staff members receive arrival notes in English, regardless of what language the patient uses at the kiosk.

Policies and Procedures

- **Make use of the patient kiosk optional.** Making the kiosk mandatory will inflate use statistics, but it will not necessarily increase patient satisfaction. Patients with complex questions still need a receptionist to resolve their issues. Kiosks should be thought of as an express option for those who are comfortable with self-service technologies and desire the convenience and/or privacy.

- **Assign basic oversight responsibilities.** Although patient kiosks do not need to be fully attended, departments should still designate a staff member to periodically check the kiosks to ensure that they are clean and in proper working order. At Newark Beth Israel Medical Center in New Jersey, the hospitality officer wipes the kiosks with a disinfectant about once an hour, and hand sanitizer is kept nearby for use by patients. Following the vendor's recommendation, the hospital reboots the kiosks once every 24 to 48 hours to maintain optimal hardware performance.

Before installing kiosks, organizations should record their base-line service levels to enable a clear before-and-after comparison. Some statistics, such as average time in line, may need to be collected by hand. This is well worth the effort, as it helps demonstrate the service level improvement and can be used to help other departments prepare their business cases for implementing kiosks.

Although many kiosk implementations meet and exceed their objectives, some deployments have not been successful. For example, Parkland Memorial Hospital (Dallas, TX) deployed registration kiosks in its emergency department using funds that were donated to the organization's affiliated medical school. Some patients found the kiosks very efficient and appreciated the reduction in wait time and increased privacy, but others found the touchscreens difficult to use. Many did not notice or did not want to try the kiosks, forcing the department to staff them with greeters at all times. This became inefficient, and the program was discontinued. Another organization tried using mobile kiosks in its cancer center, where new patients were given tablet PCs to complete an initial patient profile. The electronic answer sheet improved legibility for staff, but the tablets were not integrated with the patient registration system, which forced staff to re-key the information into the system. The benefit of enhanced legibility was too small to justify continuing the program.

Table 5 presents 12 questions that every organization should ask itself before implementing kiosks.

Table 5. Twelve Questions

Making the Decision to Invest

1. What service issues do we want to address with the kiosks?

2. Which metrics, statistics, or scores are we trying to improve, and how will we measure the changes?

3. Who will use the kiosks? Which type of kiosk and which languages are a good match for our patient population?

System Selection

4. Does our current vendor provide a kiosk module?

5. Which type of kiosk should we use, and how will it change our workflows?

6. How important is branding?

7. Are there any functions that we do not want to implement right away, but may want to add in the future?

Deployment

8. Where will we deploy the kiosks?

9. How many kiosks do we need?

10. Should we pilot the kiosks first? If so, where?

11. How will we integrate the kiosks with the check-in or triage system?

Policies and Procedures

12. Who will monitor the kiosks on a daily basis, and who will provide ongoing technical support when changes need to be made?

VII. Case Summaries

Because kiosks are a new technology, industry examples are not plentiful. For this research, interviews were conducted with several health delivery organizations that are leading the way on the implementation and use of kiosks. The following case summaries demonstrate the wide variety of uses and benefits available to organizations that employ this technology.

Basic Check-In and Payments

Kaiser Permanente (SOUTHERN CALIFORNIA)

Objectives

Kaiser Permanente (KP) is a large, nonprofit, integrated health plan based in Oakland, California. Through its Kaiser Foundation Hospitals and their subsidiaries, KP serves about 8.7 million members in nine states and the District of Columbia, including a sizable presence in the Southern California (SCAL) region. Two years ago, as part of an initiative to design the "Front Office of the Future," KP SCAL began looking at kiosks as a way to enhance ambulatory services. They developed a vision that would use kiosk-based self-service as a complement to KP HealthConnect, the name of the organization's electronic health record system.

Prior to rolling out kiosks at a number of their SCAL facilities, KP offered a traditional check-in experience in which members lined up at the receptionist's desk to check in. Changes to demographic information were communicated verbally, and co-pays were collected at the window. The process was not marked by any major breakdowns, but occasionally long lines would form during peak hours of operation, or if one member required special attention for questions or complex transactions. The verbal communications sometimes led to misspellings or other data entry errors, and co-pays were not always collected reliably. Also, traditional face-to-face check-ins did not always work well for members who spoke little or no English.

Solution

In 2007, KP tested the available technologies and surveyed members on their willingness to use a kiosk. The organization worked extensively with hardware vendors to select the right enclosure and technical components, as well as with its own clinical software system vendor to ensure back-end integration with the registration, scheduling, billing, and reporting tools.

Positive feedback from members led to an expanded pilot project in June 2008. By the end of the year, about 100 self-service kiosks were deployed in 60 medical clinics, making Kaiser the largest user of health care check-in kiosks in the country. Kaiser has plans to roll out an additional 200 kiosks in 2009.

The kiosks are used by members to:

- Check-in for scheduled appointments;
- Update demographic information;
- Pay co-pay and deductible with a credit or debit card; and
- Receive wayfinding assistance for directions to their appointment.

These functions account for the bulk of tasks and transactions that are typically performed through staff at the check-in counter. All of the tasks can be performed with the aid of language translation. Members can choose from one of six languages: English, Spanish, Chinese, Tagalog, Armenian, and Vietnamese.

Results

In 2007, a patient satisfaction survey was conducted. Patients who checked in with receptionists were interviewed to learn about their awareness level of the new self-service check-in option. Patients who checked in with a kiosk were asked about their experience using this tool. Member reactions to the KP Self-Service Kiosks were very positive. The vast majority of members who checked in using the kiosk had a successful experience, with over 75 percent of members feeling that checking in through the kiosk is faster than checking in through a receptionist. About 60 percent of members report that the reason that they used the kiosk was because the line was shorter. More than 90 percent of members who used a kiosk to check in are able to do so successfully without needing any assistance, and the same number also report that they felt comfortable with the level of privacy offered by the kiosk.

Kiosk utilization numbers have not yet been base-lined, as the focus in 2008 was to learn how to deploy and support kiosks across the KP Southern California region. Utilization is noticeably higher during peak hours, though, suggesting that the kiosks are fulfilling their role of providing additional capacity as needed.

Department administrators are also pleased with the kiosks. Before the introduction of the kiosks, members requiring special attention may not have received all the assistance they needed, as staff tried to check in members as quickly as possible in order to prevent lines from forming. When staff members were out sick, there would be pressure on remaining staff to do multiple jobs, which caused dissatisfaction for members.

With the kiosks in place, members who visit frequently can use the kiosks, leaving receptionists to give their full attention to other members who need it. Even on days in which there is a shortage of staff, the negative effect on member satisfaction is dramatically reduced because the kiosks provide additional service capacity.

Some administrative tasks are reduced or eliminated. For example, staff members no longer need to re-key changes to demographic information into the system; they can confirm with a single click the information that the member has typed.

KP SCAL's rollout of self-service kiosks could lead other KP regions to consider the technology. As the initiative expands, additional functions such as the ability to schedule future appointments will be added, although check-in via receptionist will always remain an option. KP views kiosks as an opportunity-rich technology. In 2009, KP plans to expand its use of kiosks to the pharmacy on a pilot basis, enabling members to self-arrive at the pharmacy and pick up a prescription more quickly. KP also expects to deploy kiosks to serve in locations where membership is growing most rapidly, giving more members an opportunity to have more control over the way they access care.

Check-In and Payments, Forms, and Basic Scheduling

Vanderbilt University Medical Center
(NASHVILLE, TN)

Objectives

Vanderbilt University Medical Center (VUMC) is a comprehensive health care system, with dozens of hospitals and clinics, as well as schools of medicine and nursing. Vanderbilt clinics see more than 1.2 million patients per year across a full range of specialties, including: cancer; ear, nose and throat; gynecology; kidney disease; pulmonary disease; and urology.

In 2008, VUMC became interested in kiosks as a way to improve operations in three key areas: patient satisfaction, patient flow, and the satisfaction of patient service representatives (PSRs). During VUMC's expansion to new buildings in the Nashville area, officials sought technologies to maintain a high level of patient service and ensure that bottlenecks would not occur in the waiting rooms of new clinics.

Solution

First, VUMC worked with a kiosk hardware vendor to select the right enclosure and components. The vendor custom-designed the enclosures, installed the internal computers and external user interface components, and configured the drivers to ensure that everything within the kiosks worked properly. Then VUMC worked with a software integrator to enable the kiosks to communicate with the clinics' systems. An interface was built to connect to VUMC's inhouse electronic medical record system (called StarPanel). Another interface was built to enable credit card processing through Vanderbilt's existing financial system.

In May 2008, VUMC began its pilot by installing kiosks in three areas that do not collect co-pays: the preoperative evaluation clinic, the pediatric rehabilitation unit, and radiology. Initially, patients were able to use the kiosks only to check in. Staff greeters encouraged patients to try the kiosks and answered questions. After this rollout was deemed successful, VUMC expanded the scope and functionality of the pilot, deploying the kiosks to 11 more areas and permitting patients to use credit and debit cards to make payments for co-pays.

Results

The initial reaction of patients and PSRs to the kiosks was so positive that the wider second-phase deployment was started just five months later, in October 2008. VUMC is deploying kiosks to 20 of its ambulatory settings, including clinics in dermatology, surgical weight loss, and women's health, among others. Patients can check in and make payments via credit card and debit card, or they can select the "cash/check" button and pay at the receptionist's window after they have checked in.

Patients can also use the kiosks to read and sign forms, such as the HIPAA consent form and VUMC's standard consent-to-treatment form. Patients simply review the form as they would on paper, and then use the electronic signature pad to give their signature (paper versions are always on hand if patients prefer not to use the kiosk). Additionally, patients can access their schedule of appointments, and view or print a summary of all of their future appointments. VUMC requires that the user answer a security question—birth date—in order to perform these transactions.

VUMC's own informal study of patient feedback indicates that kiosks reduce lines and decrease the perceived waiting time. In a sample of 465 timed kiosk check-ins, VUMC measured the average

check-in time at two minutes, which staff members believe is at least as good as the total time waiting in line for a receptionist and then checking in with the receptionist. Utilization rose to 35 percent of check-ins. In addition, staff members reported feeling better about spending more time with patients who have complicated questions or additional needs.

As VUMC continues to expand its ambulatory clinics, patient kiosks will be deployed to more locations and specialties. Additional functions are also being discussed, such as identifying a patient who is part of a research study, and the ability to handle Medicare secondary-payer claims more easily. VUMC has also explored the idea of introducing mobile kiosks to enable new patients to register and provide their full medical histories.

Check-In and Payments, Patient Feedback, and Reporting

Scott & White Hospital and Clinic
(TEMPLE, TX)

Objectives
Scott & White Clinic (S&W) is the largest multi-specialty medical practice in Texas, and one of the largest in the United States. It has approximately 700 physicians spread over 30 locations in central Texas.

After changing its model from a "closed system" to accept a wider range of insurers, S&W found that it needed to perform far more eligibility checking and verification tasks than before. These additional processes increased the check-in time, causing patient queues to build up, occasionally even stretching out the door. In order to maintain its reputation for operating efficiency and community responsiveness, S&W began to look at solutions to increase patient satisfaction. One option was to overhaul the entire computer system, but this approach would take too

long to implement. Another option was to redesign workflows, but administrators were not confident that this approach would provide enough of a benefit. A third option — to redesign the physical architecture of the clinics or construct a new building — was also briefly considered but dismissed due to cost.

Solution and Results
S&W ultimately turned to self-service kiosks as a means of improving patient check-in. They worked with a hardware vendor to supply a streamlined countertop kiosk outfitted with a mag-stripe reader, electronic signature pad, and integrated receipt printer. Then they worked with the vendor to integrate the kiosk with their practice management system.

S&W started with three kiosks to test user acceptance, and shortly thereafter deployed three more. Patient feedback during this period was 95 percent positive. Today, about ten kiosks are in use across three sites. More may be added, depending on capacity and demand patterns.

Using the kiosks, patients can check in by swiping a driver's license or entering their social security number. Then they verify their insurance information, and make a co-payment with a credit card or debit card. The system is custom-configured to print off arrival notices at the nurse's station automatically. Patients can also indicate whether they need any other printouts, such as a doctor's note. These instructions are captured in the scheduling system and passed along to the appropriate caregiver.

S&W also takes advantage of the opportunity that kiosks provide to conduct real-time patient satisfaction surveys. Depending on patient volume, the system can be configured to prompt users to answer a few brief questions about their experience, such as "Was parking adequate for you today?" and

"Is the building clean?" Questionnaires are kept very short in order to allow people to conduct their business and move on, but nevertheless the feedback provided is valuable to S&W and can be reviewed as often as desired.

S&W also makes use of a number of metrics and reporting capabilities, including daily and monthly counters for check-ins, co-payment tallies, time-to-check-in, and percentage of successful check-ins. For example, early in the deployment, the organization found that two kiosks in one location logged 1,872 check-ins over a two-month period (about 20 check-ins per kiosk per day). Currently, each kiosk handles between 50 and 110 patients per day. Average check-in times range from one to two minutes, depending on the location and configuration. By comparing the number of kiosk check-ins to traditional check-ins, S&W estimated that about 25 percent of visiting patients use a kiosk. Patients report liking the kiosks for two reasons: (1) faster check-in/no waiting in lines; and (2) enhanced privacy and confidentiality.

Each kiosk handles between 50 and 110 patients per day. Average check-in time ranges from one to two minutes.

Although the purpose of the kiosks is not to eliminate staff, S&W estimates that one kiosk can handle approximately one-half of a receptionist FTE (in terms of check-ins). In effect, each two kiosks that are deployed free up a person to resolve more complex issues relating to check-ins and insurance questions, or to spend more time with patients as they check out—particularly if they require referrals or would like to set up future appointments.

With an acquisition cost of about $12,000 per kiosk, plus $350 for annual maintenance, S&W's total five-year cost of ownership has been under $15,000 per kiosk. A basic cost-benefit analysis estimated that the average cost of a check-in with a kiosk is between $0.74 and $1.12, compared to $8.12 per check-in through an office clerk. In addition, although the kiosks cannot perform all of the duties of an office clerk, the kiosks have been shown to collect more co-pays than the average clerk.

Finally, S&W has found that the kiosks have essentially no impact on the information technology department, once the initial setup and configuration is complete. As is the case with most kiosk vendors, the annual maintenance fee paid by S&W covers all of the routine issues that arise.

Kiosks for Check-In and Triage in the ED Setting

Newark Beth Israel Medical Center
(NEWARK, NJ)

Objectives
Newark Beth Israel Medical Center (NBIMC) is a 673-bed regional teaching hospital and affiliate of the Saint Barnabas Health Care System. With more than 100,000 patients per year, NBIMC is a major referral and treatment center for the northern New Jersey metropolitan area.

In 2005, Newark Beth Israel became an early adopter of patient self-service kiosks, deploying several units across selected hospital departments, including oncology, pre-admission testing, same-day surgery, and the adult and pediatric clinics. Patients and staff reacted so positively to the convenience and efficiency offered by the kiosks, that the organization began to look for new opportunities to use the technology.

Solution

After two years of experience with the kiosks for basic check-in and wayfinding, NBIMC expanded the program to the emergency department, which had been using an inefficient pen-and-paper system that was slow and led to long lines. In an urban setting with many patients dependent on public transportation, it was not uncommon, for instance, for the 11:30 a.m. bus to drop off 15 patients at once, creating an instant backlog. Sometimes waiting times for check-in stretched to nearly an hour and a half, contributing significantly to low patient satisfaction ratings and low Press Ganey scores.

NBIMC worked with an established kiosk vendor to select components—three wall-mounted kiosks—which were installed in the ED in November 2007. The units have a 15-inch touchscreen display and are placed inside wooden carrels to provide privacy for patients. Three mobile kiosks are also kept on hand for use by the ED hospitality officer or waiting room technician, or to hand to patients who arrive in a wheelchair. (For emergency department settings, NBIMC's vendor recommends approximately one kiosk per 25,000 patients per year. Between the wall-mounted kiosks and the less-used mobile ones, NBIMC meets this ratio.)

Prominent signage helps guide patients to the registration kiosks as they arrive at the ED. Patients with serious emergencies are rushed to treatment areas, but other patients may use one of the kiosks as an alternative to waiting in line to check in with a staff member. The kiosks are configured to perform "registration lite," meaning that patients answer a few basic demographic and health questions, but are not required to enter a detailed medical history. Repeat visitors can swipe a credit card to populate the standard fields such as first name, last name, date of birth, sex, and zip code. New patients simply type in this information using the onscreen keyboard. The screening questions that appear are adaptable based on the answers provided. For example, a female patient between the ages of 12 and 55 would be asked if she is pregnant. If she answers yes, the kiosk asks if she is less than 20 weeks into her pregnancy, more than 20 weeks, or in active labor. Other screening questions ask about diabetes and allergies to medications. The final screening question is an all-purpose "complaint field" composed of a grid of 18 different conditions. Eight of these are red-flag indicators, including chest pain, shortness of breath, blood-borne exposure, fever and/or chills, and homicidal ideation.

The kiosks are configured to perform "registration lite," meaning that patients answer a few basic questions, but are not required to enter a detailed medical history.

After the information is collected at the kiosk, it is sent to a back-end system monitored by the triage nurse. As yet, NBIMC has not implemented a direct interface between the ED registration kiosks and the documentation system. Therefore, the nurse manually re-enters the data along with his or her evaluation. Since both systems can be accessed via the same computer, transposing the information is usually only a matter of copying it from one window to another—a process that is at least more efficient than traditional pen and paper.

Results

Nurses can now perform triage more quickly than before, allowing caregivers to provide patients with faster treatment based on medical need. Once the information is in the system, the nurse can print out a face sheet with demographic information, and can look up medical record numbers and patient numbers. Within the first day of implementation, the number of triaged patients seen rose from six to ten patients per hour.

Patient feedback has been almost entirely positive. Waiting lines to check in at the ED have essentially disappeared, and some patients commented that the kiosks also make the ED experience less stressful. The average waiting time has been reduced by one hour. The department saw an immediate increase in Press Ganey patient satisfaction ratings from 74 percent to 77 percent. Perhaps most revealing, the number of patients who left the ED without being seen dropped 13 percent despite an overall increase in volume of 8 percent. For a total investment of under $100,000 for six devices and all the necessary software and integration, NBIMC is now able to serve more ED patients at a higher level of service than before.

As ED utilization continues to rise, NBIMC plans to refine its triage kiosks program and make use of new features as they become available from the software vendor. Reporting capabilities, for instance, currently include average check-in time, wait time to be seen, and average triage time. New functionality will continue to be introduced as more hospitals express interest in kiosks and vendors catch up with the needs of leading organizations.

VIII. Conclusions

The growth of check-in kiosks could spur hospital interest in other self-service technologies.

KIOSKS ARE A RELATIVELY SIMPLE AND INEXPENSIVE WAY to introduce the patient self-service concept to the ambulatory office or emergency department. Patients benefit from enhanced convenience and shorter waiting lines, and staff members benefit from spending less time on routine administrative tasks and more time with patients who need their assistance. Kiosks benefit the organization as a whole through improved patient satisfaction scores and greater operational efficiency. Moreover, these enhancements frequently have a "halo effect," helping to create a positive atmosphere for patients, staff, and providers.

Adoption of patient kiosks will continue to increase until kiosks become a mainstream technology. The physical design of kiosks has reached maturity and is not likely to change significantly. The originally segmented vendor landscape may continue to blend together as hardware specialists accumulate expertise in software integration, and as combination hardware/software vendors reach out to more customers through competitive pricing.

The growth of check-in kiosks could also spur hospital interest in other self-service technologies. For example, there are kiosks that dispense medications to patients, which increases patient access and convenience. At Owatonna Hospital (Owatonna, MN) patients can get their emergency prescriptions filled without making a trip to the pharmacy. The kiosk is stocked with 40 to 60 of the most common acute-care drugs (no narcotics) and is accessible 24 hours a day, 365 days a year.

Kiosks can also be used as diagnostic health stations, where patients can get readings taken using the blood pressure cuff, pulse oximeter, weight scale, and body composition analyzer; they can then learn more about their health and what risk factors they might have. One cancer research program, run by the University of Georgia College of Pharmacy in conjunction with the American Cancer Society (ACS), placed several of these kiosks in local pharmacies and grocery stores in Georgia for use by the general public.

Appendix A: Case Study Interviewees

Debi Apostol
    Assistant nurse manager, emergency department
    Newark Beth Israel Medical Center
    Newark, New Jersey

Brent Blumenthal
    Assistant executive director
    Regional Clinic Operations
    Scott & White Clinic
    Temple, Texas

Lydia Howard
    Senior business and operations consultant
    SCPMG Consulting & Implementation
    Kaiser Permanente
    Pasadena, California

Melissa Libby
    HIS projects manager
    Vanderbilt University Medical Center
    Nashville, Tennessee

Steven Pomerantz
    Self-Service Kiosk Initiative
    SCPMG Consulting & Implementation
    Kaiser Permanente
    Pasadena, California

Larry Sharfstein
    Regional practice leader
    SCPMG Consulting & Implementation
    Kaiser Permanente
    Pasadena, California

    Corporate Communications Office
    Parkland Memorial Hospital
    Dallas, Texas

Appendix B: Representative Vendors

VENDOR / PRODUCT NAME	CONTACT INFORMATION		VENDOR CATEGORY
Clearwave *Clearwave Network*	3445 Peachtree Road NE, Suite 1275 Atlanta, GA 30326	(678) 738-1120 www.clearwaveinc.com	Software
CVD *Custom kiosks*	2130 South Yale Santa Ana, CA 92704	(714) 966-1600 www.customvideodisplay.com	Hardware
D2 Sales *Patient Passport Express*	10520-L N. Baehr Road Mequon, WI 53092	(262) 242-6100 www.d2sales.com	Hardware
Epic Systems *Epic Welcome*	1979 Milky Way Verona, WI 53595	(608) 271-9000 www.epicsystems.com	Software
FutureTouch Technology *Custom and stock kiosks*	17301 Edwards Road. Cerritos, CA 90703	(562) 366-8766 www.futuretouchtech.com	Hardware
IBM *IBM Kiosk*	P.O. Box 12195, 3039 Cornwallis Road Research Triangle Park, NC 27709	(800) 4-A-KIOSK www.ibm.com/industries/retail/store	Combination
Kio Health *Patient Check-In*	2619 Manhattan Beach Blvd Redondo Beach, CA 90278	(888) 321-0999 www.kiohealth.com	Combination
McKesson *Horizon Patient Kiosk*	One Post Street San Francisco, CA 94104	(415) 983-8300 www.mckesson.com	Combination
MEDHOST *ED Patient Access Self Service (ED PASS)*	5055 Keller Springs Road, Suite 400 Addison, TX 75001	(888) 218-4678 www.medhost.com	Combination
MediSolve *Patient Check-In*	363 Lang Blvd, Grand Island New York, NY 14072	(888) 987-6583 www.medisolve.ca	Combination
NCR *MediKiosk and eClipboard*	1700 S. Patterson Blvd Dayton, OH 45479	(800) 225-5627 www.ncr.com	Combination
NVIT *Patient Junction*	nvit@nvit.com	(888) 684-8266 www.nvit.com	Software
OTech *Patient Self Check-In*	5985 Artist Bay Road West Bend, WI 53095	(888) 392-9731 www.otechgroupllc.com	Combination
TabletKiosk *Custom kiosks and stock tablets*	2832 Columbia Street Torrance, CA 90503	(310) 782-1201 www.tabletkiosk.com	Hardware
Unicomp *POWERstation Kiosk*	9600 West Sample Road, Suite 507 Coral Springs, FL 33065	(800) 771-1710 www.ucoa.com	Software

Endnotes

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