Can barcoded wristbands improve patient safety?

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In the majority of U.S. healthcare institutions, patient wristbands do not contain barcodes, creating a situation where patient data is manually typed into a database or point-of-care device, leaving plenty of room for error.

In light of error statistics issued by the United Kingdom's National Patient Safety Agency (NPSA) and the United States' Joint Commission on Accreditation of Healthcare Organizations (JCAHO), and the fact that such errors are largely preventable, patient safety is even more of a priority for healthcare organizations. Both NPSA and JCAHO have issued directives to encourage improvement in the accuracy of patient identification.

Identifying a patient with a barcoded wristband upon admission is a good first step towards accurate patient processing.

Although not without drawbacks, a review of current literature finds that, for some institutions, barcoded wristbands have made a statistical difference in reducing errors, improving patient safety and optimizing staff time and satisfaction.

We've all seen them. Some of us have worn them. Get admitted to the hospital and you'll be identified by a barcoded wristband, right? Maybe.

According to Drs Robert Wachter and Kaveh Shojania at the University of California San Francisco Medical Center, less than 2 % of U.S. hospitals have barcoding systems [1].

Another industry insider estimates that statistic at *"10 % to 12 %"* [2]. Patient wristbands do not contain barcodes *"in the majority of U.S. healthcare institutions"* [3], creating a situation where patient data is manually typed into a database or point-of-care device, leaving plenty of room for error.

The United Kingdom's National Patient Safety Agency (NPSA) reported that, between November 2003 and

July 2005, it received 236 reports of *"patient safety incidents and near misses relating to missing wristbands or wristbands with incorrect information"* [4].

NPSA also reported that errors in England and Wales cause 572,000 *"patient safety incidents"* annually and result in approximately 840 deaths [4]. The Institute of Medicine's (IOM) 1999 landmark report estimated that as many as 98,000 people die in U.S. hospitals each year as a result of medical errors [5].

(By 2005, however, the consensus seemed to be that this number of deaths was overestimated [6].)

The fact that such errors are largely preventable makes patient safety a priority for healthcare organizations. In response to the IOM report, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) issues annual national patient safety goals (NPSGs) that nearly 15,000 accredited organizations must follow.

"Improving the accuracy of patient identification" remains a primary goal, requiring the use of *"at least two patient identifiers when providing care, treatment, or services"*. These identifiers can share the same location, as on a wristband.

JCAHO specifically states that *"barcoding that includes two or more person-specific identifiers (not room number) will comply with this requirement"* [7].

Similarly, in November 2005, NPSA issued a Safer Practice Notice recommending specific measures to make certain that wristbands are worn by all hospital inpatients, with an agency representative commenting that *"barcoding is the current and best technology for avoiding mismatching"* [4].

One year later, a review of the Safety Alert Broadcast System shows 90 % compliance [8].

Barcode basics and beyond

Identifying a patient with a barcoded wristband upon admission is a good first step towards accurate patient processing. Once the wristband is in place, test and medication orders, specimens, medical procedures and even billing have a reduced potential for error.

Medication administration, for example, might involve a nurse scanning a patient's wristband, scanning (or entering) data from the unit medication container and then scanning her own ID badge. Each action would be charted and documented on the electronic medication administration record.

The *"five rights"* – right patient, right medication, right dose, right time and right method of administration – would be verified at the bedside, helping to prevent medication administration errors.

Beyond the barcoding basics of patient identification, such wristbands can also streamline other activities, including blood transfusion.

In 2002, the Serious Hazards of Transfusion (SHOT) annual report recommended the evaluation of computerized transfusion aids and barcode technology for confirmation that the correct blood is administered.

SHOT reported that, from 1996 to 2005, 22 deaths and 94 cases of major morbidity due to incorrect blood component transfusion occurred. The Haematology Department at Oxford Radcliffe Hospitals in England tested and is currently implementing an electronic transfusion management system involving barcoded patient identification.

Included on a two-dimensional barcoded wristband are a patient's first and last names, birthdate, gender and hospital number. Before administering blood, a staff member using a hand-held computer is prompted to make a series of checks and scans on the barcodes on both the wristband and the blood.

If the blood does not match, the computer sounds an alert. Multiple benefits from this technology include a reduction in the time and number of staff involved in the transfusion process.

Prior to implementation, two staff members checked two wristbands and followed 27 steps. Now, one staff member checks one wristband and follows 16 steps [8].

Specimen collection and identification also could be improved, offering a quality assurance method for tracking samples. To ensure that a sample hasn't already been collected, a nurse would scan the patient's wristband and verify via computer that one is still needed.

As the samples are drawn, the phlebotomist, respiratory therapist or nurse (if the sample is a blood gas sample) would use a mobile computer or barcode reader to scan the patient's ID and the prebarcoded sample tube or blood gas syringe at bedside, reducing the risk of misidentification.

The barcoded sample is then brought to the lab and tested.

When test results are available, the barcoding system scanner can even release patient data to the hospital's computer, thereby updating the patient's electronic medical record. This eliminates the extra step of a nurse manually entering the information, which improves accuracy and saves time.

A barcoded wristband can also optimize charge capture by allowing staff to scan and enter charge codes into a computer rather than handwriting data for later entry into the system.

Barcode benefits

Barcoded wristbands can potentially be used for positive patient identification in various settings, including the operating room and blood bank, infant protection for obstetrics departments and breast milk in the nursery, and wander prevention for geriatrics departments.

This would allow nurses, laboratory personnel, therapists and other healthcare professionals to verify data more effectively than by handwriting or keyboard data entry. By comparison, barcode data entry errors *"occur less than once per 3 million scans"* [9].

Barcodes can include more information than traditional text, while two-dimensional barcodes contain even more data than traditional, multilined versions. They can be printed directly onto the wristband or first printed on a label and then manually applied to the band.

A review of current literature finds that, for some institutions, barcoded wristbands have made a statistical difference in reducing errors, improving patient safety and optimizing staff time and satisfaction.

A clinical team at Massachusetts General Hospital in Boston, USA, aimed to have an inpatient wristband to facilitate the accurate, automated identification of every patient. One- and two-dimensional barcoded wristbands were piloted and later implemented.

Changes to the wristbands included the font, content and display format of patient demographics. Seventy-seven patients in the pilot had an average length-of-stay of 6.2 days. When recording patient identification before the pilot, manual data entry had an error rate of 1.2 %.

Use of barcoded wristbands during the pilot dropped that rate to 0 %. After the pilot, reverting to the prior, non-barcoded wristbands increased the error rate to 1.5 %. The prior wristbands also had a 4.1 % error rate compared to 0 % with barcoded wristbands.

Pilot glucometry results showed a 0.0 % error rate, after 35 patients with 158 glucometry results.

The team later was involved in institution-wide efforts to standardize the structure of the two-dimensional wristband barcode information so that essential data could be recognized and shared by various applications, including medication administration, smart IV pumps and EKG machines [10].

The Royal Brompton and Harefield Trust in London, admitting 25,000 patients each year, projected that patient misidentification problems would be found in at least 1 % (250) of admissions. Up to 30 % (7,500) of patients would not be wearing an identification wristband during all or part of their stay.

In 2005, concerned about the volume of mislabeled specimens received in the lab and consequent problems of accurate patient identification, a multidisciplinary team consisting of members from nursing, laboratory medicine, patient services, medical and information technology recommended printed wristbands be produced from one authentic data source, the Hospital Patient Administration System.

Wristband data included eye-readable demographic information (first and last names, date of birth, gender, and hospital number), along with the hospital number barcode to allow for integration with services such as pharmacy, blood transfusion and pathology. It further recommended that handwritten wristbands be abolished [11].

Prior to December 2002, the manual entry of patient data at St. Luke's Hospital in Kansas City, Missouri, caused identification errors as high as 12.4 % and 400-500 unidentified blood glucose results out of 12,000 point-of-care glucose tests performed each month.

After initiatives including barcoded patient wristbands and a new information management platform were implemented, patient identification errors decreased from as high as 12.4 % to 0.18 % per month. Unidentified blood glucose results dropped from 400-500 to 6 per month within 18 months [12].

In County Galway, Ireland, Portiuncula Hospital wanted to automate its patient identification process to help reduce errors. Prior to automation, ward nurses would gather data from the patient's medical history and handwrite the wristband.

Because handwritten wristbands would be misread, damaged or lost, barcoded wristbands were introduced, containing the patient's name, gender, birthdate and hospital number. After a successful trial, the facility plans to use barcoded wristbands for all adult inpatients [13].

Barcode drawbacks slow industry adoption

In practice, however, the disadvantages of barcodes have *"contributed to their slow adoption in the healthcare environment"* [13].

When Renner and colleagues studied patients' wristbands, they found that some study participants had implemented a patient identification system that included barcoded wristbands, and that they had successfully reduced errors with this system; however, only a few hospitals by mid-2004 had implemented such systems [14].

Certainly, paper barcode labels can become torn, wrinkled or detached, resulting in an improper scan. In order to scan the barcode, caregivers require direct access to the wristband, which might mean disturbing a sleeping patient. Linear, or one-dimensional, codes allow only a limited number of characters for encoding.

Such limitations have created interest in alternative methods for patient identification. One such method is radiofrequency identification (RFID).

Although still evolving, RFID offers certain advantages over other automatic identification technologies, including almost limitless data storage, durability, and, because it can be scanned through bedsheets and clothing, there is no need to disturb the patient.

What does the future hold?

The Healthcare Quality Directorate of London's Department of Health considers barcode technology a valuable verification tool, but cautions that scanning a barcode should never replace communication between patient and caregiver.

Barcoded wristbands are not foolproof, of course, but are considered *"far superior to manual entry of patient information"* [12]. As one industry insider posited, *"Within 5 years, hospital use of barcodes will be at 80 % to 90 %"* [2].

Automatic identification technologies like barcoding *"have the potential to dramatically improve"* healthcare's documentation and identification processes [3]. With the critical objectives of improving patient safety, reducing medical errors and streamlining operations, barcoded wristbands could be just what the doctor ordered.

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