

# Targeting Adoption, Training and Device Deployment Strategies

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## Abstract

The disposition of end-user devices in healthcare environments is often an ad-hoc affair with assumptions being made regarding utility. Occasionally workflow analyses will identify the type and location of a device required. Post-activation workflow and device use analyses are rare. Following the activation of an Admission Discharge and Transfer (ADT) and results reporting system in a tertiary care institution, device use was examined over a six-month time frame by user, location and type of device. Device utilization varied from unit to unit, by specialty and by occupation. A detailed analysis of devices on a medical ward also identified high and low use devices, as well as the occupation of the majority of users. This evaluation allowed the institution to modify device locations, identify readiness in individual units, focus training and super-user resources for future activations (which will include computerized physician order entry) and institute clinical adoption strategies.

## Introduction

Workflow analysis has become a key indicator for the deployment of end-user devices prior to the activation of hospital information systems (Rausch 2007; Smaling 2003). It is the

task of systematic management to provide the right information in the right place at the right time (Winter 1996). The future state extrapolation, however, is an assumption, because it is only after the activation that the correctness of the assumptions can be validated. More often than not, the subsequent requirement for end-user devices becomes an additional reactive process.

St. Boniface General Hospital is a 550-bed tertiary care institution in Winnipeg, Manitoba, that went live with a new clinical information system in April 2007. The activation of this system was divided into two phases, with phase one including patient demographics and ADT information. This phase also included clinical information, with the ability for providers to generate patient lists, record allergies and review results from the laboratory and diagnostic imaging departments. Given the complexity of the design and implementation of phase two, it was eventually slated to occur in a split activation with computerized physician order entry (CPOE) and electronic medication administration records (eMARs) in November 2008, to be followed by the activation of clinical documentation in 2009. The gap between phases one and two allowed us a window of opportunity to evaluate the deployment and actual use of end-user devices.

### Objectives

1. To determine the overall use of end-user devices by individuals to identify both low and high users and patterns of use amongst clinical groups.
2. To determine use by unit to analyze the culture readiness of the unit and identify access and other issues or barriers.
3. To determine the patterns of use of devices based on individual units, by individual device and by the occupation of the user.

### Methodology

Electronic patient record (EPR) audit logs were collected over the six-month period following activation from April to September 2007 inclusive. Data collected included the identification of the user, their occupation, the location of the device, the device type and the date of each log-in. Data collection was limited to those users who had logged in more than four times during that time period.

An obvious limitation of this methodology was that we were unable to tell if the user who logged in was in fact the person using the system. We also did not take into account what the user had actually looked at, only that they were logged in and had accessed a patient record.

### Results

Analysis showed that the number of log-ins per user ranged from four to 899. By occupation, registered nurses were the most frequent users followed by administrative (clerical) staff. The percentage of trained users who accessed EPRs five or more times in that time frame is shown in Figure 1. Since this system is essentially an ADT system, 100% of ward and registration clerks used the system. Of clinicians, 82% of trained nurses and 52% of trained physicians used the system during this time frame. The physicians who had not used the system were subsequently surveyed to identify the reasons. The response to the survey was poor [8% of those surveyed (inactive users)]. However, the responses probably accurately reflect the reasons for not using the system: 67% said that there

was no need for access because all of the information was in the paper chart, including the abnormal laboratory results that were still being printed out at central desk locations; 20% claimed to have difficulty with access, including not having had training and/or not having obtained passwords; and 13% asked someone else to access the information.

Figure 2 identifies use by program. Program team managers and charge nurses were subsequently quizzed as to the reasons for high or low use. Of note is the fact that at this point the EPR had functionality, including patient lists personalized by individual users and laboratory results that could be tracked with trend plots over time.

In the area of medicine, it was noted that there was a high rate of EPR access related to the high turnover of patients in clinical teaching units with a motivated nursing group. The amount of urgent blood work required increased the use of the system by house staff. Surgical wards also had a high rate of access because of the clinical requirement to track postoperative laboratory work. The surgical wards also had proactive nurses who were keen on early access to information. The cardiac surgery ward had a requirement to access laboratory work prior to proce-

Figure 1. The percentage of trained users who accessed electronic patient records five or more times during a six-month period, stratified by occupation

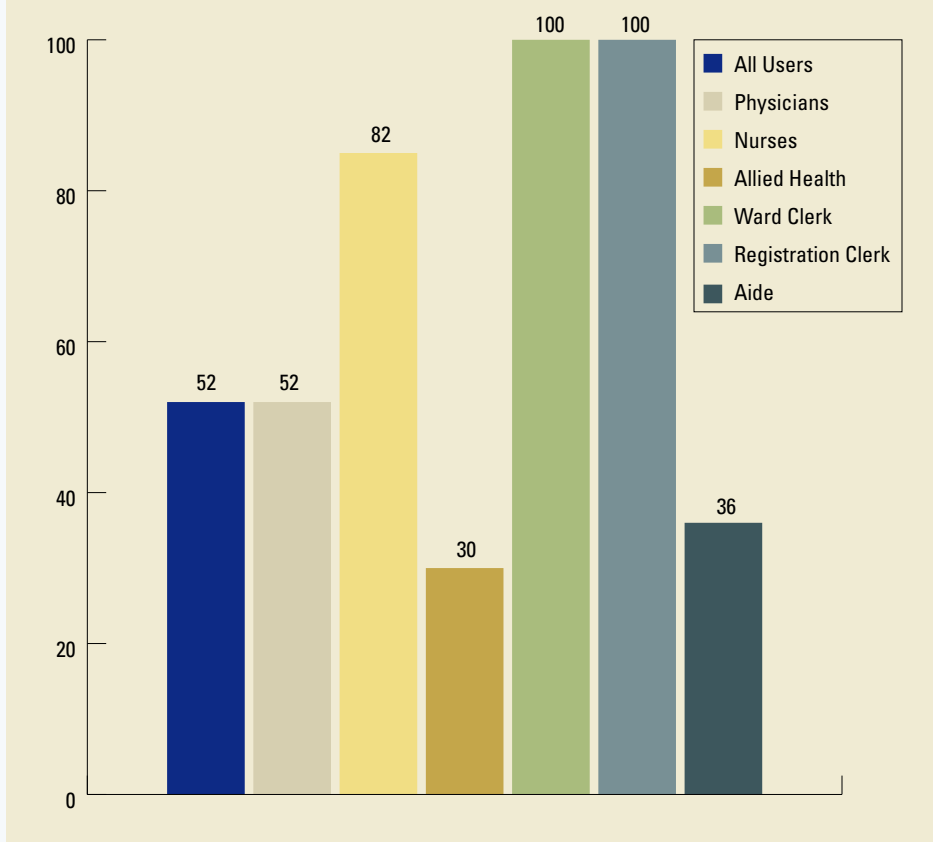
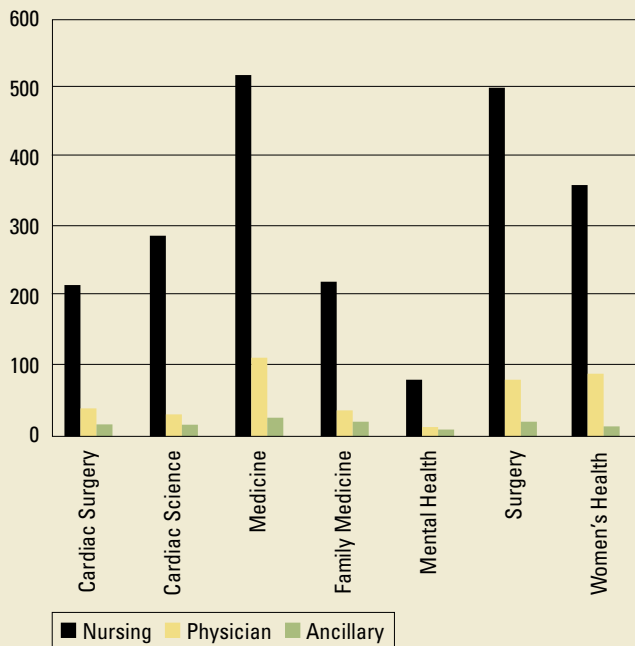


Figure 2. Device use by program



dures such as removing chest tubes. Electrolyte results were also checked often for patients who were monitored by telemetry. The cardiac sciences program is a relatively new program in the institution and has a highly motivated task force. All of the nurse educators in this program are EPR trainers and all of the charge nurses are super-users.

On the family medicine ward, it was noted that blood work was performed only once a day and was rarely available to the physicians who arrived early to do rounds. The system was therefore of little help to these physicians. The patient team manager also noted that only about 50% of the nurses on the family medicine ward were using the system at all.

In women's health (obstetrics and gynecology), the charge nurses observed that the laboratory results were printed so there was no need to access the system. They also identified a lack of an adequate number of end-user devices.

**Patterns of Use by Device**

The audit data included use by device. These data were further evaluated by superimposing the device use information onto a physical layout of the clinical area, as illustrated in Figure 3. Table 1 identifies the use of each individual device by occupation. This allowed us to observe patterns in the preference of device type (stationary vs. mobile) and in the physical location of the stationary devices. Patterns of device type and/or location

preferences were noted. Some devices were well-used by a varied group of clinicians, while others were predominately used by certain clinical groups. These patterns were validated with the clinical staff on the units and explanations sought. Although devices were rarely "assigned" to specific occupations, those in specific occupations tended to prefer certain devices, more often as a result of their geographic location than specifics about a device.

Analysis also revealed that several devices were hardly used at all, while others were used heavily. Upon further inspection of the rarely used devices it was often found that their location was not conducive to use, for example there was no phone within reach, or they were difficult to access and use in a busy area. Some devices were found to be in poor working order and therefore used infrequently or not at all. These were subsequently either repaired and returned or relocated. In other cases, although the device was not often used for EPR access, it may have been used heavily for other purposes, typically Internet access. This will require further analysis to determine whether Internet access on these devices should be restricted.

**Discussion**

The interaction between user and individual devices has been analyzed to assess the impact of functionality (Winter 1999), assess workflow during multidisciplinary rounds (Morrison 2008) and in the context of integrating systems (Friedman 2007). Device deployment is rarely examined from a utilization point of view. A review of audit data, as shown above, allows the evaluation and possible redeployment of devices to meet the needs of both the specific clinicians and the geography and culture of individual units. Audits can also help to evaluate actual use rates of new device types (such as wall mounts or different mobile cart configurations) during any "trial" period. They will also help to identify and address possible technical issues with devices. All too often clinical users are reluctant to report issues and simply move on to the next working device. Finding and addressing the location of devices that are not well-used allows the institution to achieve maximum use of the existing devices.

From individual user and program area perspectives, we have been able to highlight the need for targeted, unit-specific training and coaching both before and during the next activation. The activation support plan will be re-evaluated and the distribution of super-users may be modified to support programs that have not yet achieved significant clinical adoption. There is always a requirement for sufficient end-user devices to be deployed in appropriate locations; however, the audit showed that some units experienced difficulties beyond simply access to devices.

With the requirement for CPOE, there will be a need for all

physicians to access the system. To promote this, we intend to remove the printed (abnormal) laboratory results from each of the units following the placement of all of the end-user devices in phase two. There will be an assessment of impact prior to this to pre-empt patient safety issues. Training and/or re-training will be offered to all users.

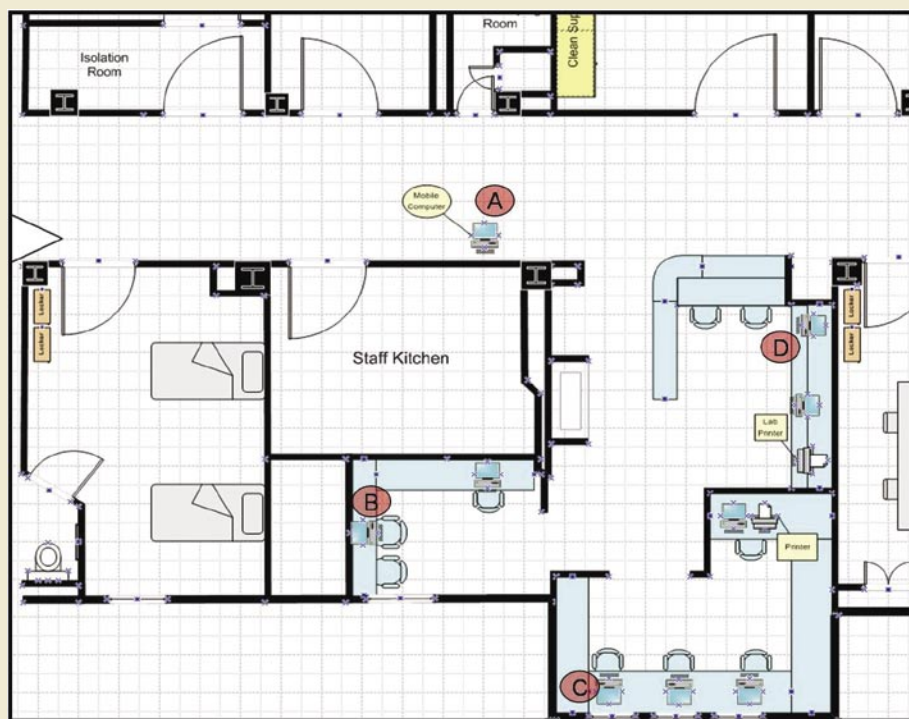
From the high-user personnel identified through the audits, we have identified and approached several individuals who will be given extra training to become super-users.

At the present time, we cannot determine if multiple users are using the same log-in credentials (i.e. sharing log-ins and passwords). With CPOE, further education and training will be required because there will be accountability for orders and electronic signatures. To date, there has been poor compliance with confirming patient allergies in the system. This will have a negative impact on the next phase (CPOE and eMAR). Further education and training (and re-training) are required to emphasize the need to collect and corroborate clinical information. Tools such as ongoing audit and compliance information are expected to play a significant role in correcting this situation. This will complement the targeted, unit-specific training efforts and activation support needs discussed above.

**Conclusion**

Monitoring the use of end-user devices is a useful tool to track changes in workflow and processes in a clinical environment. The observations can be used to reassess the distribution of mobile versus fixed devices, as well as to monitor and evaluate system changes. There is an opportunity to target high-need areas with future activations, as well as to recognize successful groups. Across the institution there is a high degree of variability

Figure 3. Layout of a nursing station with devices located (A-D)



related to culture and workflow from program to program, which can be addressed following audits. Systemic issues inhib-

Table 1. Unique users by occupation\*

Device Identifier	Registered Nurse	Physician	Resident	Medical Student	Health Care Aide	Other Ancillary
A	16	4	8	5	2	1
B	25	1	3	3	1	1
C	26	7	17	6	0	1
D	33	1	1	0	2	2

\* Device identifiers correspond to the devices labelled in Figure 3

iting clinical adoption may also be identified throughout this process, and these issues can be appropriately addressed.

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