IT'S ALL IN THE WRIST:
Improving Patient Safety With Barcode Wristbands

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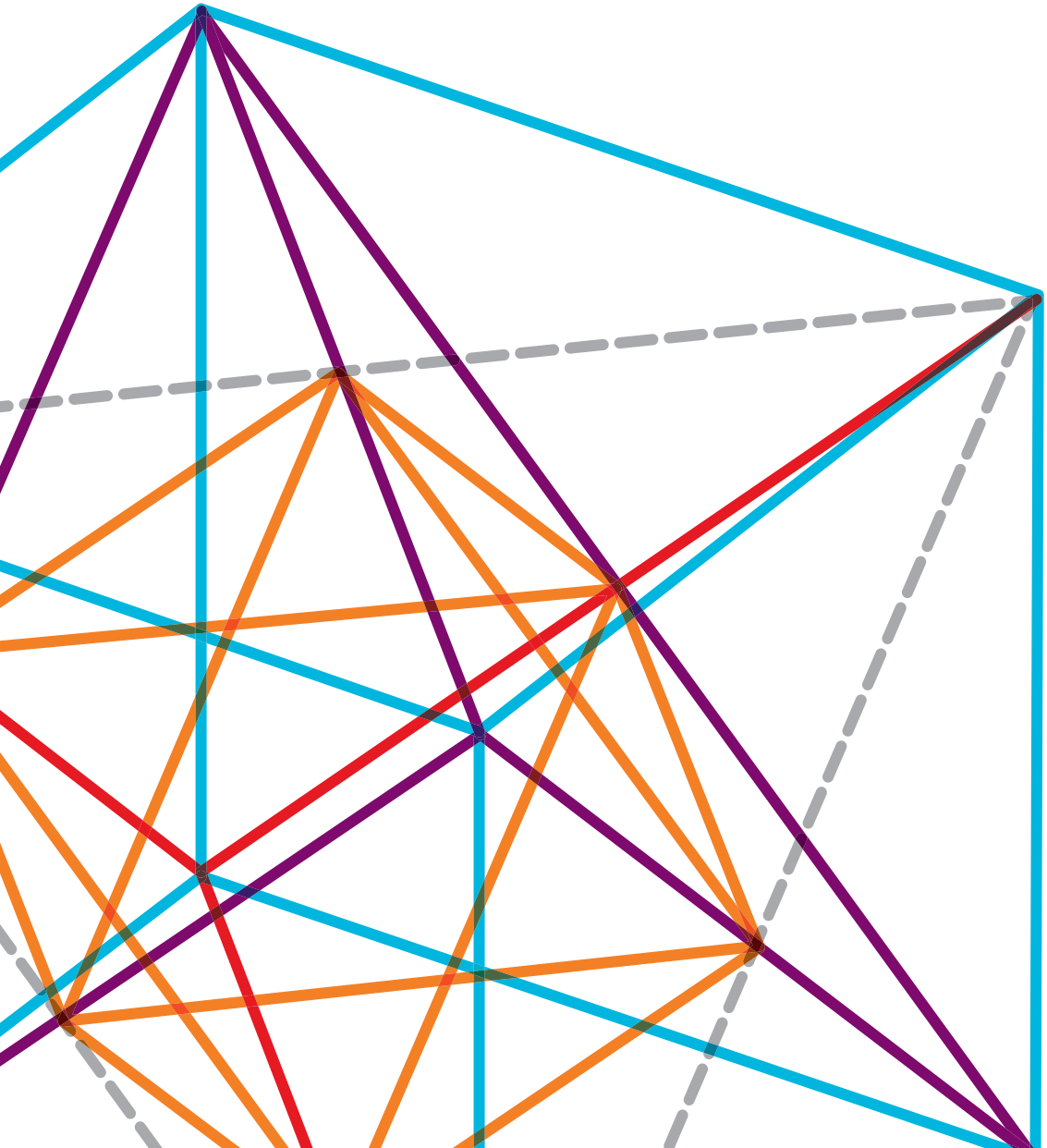


EXECUTIVE SUMMARY

When The Joint Commission first introduced its National Patient Safety Goals (NPSG) in 2003, improving the accuracy of patient identification topped the list, a position it has held with each successive year. Then, in 2006, the Food and Drug Administration (FDA) began requiring unit-dose barcode identification on medications to be dispensed in healthcare facilities, increasing the demand for solutions that would allow caregivers to ensure an accurate match between patients and medications being administered at the bedside.

Now, as the American Recovery and Reinvestment Act (ARRA) spurs the widespread adoption of electronic health record (EHR) systems at hospitals nationwide, barcode-based systems have also been shown to improve the accuracy of patient records, minimize errors and enhance the overall safety of care. In fact, barcoding is one of the technologies currently under consideration by the Health Information Technology Policy Committee as it formulates the second and third stages of the meaningful use requirements that will go into effect in 2013 and 2015. Barcode-based systems not only allow caregivers to identify patients and document the associated treatments, but they also enhance the use of EHRs in terms of both accuracy and completeness, ultimately helping to ensure that clinicians have access to the information they need to deliver the safest, most effective care.

According to a 2010 study conducted by the Agency for Healthcare Research and Quality, barcode-based systems can reduce medication administration errors and drug-related adverse events when used in combination with an electronic medication administration record (eMAR). These findings follow the Institute of Medicine (IOM)'s landmark report, *To Error is Human: Building a Safer Health System,* which stated that preventable medical errors cause up to 98,000 deaths and 770,000 adverse events in the U.S. each year. Another 90,000 deaths result from the up to 2 million infections patients acquire in U.S. hospitals, according to Centers for Disease Control (CDC) estimates. The report helped motivate the FDA to create its first requirement for pharmaceutical barcode labeling at the unit-dose level. The FDA's own research concluded that increased use of barcode-based bedside medication administration systems alone will prevent 500,000 adverse drug events and blood transfusion errors over 20 years, keeping an estimated $93 billion in treatment costs out of the healthcare system.

Identifying patients with barcoded wristbands is a first step healthcare organizations can take to make these improvements. Checking the "Five Rights"—Right Patient, Right Medication, Right Dose, Right Time and Right Method of Administration—prevents most medication errors. But all too often, the five rights check is flawed because it fails to guarantee the right patient. Today, approximately 5 percent of patient wristbands are erroneous or missing altogether. Missing, poor-quality, and incorrect wristbands are a major contributing factor to many adverse events.

Barcoded patient wristbands provide the necessary foundation for preventing errors by ensuring accurate patient information is always available at the point of care. Barcode wristbands will improve the effectiveness of five rights checks for medication administration and provide a platform to extend safeguards to other patient care activities.

Automated medication administration, electronic health records, computerized physician order entry (CPOE), barcode point-of-care (BPOC) and other automated procedures for improving patient care all rely on accurate input that barcoding can provide. This white paper will explain the role wristbands can play in improving patient safety and freeing nurses and other valuable medical personnel from paperwork and clerical tasks. It will clearly explain:

- How barcoded wristbands can satisfy The Joint Commission National Patient Safety Goals (NPSG) and other requirements;
- Applications for barcoded wristbands, including medication administration, specimen collection and management, blood administration, CPOE and other patient-care actions, plus uses for billing and administrative activities;
- Considerations for choosing a barcode symbology; and
- Options for printing barcode wristbands in patient care settings.

Healthcare providers don't need to create full-scale, facility-wide systems to benefit from barcoded wristbands. Limited applications that can be developed fairly quickly can provide tremendous safety and time-saving benefits. By understanding the capabilities, options, and advantages that barcoded wristbands provide, organizations can begin planning systems that will provide the foundation for multiple improvements and long-term benefits. After all, the foundation of the "Five Rights" is "Right Patient." Once organizations can consistently and accurately identify the right patient, many improvements can follow.

WRISTBANDS, BARCODES, AND THE JOINT COMMISSION

Barcoded wristbands provide a convenient way to comply with the National Patient Safety Goal (NPSG) to "Improve the accuracy of patient identification," which The Joint Commission has included in its goals annually since 2003. Compliance with the patient ID goal requires that at least two patient identifiers be used whenever blood samples are taken and medications or blood products are administered. A barcoded wristband can provide two forms of identification in one easy-to-access place by encoding the patient name and identification number. The Joint Commission recognized the value of this approach in an FAQ item on its website that explains the safety goal: *"The two identifiers may be in the same location, such as a wristband… Acceptable identifiers may be the individual's name, an assigned identification number, telephone number, or other person-specific identifier. Electronic identification technology coding, such as barcoding or RFID, that includes two or more person-specific identifiers (not room number) will comply with this requirement."* Once wristbands are barcoded to provide basic patient identification, numerous other identification, tracking, and data collection applications can be added to take advantage of barcode data entry.

HOW BARCODE WRISTBANDS WORK

The barcode is simply an alternative to text for expressing information. Anything that can normally be printed on a wristband can be encoded in a barcode. The barcode frequently serves as a key to a database. When it is read, the scanner decodes the symbol and instructs a computer to look up or update the specific record that corresponds to that patient. Barcode scanners are always used with computers, although they are frequently combined into a single handheld unit. Barcode scanners can also be used with virtually any type of computer including PCs, laptops, tablets, and smartphones. The barcode reader may communicate with the computer through a cable or wireless connection.

There is usually no patient information encoded in the barcode itself, but merely an ID number (like a serial number) that tells the software application where to look up the patient information. The patient may be identified by encoding their name in the wristband, or by assigning a random, unique patient ID number that can be encoded and printed in human readable text. This approach satisfies The Joint Commission's requirements.

Because barcodes store data in less space than is required for the same text, barcoded wristbands can include more information than traditional text wristbands. In addition, two-dimensional (2-D) barcodes can store exponentially more information, so they can serve as portable records or could even allow a digital photograph of the patient to be encoded on the wristband and viewed on a PC or portable computer whenever the barcode is scanned.

The biggest advantage barcode wristbands provide in healthcare settings is not in the amount of information they hold, but in how they enable information to be presented and recorded. A study of wristband problems by the College of American Pathologists

(CAP) found that 6.8 percent contained erroneous data and 7.7 percent had illegible data. With barcoded wristbands, as long as information is entered accurately at admitting, nurses, doctors, medical assistants, lab technicians, and other personnel can be sure that the patient will be identified correctly and the right information will be presented every time the wristband is scanned.

Barcode scanning is extremely accurate—much more accurate than any manual means of information recording. Studies have shown that skilled typists make an average of one error per every 300 keystrokes. Busy nurses on their feet can scarcely be expected to do as well. The error rate for barcode data entry is less than one per 3 million scans. Barcodes improve patient safety by improving the quality of information in patient records.

Barcode data entry is also much faster than manual data entry. The Carilion Health System reported time savings of 2.75 hours per 12-hour nursing shift after switching to a barcode-based system to record medication administration.

USES FOR BARCODE WRISTBANDS

Barcode wristbands can be beneficial wherever patients need to be identified or information needs to be recorded. Improved accuracy and time savings translate into benefits in any environment. This enables facilities to earn a positive return on investment with relatively small, standalone applications, and then extend the use of wristbands into additional departments. The best-known uses for barcode wristbands are in conjunction with automated medication administration or computerized physician order entry (CPOE) systems. However, smaller applications that require less time and resources to implement can also provide many accuracy and time-saving improvements. Scanning the patient wristband can help prevent errors in specimen collection and processing, administration of tests and therapies, patient transfers and meal management, plus several administrative and billing activities. Uses can be expanded without requiring changes to information on the wristbands or the equipment used to produce them.

Besides serving as the key to accurately recording what is done with patient care, computerized systems can offer the additional safeguard of issuing alerts when things are not done. This is one of the most valuable aspects of medication administration applications. Approximately one in five doses of medication administered in hospitals and skilled nursing facilities is given in error, according to an Archives of Internal Medicine study.

Time of administration was the most common mistake. Computerized systems can issue alerts if the end of the prescribed time is nearing and the medication hasn't been administered. Different applications may also issue alerts or reminders to collect specimens, or check vital signs or other conditions. More details on the uses, functions, and benefits of barcode wristbands are presented in the following sections.

Medication Administration

One of the most effective ways to take advantage of barcoded wristbands is to combine them with automated medication administration systems. While the Office of the National Coordinator for Health Information Technology did not include barcoding in the 2011 Meaningful Use requirements, a significant portion of the guidelines that hospitals must meet to demonstrate compliance involve medication administration. In order to meet these objectives, most facilities will rely on an electronic medication record (eMAR). Once an eMAR is established, barcoding is the next step for healthcare facilities looking to improve the safety and efficiency of medication administration.

When a barcode system is in place, the nurse scans the wristband to identify the patient with a barcode scanner that is interfaced to a mobile or bedside computer. The nurse then scans the barcode on the medication. Application software then compares the

medication to information in the patient's electronic record, which was called up by the wristband scan, to verify that the patient should be receiving the medication at the indicated dosage and method at that time. The nurse continues after getting a confirmation or warning on the computer screen. Warnings are often accompanied by an audible beep.

Finally, nurses scan their own barcoded ID badge to record who administered the medication. The system essentially automates the Five Rights check, with the wristband scan verifying right patient, and the database lookup from the medication scan verifying the other elements.

The FDA estimated that the use of such systems would intercept 50 percent of all medication administration errors when it released its unit-dose barcode rule. In practice, healthcare providers have achieved even better results. The Veteran's Administration (VA) implemented point-of-care scanning for medication administration at all 173 of its hospitals after reducing errors by 86.2 percent during a trial. More recently, Brigham and Women's Hospital in Boston found that using barcoded wristbands in combination with an eMAR reduced the chance of administering the wrong drug by 57 percent.

A number of studies have also examined the benefits a system can provide. First and foremost, automated medication administration improves patient safety by preventing errors. A 2006 study released by the Institute of Medicine states that medication errors are among the most common types of medical errors, affecting 1.5 million patients each year. The financial impact of these errors is quite significant, generating approximately $3.5 billion in extra medical costs annually. Thus, there is a strong financial incentive to prevent medication errors in addition to safety and moral considerations.

The FDA studied the incidence of adverse drug events (ADEs) and found they range from 2.4 percent to 6.5 percent per facility, with a mean rate of 4.3 percent. For its analysis, the FDA used an average cost per ADE of $2,257, although many other estimates have been put forth, most of them higher. Therefore, hospitals spend an average of $9,705 per 100 admissions in treating the effects of ADEs (4.3 ADEs per 100 patients x $2,257 per incident). This equates to ADE-related costs of $97 per admission. A facility that averages 20 daily admissions could expect to incur $708,100 in annual expenses related to ADEs. If an automated administration system intercepted just 50 percent of potential medication errors, as the FDA suggests, the facility would avoid costs of $354,050. If the system was 86 percent effective, like the U.S. Department of Veterans Affairs, the cost avoidance climbs to $608,966, or $8,342 per 100 admissions.

Reduced errors also lead to reduced liability and exposure to malpractice suits. Medication errors are the basis of 5 percent of all malpractice claims, according to an analysis by Dr. Byron J. Bailey, a fellow of the American College of Surgeons (FACS); an article published in *Legal Medicine* reports approximately 30 percent of all malpractice suits involve drug-related injuries. In a 2010 study, the average jury award in medication error cases was $3,539,541, according to Jury Verdict Research. An automated medication administration system could pay for itself by preventing one malpractice suit, while improving the safety of every patient in the facility.

Blood Administration

The process for verifying that patients receive the right blood products is very similar to the process for medication administration. After correctly identifying the patient, the nurse scans the blood product to be transfused; confirms the patient's blood type; and verifies both the physician's order and the patient's consent for the transfusion.

All blood products carry a standardized barcode identifier, which makes it easy to create scan-based safety checks. There are an average of 414 annual transfusion errors in the U.S., or about one in 38,000 transfusions, compared with 1.25 million adverse drug events annually, according to the FDA. The maturity of barcode identification in blood collection, processing, and distribution may explain the tremendous disparity in the amount of blood administration errors compared to medication administration errors.

When transfusion errors do occur, incorrect identification of patients is a leading cause. A recent industry study shows that nearly 80 percent of blood transfusion errors are related to bedside or labeling mistakes. To help promote a culture of safety and minimize the incidence of preventable errors like these, the Centers for Medicare and Medicaid Services stopped reimbursing hospitals for "never events," which includes the treatment of blood transfusion errors.

Specimen Collection

Barcodes are important quality assurance tools for tracking collected specimens. By scanning patient wristbands prior to drawing specimens and producing labels at the patient bedside with a mobile printer, caregivers can minimize the potential for error and help to eliminate the 160,900 adverse events that occur in U.S. hospitals annually because of specimen identification errors.

When a barcoded specimen ID label is printed at the point of care, it can be applied to the specimen immediately, which significantly reduces the possibility that the specimen will be misidentified. Without a system like this in place, barcode labels are produced when lab orders are generated. The lab orders are assigned to a technician who is responsible for collecting the specimen requested on the lab order. Unfortunately, this process is not failsafe because the wrong label can easily be placed on the wrong specimen if the lab orders get mixed up. Labels can also be easily lost or misplaced.

The use of a barcode system can also help to drive productivity enhancements by reducing duplicate tests and the need for re-draws. Scanning the barcode on the specimen container in the lab also saves technicians the time of entering the patient information into their computer systems. The required tests can be encoded on the specimen label in a two-dimensional (2-D) barcode, to eliminate any chance of confusion as to what tests should be performed. Barcode data entry also aids test result recording and improves patient record accuracy, while simultaneously providing time savings for laboratory staff.

Treatment

Imagine an X-ray technician telling his replacement during the shift change, "I'm running a little late. Can you take my last patient and give a portable chest X-ray to Mrs. Johansson down the hall?" The technician just coming on then takes the equipment down the hall, sees a patient room marked "Johnson" and enters to take the X-ray. A barcode-based confirmation system would prevent him from performing the procedure on the wrong patient.

In this case, the error would probably have resulted in little more than having taken a wasted X-ray and having to redo the procedure on the right patient. Had the patient been misidentified for surgery, the result could have been fatal.

Wristband scanning for patient verification could help surgical teams, respiratory therapists, radiology technicians, physical therapists, and other professionals ensure they are providing the right treatment or service for the right patient. "Procedures performed when not indicated" trails just behind "medication error" among causes for malpractice claims, according to the Bailey analysis. Avoiding these errors provides very significant safety and liability benefits.

Non-Medical Applications

However it is used, barcoding provides fast, accurate data entry. The benefits of saving time for nurses are obvious. However, timesaving benefits also can be gained in a variety of administrative and non-medical activities where patient information is recorded. The wristband can serve as a credit card to be scanned to capture charges for supplies or optional services like telephone use. Barcoding can even make hospital food more palatable: At some facilities, foodservice workers scan the patient wristband and enter the meal order into a mobile device. The process helps ensure patients will get what they requested, without generating paper orders for food service staff to sort, read, and process. Many facilities use non-wristband barcode systems for materials management, asset tracking, and inventory control. Zebra's white paper *"Increasing Profits and Productivity: Barcoding and RFID Enable Precise Asset Management"* provides a thorough overview of these systems, including guidelines for calculating return on investment. It can be found at www.zebra.com.

PRODUCING BARCODE WRISTBANDS

The attributes of a good wristband are easy to understand but surprisingly difficult to attain. Numerous studies have shown that between 2 percent and 6 percent of patients aren't properly identified by their wristbands. A College of American Pathologists (CAP) study of 217 institutions uncovered 45,197 patient identification errors. Missing wristbands accounted for 71.6 percent of the errors, but erroneous information and illegible text also plague healthcare professionals who rely on wristbands to accurately deliver care.

To ensure patient safety, the wristband must stay on the patient and remain readable for the duration of the hospital stay. It also must uniquely identify the patient in a HIPAA-compliant manner. Barcode wristbands produced with printers built specifically to print wristbands will conveniently and cost-effectively satisfy all these conditions.

The process for planning and producing barcode wristbands is not much different than for traditional wristbanding. There are four decisions that must be made to plan a wristband printing system, and only one is unique to barcoding:

1. What information will be included on the wristband?
2. What kind of barcode will be used to encode it?
3. How should the wristband be printed?
4. What material should be used?

The following sections will help answer these questions so you can create a wristband program that provides the foundation for numerous quality and efficiency improvements.

WHAT INFORMATION TO INCLUDE

The information content of the wristband is a key factor in determining the type of barcode to use and how to produce the wristband itself. Ideally, the wristband will include two forms of patient identification. Encoding the patient's name in a barcode and printing an ID number in human-readable text will satisfy both HIPAA and The Joint Commission requirements. Any type of text can be encoded in a linear or 2-D barcode, so blood type, allergies, primary physician, and other information could also be securely included on the wristband. The wristband material itself may also be color-coded to convey special cautions or other information.

Patient care practices and the information systems infrastructure also play roles in determining wristband content. The more frequently information needs to be accessed, the more it makes sense to include the information on the wristband, in text and/or barcode format. If nurses can't conveniently access routine information from the bedside, there is a compelling reason to investigate ways to provide the information on the wristband. Conversely, if nurses use mobile computers to access complete electronic patient records over a wireless network, there is little need for the wristband to serve as anything more than a key to a database lookup.

SELECTING A BARCODE TYPE

There are many different types of barcodes, which are called symbologies. They vary by the amount and type (e.g., numeric only or alphanumeric) of data they can encode, the space they require to do so, and other factors. Virtually any barcode symbology can encode patient ID information to conveniently fit on a wristband and leave room for text and graphics. Two-dimensional (2-D) symbologies can serve as limited portable record files or to provide commonly needed patient information such as allergies, primary physician, blood type and reason for admission.

Barcode scanners can recognize multiple symbologies, so it is generally not necessary to match the symbology on the wristband with barcodes that may be scanned on blood bags or medication labels. However, laser barcode scanners cannot read matrix-type 2-D symbologies (e.g., Data Matrix and Aztec Code). These symbologies must be read with a CCD or imager, which are available as integrated units within handheld computers used for point-of-care applications, and as peripheral units that plug into handheld computers or PCs.

It is generally recommended to choose a symbology that encodes the desired information in the least amount of space. Extra space on the wristband can be used for additional text or graphics, or for the barcode to be printed larger, which makes it easier for scanners to read. Once the information content requirements are set, the barcode solutions provider will be able to recommend a symbology that provides the best combination of performance and space efficiency.

Two-dimensional barcode symbologies, such as Aztec Code, are best suited for patient wristbanding because of their ease of use. For example, by repeating a 2-D barcode along the entire length of the wristband, the band does not have to be adjusted in order to be scanned. This helps to ensure ease of scanning and prevents the need for nurses to devise workaround solutions when verifying the patient.

For healthcare organizations that opt to use linear barcodes, Code 128 is a popular choice because it is one of the densest linear symbologies. This means it can encode information in a smaller amount of space.

WRISTBAND PRINTING OPTIONS

Barcodes can be printed directly on wristbands when they are produced, and either thermal or laser printers can be used to print barcode wristbands. Thermal printers are much better suited for producing barcodes, while laser printers offer the convenience of using the same unit to output forms and wristbands. Both technologies can print barcodes directly on wristbands.

Laser printers are typically located today within areas of the hospital where wristbands need to be printed, making laser printing a quick and easy way to implement a barcoded wristband solution. Thermal is the dominant barcode printing technology used throughout industry for mission-critical operations. Global express delivery services, manufacturers, military organizations, and logistics providers all use thermal printers to ensure their barcodes will get materials where they're needed without fail.

Healthcare quality requirements and usage environments demand excellent barcode symbol quality. Scanners decode the information from barcodes by measuring the differences between narrow and wide elements, and the contrast between dark bars and light spaces. If the ratios or contrast are slightly off, the barcode may be difficult or impossible to read. Think about the times you've seen a supermarket checkout clerk struggle to get an item to scan. After multiple attempts, the clerk becomes frustrated and key-enters the UPC number. By valuing barcode quality, hospital administrators can prevent a similar scenario from happening at the patient bedside. A nurse's time is too valuable to waste by repeatedly trying to read poor-quality barcodes, and rushed, manual data entry or other workarounds by a frustrated nurse carries too high of a risk for errors. Printing the barcodes in vertical, or ladder, orientation, facilitates faster, easier scanning than when symbols are printed horizontally (a.k.a. picket fence orientation).

WRISTBAND MATERIALS

The print method, barcode symbol, and data content won't make any difference if the wristband doesn't stay on the patient's wrist. All too often, it doesn't. Missing wristbands are the most common wristband error identified in every published study on the subject and account for more than half of all wristband errors. Different studies have found between 2 percent and 10 percent of all hospital patients are without a wristband at any given time.

There are many secure and durable wristband materials that enable barcodes and text to be printed directly on the wristband. Because the wristband must remain with the patient and the barcode must remain readable for the duration of the admission, it is important to consider all the potential exposures and usage conditions when selecting material. Water, soaps, Purell®, foam washes, alcohol and betadine all have the potential to damage the barcode and text printed on the wristband. Using low-quality printers and wristbands may also cause fading, scratching, or wrinkling that renders the barcode useless.

Materials must be matched to the print method. There are two forms of thermal printing, direct thermal and thermal transfer, and each has different media requirements. Thermal transfer printers use a printhead to heat a ribbon that produces images on the surface being marked. The ribbon can retain the printed image, so it should be incinerated or shredded to meet HIPAA privacy requirements. No ribbon is used in direct thermal printing, which applies heat directly to the material to produce the image.

Introducing barcoding puts a few limitations on the palette of wristband colors to choose from. Because successful barcode reading relies on contrast between dark and light elements, dark backgrounds are not recommended because they may not provide enough differences between bars and spaces.

ZEBRA WRISTBAND SOLUTIONS

With Zebra's wide range of direct-print, barcoded, durable laser and thermal wristband solutions, hospitals can ensure adult, pediatric and infant patients are accurately identified throughout their hospital stay. The cornerstone of patient safety, Zebra wristband print solutions enable immediate access to critical patient information at the bedside and across all hospital departments.

Laser Solutions

Zebra's self-laminating LaserBand® wristbands feature the ability to print wristbands and labels on one sheet utilizing existing laser printers.

- Patented self-laminating seal protects the wristband from moisture and hand sanitizers, preserving patient data for longer wristband usability.
- Ability to simultaneously print patient chart labels and the wristband on one sheet, streamlining patient admissions.
- Available with hole punches for securement into patient charts.
- Enables quick deployment of a barcoded wristband solution without the need for a separate printer for wristbands.

Thermal Solutions

Zebra's thermal printers and direct-print Z-Band® wristband solutions are easy-to-use, fit a wide variety of environments and require minimal IT support.

- Wristband can be immediately secured to the patient as there is no assembly required.
- The small footprint of Zebra's thermal desktop printers allows them to fit into crowded nurses stations and WOW's (workstations-on-wheels).
- Zebra's HC100™ Patient ID solution is easy to use. Simply pop the wristband cartridge into the printer and you are ready to print—the printer automatically calibrates for wristband size and optimal print quality.
- The reliable nature of thermal printers ensures maximum uptime and minimal IT service calls.

Wristbanding Infants

Wristbanding infants is a sensitive issue. While hospitals go to great lengths to properly identify infants, staff members are also concerned with the comfort and durability of the bands. Zebra kept these challenges in mind when creating a complete line of laser and direct thermal wristbands for infants.

Zebra specialty solutions for infant wristbands include:

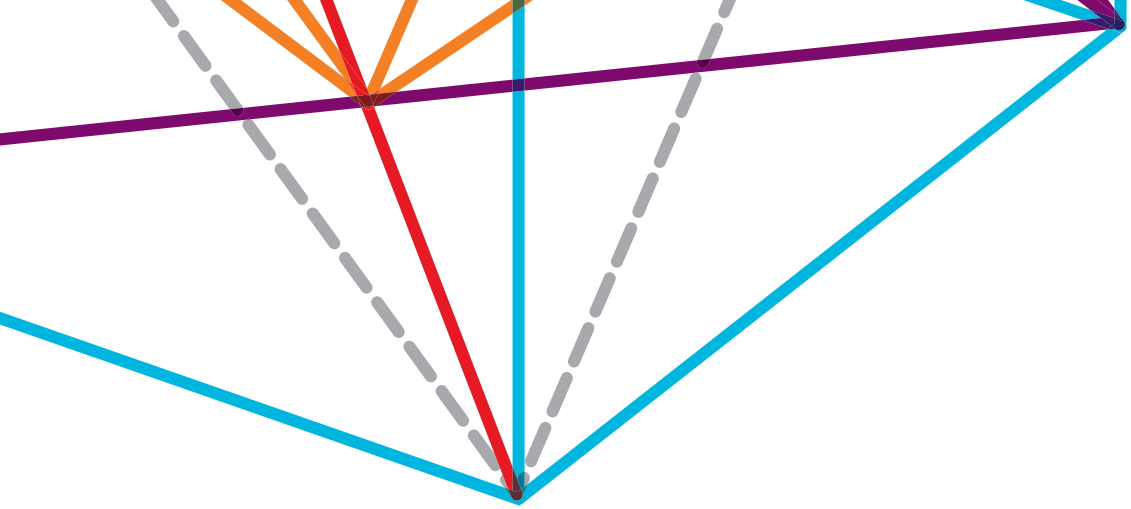
- **Laser Solutions:**
  - » **LaserBand2®** – Infant wristbands and tags that can be utilized with our ComfyCuff® products or our vinyl infant wristband.
  - » **ComfyCuff** – Soft, foam cuff with adjustable Velcro® closure ensures patient comfort that can be used in conjunction with LaserBand2 wristbands and tags and LaserBand2 Advanced pediatric/infant ID tags.
  - » **ComfyCuff Infant Swaddle Band** – Soft vinyl band makes identifying a swaddled baby quick and easy. The Swaddle Band creates an extension between the ComfyCuff and LaserBand2 and LaserBand2 Advanced infant ID tags, allowing the tag to be easily accessible.
  - » **Vinyl Infant Wristbands** – Soft, flexible vinyl wristband with a clip closure for use with LaserBand2 and LaserBand2 Advanced infant ID tags. The narrow width allows some models of "Abduction Prevention Systems" to be attached.
- **Thermal Solutions:**
  - » **Z-Band Direct Soft Infant** – Soft and comfortable for infant patients, these direct thermal polypropylene wristbands with nylon backing are perfect for delicate skin. Features adjustable adhesive closure to fit the smallest of wrists.

CONCLUSION

There are many ways to benefit from barcoded patient wristbands and take advantage of the accuracy and convenience that barcoding provides. Barcoded patient wristbands can help healthcare facilities comply with The Joint Commission National Patient Safety Goals today, while positioning them for dramatic safety and quality improvements enabled by complementary systems. Quality care begins with quality wristbands.

Zebra Technologies is a leading manufacturer of specialty thermal and laser printing solutions, including wireless, mobile, high-volume and wristband printers designed to meet the unique needs of the healthcare market.

Barcode printing solutions from Zebra can help healthcare organizations reduce errors and increase productivity. Now is the time to provide your patients a virtual voice—so you can work with the patient and continue to provide safe treatments and a caring atmosphere. Information about Zebra barcode and card products can be found at www.zebra.com/healthcare.



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P1028434 Rev. 1 (01/13)