Technology to Reduce Specimen Collection Errors

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One of the vexing problems for hospitals is keeping track of the massive amounts of information that come from handling patients. Records become very voluminous, putting a premium on systems that can both organize large amounts of information and retrieve it quickly and accurately. Personal computers have become smaller, cheaper, and faster—to where useful devices can now be easily carried in pockets or attached to clothing while connected to larger computers with stores of patient information. Still, training to use computers requires more time and effort than using paper and filing cabinets, but that gap is narrowing, as computers and computer-connected peripherals become more user friendly. One example of the most current adaptations of computer technology is the BD.id Patient Identification System.

The BD.id™ Patient Identification System is, in part, based on standard, computer technology that has been around for years. The system includes a hand-held computer and uses bar-coding. Hand-held computers have been with us for at least 15 years, when the first multi-function palmtops with high-definition screens began appearing on the market. Bar-coding has been around even longer, at least 30 years. It was first used in 1974 with UPCs (universal product codes) for the retail food industry (grocery stores). Thus, it could be said the BD.id Patient Identification System, technologically, was waiting to happen. All the components were there; a clear need for their assembly into the whole was critical to it happening.

The need had been there for as long as hospitals existed, doctors ordered samples from patients, and accurate tracking of both was necessary. Of course, necessity is, in part, defined both by the need to give accurate care with as few mistakes as possible and to avoid litigation that mistakes can bring. That is not to say that hospitals did not already have systems in place for tracking blood, urine, and other kinds of samples. They did, but mistakes occurred, and some of those mistakes were costly. Could the number of mistakes per year be reduced, and could it be shown to be by using the BD.id System?

Two institutions have been using the BD.id System long enough to answer both of those questions. As Beth McBride, BD Diagnostics Senior Marketing Manager stated, “the institutions are The Valley Hospital (Ridgewood, NJ), and the South Georgia Medical Center (Valdosta, GA). Swedish American Hospital (Rockford, IL) has also adopted the system.” The data go back several years, in fact, as McBride states, “the first set of data was published in 2001, by The Valley Hospital and South Georgia Medical Center. July of 2003 reflects better data as a result of the learning curve and roll-out to additional locations within the hospitals.”

Blueprint of the System

The BD.id System is a hand-held computer that identifies the person taking the samples by scanning their user ID badge. Patient identification is done by scanning the patient’s wristband (with bar codes). The hand-held computer is able to receive patient information from the laboratory information system (LIS), especially which tests have been ordered for the patient. Information matching is done between the hand-held computer and the patient’s wristband; the information about the patient in the hand-held computer is compared to that on the patient’s wristband. Thus, mistakes, like trying to take samples from the wrong person, or the wrong samples from the right person, can be caught here. Another important feature of the BD.id System is it is used to scan the specimen container at the time of collection, to ensure the correct specimen goes in the correct container. Once that has been confirmed, a bar code label is printed (by the system) for the specimen container, including information about the tests ordered, the container, and the time and date of collection.

Reducing Error

Perhaps the most important conclusions about improvements and advantages with the BD.id System were apparent early in the system’s use. Error reduction was, and is, a very important issue, and it has been answered by the use of the BD.id System. As Michael Mutter, Director of Clinical Systems Quality Improvement, The Valley Hospital, noted, “out of 25,000 sample collections with the BD.id System, there were no patient identification errors, and no incorrect specimen collection device errors, but there were 3 mislabelings (they were operator errors).” More than 160,000 sample collections are performed annually at The Valley Hospital using the BD.id System.

Mutter further explained how the operator errors occurred. “The most popular specimen collection time” (at The Valley Hospital) “is 6:00 AM, so all the test results can be collected by 8:30 - 9:00 AM, for doctors to have the data when they come in. If a ‘new’ order comes in during this time, the operator must go back and ‘re-synch’ the hand-held computer to get the ‘new’ order (so the hand-held computer will have the information when the patient is scanned). However, some people don’t do it, so all mistakes were omissions. Future improvement would mean a real-time link instead of ‘batch’ data collection, so a wireless connection is implied.”

Additional experience with error reduction in collecting, labeling, and routing patient samples was described by George Hardy, Assistant Administrator for Ancillary Services, South Georgia Medical Center. As he stated, “the pre-BD.id System error count was 89 in the base year, in which there were 45 critical errors, where the patient was misidentified, and a result got all the way through the system, out of the laboratory, and reported.”

Comparing the error rates before the BD.id System was installed to after it was installed is not only possible, but exactly what was done at South Georgia Medical Center. As Hardy stated, “examination of the 4 months before installation of the BD.id system to the 4 months after the BD.id system was installed showed there were 4 errors after the system was installed. Total errors were reduced by 72% with the BD.id System, and critical errors were
reduced by 94% with the BD.id System (there were 4 critical errors where the BD.id System could not be used in some situations, like where it had not been installed, such as in the emergency room), but there was a 100% reduction in errors with the BD.id System used properly (and installed in all places in the hospital).” BD worked with South Georgia Medical Center to understand the special needs of different locations within the hospital. With resulting features incorporated, the system is now installed throughout the hospital, including the emergency room.

**Ease of Training**

Part of the reason for the BD.id System’s success in reducing errors in the institutions where it is used is its ease of learning. Hardy explained, “training of the people to use the system is done in-house as part of our phlebotomy orientation. BD did it at first, but not now. It takes 1 hour to train; it is an additional 1-hour training on top of phlebotomy training itself. That can include people with no phlebotomy training at all to start with.”

Mutter, of The Valley Hospital, related similar experiences, “BD provided training to staff, in part because of the experimental nature of the product at the time. However, now that it is a finished product, the hospital does its own training, though they had help from BD to design the training. Two hours is sufficient to train an end-user.”

McBride added, “there is also 24-hour support by phone.”

It should be noted that while most people have learned very quickly to use the BD.id System correctly, there were a few problems. McBride explains, “there are no reports of people who can’t learn the BD.id System, but there are reports of people who work around it; it’s more a resistance to change than a reflection upon the BD.id System itself. Most of the challenges to getting people to use the system are of that type. BD developed features to help eliminate and identify work-arounds; however, nothing can substitute for the focused corrective action of staff management.”

**Time is Money**

Advantages to using the BD.id System extend past reducing the number of errors staff make; another advantage is, as McBride stated, “you can cut employee work hours and time (from streamlining processes); that’s one savings. Time and motion studies (The Valley Hospital) show a 13% reduction in collection time for samples pre- and post BD.id System. Another savings is in materials, like eliminating redraws (twice taking a sample), and then testing a sample several times.”

Hardy offered another example of how the BD.id System saves costs, “we are working with BD to enhance the current bidirectional interface with the BD.id System and the LIS. The result is that the processing time per tube is reduced. Each accession number will be transferred into the LIS from the BD.id System; a person used to do that manually. Transferring it into the system from the BD.id System should save at least 1 full-time employee per shift. There is also reduced time for correction of errors later in the system, after entry, so a lot of rework has been eliminated.”

However, as Hardy pointed out, “BD did a time-and-motion study pre-BD.id System, and post-BD.id System; there was no real change in the phlebotomy time from patient to patient. It stayed the same. The time gained was in doing the process once, and removing the expense in having someone (or something) on the back end to figure out mistakes.”

**Also on the Market**

The BD.id System should be judged, in part, against its competitors. What are they like, and how do they compare to BD’s product? McBride answered, “there are a few competitor systems for specimen management and collection. The majority of these have just been installed in their first beta
sites in the past couple of months. Their intended purpose is similar in some ways to the BD.id System. Competitive systems are much more IT oriented, and more oriented to information flow, but not as oriented to clinical processes as the BD.id System. The BD.id System includes process mapping to eliminate steps that can cause error, and includes conformational steps that reduce error.”

**Trial and Error**

Of course, no system is perfect, including the BD.id System. It had its “teething problems” at the institutions mentioned here, so there was need for improvement. Some of the desired changes in the BD.id System since its first installation at these institutions have already been made. Other changes are pending. As Mutter related, “the biggest challenge with the BD.id technology was the printers, especially using hand-held printers. Different users cause ‘play’ in how labels fit in the printer. BD has a new printer that is now being pilot tested on 1 of their units, it loads like a point-and-shoot camera, and has no ‘play,’ so analyzers can read the bar codes better in the laboratory.”

Some of the future changes for the BD.id System are described by McBride, “a hardware upgrade for the hand-held unit and the printer is going to happen in the summer of 2004; wireless capability will replace the cable connection for the printing function. There will be enhancements for the software to work properly with the new wireless setup for printing. In addition, other improvements include increased management report capability. The new hand-helds will have higher resolution and 256 colors, so screen resolution is better. The operating system will be converted to Windows Mobile in the summer of 2004. The change was made to allow more applications to be added, so you get more flexibility.” McBride also describes another development, this one an application, “a transfusion application is under development. There is market data that shows 59% of transfusion injuries come from errors in the specimen collection process, patient misidentification, and sample misidentification. This will expand the platform to address administration of blood products to patients.”

**Summary and Conclusion**

Hardy also had some comments about how the BD.id System was an improvement over the system they had before. It should be noted that the previous system also used printed ID labels, but that was not enough to prevent errors. As Hardy noted, “the worst problems were labeling 1 patient’s sample with another’s label, or collecting specimens from the wrong patients. Patients were supposed to be identified by an arm-band, and sometimes it just didn’t happen. Also, comparing the arm-band to the label to be sure they had the correct label was a problem. The fundamental process was to make a collection list of 10 to 15 patients with the system based on orders placed by nursing staff. The system made ID labels, and organized them by the desired route through the hospital. Each patient was seen in order, with the tube so labeled. One problem was, what if one patient was a ‘can’t get’ (couldn’t get the blood sample for some reason), if that person’s label wasn’t placed in the back of the stack, then that threw off the rest of the list.”

Concerned about patient privacy with the BD.id System? Mutter said, “the security of the BD.id System allows the hospital to comply with HIPAA (patient privacy) requirements.” He also said, “the system is time-sensitive, so information isn’t passed along with a long lead time, it’s provided with a just in time lead. The users only have access to the patients they are caring for, or for the patients in their unit. Security hierarchy prevents access even by other people in the facility; there have been no known breaches of security.”

The BD.id System has so far shown promising results at several institutions, with additional results in the future from several other institutions. Hopefully, the future results will confirm the strong initial results from The Valley Hospital and South Georgia Medical Center. The BD.id System has the potential for being adopted by many institutions, especially because it is easy to learn and use, and because of its future improvements, including new applications. The BD.id System is another example of how computers, when adapted to their users, work with them to produce improvements in important health care processes.