The Role of Barcoding in Improved Patient Safety

Improving patient health and maintaining safety during the healthcare delivery process are the primary goals of healthcare. With so many healthcare organizations refocusing their efforts on lessening medication errors and improving patient safety, it is apparent that barcoding can play a significant role in these efforts. Of all the functions barcoding can serve in the healthcare setting, clinical applications are among the most important from a patient safety perspective. All clinical processes are subject to human error; barcoding can be employed to provide critical double checks for patient safety. From medication administration to blood transfusions and beyond, barcode implementation can significantly reduce the risk of human error in the healthcare delivery process while improving productivity and reducing costs.

The Statistics

Medication errors are the most common cause of medical errors in hospitals, affecting 3.7% of all patients[1]. At least 1.5 million preventable adverse drug events (ADEs) occur in the United States each year. Nearly 20% of medication doses administered in hospitals are given in error[2]. The two most common errors are dispensing medications at the wrong time (43% of incidents) and omitting a dose (30%)[3]. Clearly, medication errors are a significant component of medical errors in U.S. hospitals.

And this may be only the tip of the iceberg because:

1. Hospital workers reported only about 14 percent of the patient safety incidents experienced by Medicare beneficiaries discharged in October 2008. Hospital staff failed to report the remaining 86 percent of patient harm events, partly due to staff misunderstanding of what constitutes patient harm[4].
2. Hospital administrators labeled 61 percent of the unreported events as those that staff did not identify as reportable and 25 percent as events that staff normally reported, but did not report in this case, according to the OIG. Also, the report stated that all of the 189 hospitals reviewed used incident reporting systems to identify patient safety incidents. Although they rely heavily on such systems to track and analyze problems, administrators admitted they supply incomplete data about how often problems occur[4].

Patient Wristbands

Using barcode technology from the onset of a patient's healthcare delivery process, beginning at patient registration, enables a hospital to construct a foundation upon which to further utilize barcode technology across the continuum of patient care. Using a barcoded patient wristband that must be worn by the patient from registration on ensures that patient identification is complete and accurate before administering medications, processing diagnostic procedures, or simply transporting the patient to another part of the hospital. Using barcode identification technology in conjunction with an electronic health record further strengthens patient safety efforts.

Choosing the Right Wristband Technology Can Further Improve Safety

Almost everyone agrees that patient identification wristbands can help hospitals achieve patient safety goals by providing a reliable and convenient solution for patient identification. Hospitals can easily print text, barcodes and graphics directly on the wristband using standard desktop thermal or laser printers.

The key to this process is the direct printing of patient data on the wristband. These wristbands do not require stick-on labels or inserts; therefore, they save time and reduce the potential risk of human error. Direct print wristbands constructed of sturdy materials also prevent clinicians from having to use "workarounds" to identify patients due to damaged or poorly printed labels. These workarounds can lead to inadvertent patient misidentifications.

A good wristband solution will help meet the Joint Commission's top National Patient Safety Goals which call for two forms of patient ID on the wristband; it will also help facilities comply with HIPAA privacy requirements. Wristbands should provide nurses with easy visible access to the patient's data as well as 2-D and linear barcode scanning access from any angle. The wristband materials should be designed and constructed to produce high-resolution text, barcodes and graphics that are long-lasting and stand up to abrasion and exposure to alcohol, soap, water, Betadine, moisture, hand sanitizer, X-rays and other hazards that can make critical patient information encoded on the barcodes illegible.

Following are the most common examples of how wristband barcode technology can improve patient safety and the delivery of healthcare in the clinical environment:

Five rights of medication delivery:

the **right dose**
of the **right drug**
in the **right form**
to the **right patient**
at the **right time**

1. Medication Administration Verification

Typically, a physician writes a medication order electronically or manually. The hospital pharmacist reviews and fills the order and sends it to the clinical unit. In most cases, the nurse correctly follows the physician's prescription, delivers the medication to the patient, and documents this administration in the medical record. When barcode technology is employed, the nurse scans his or her name badge and then scans the patient's wristband. This process enables the patient's medication record, as ordered by the physician and transcribed by the pharmacist, to appear on the computer screen. The nurse then scans the barcoded medication before giving it to the patient. This medication administration is recorded electronically, which makes it easily accessible to physicians and other clinicians. If the nurse has unintentionally violated one of the "five rights" of medication delivery, a warning appears on the computer screen before the patient receives the medication.

Implementation of barcode medication-verification technology was associated with a 41 percent reduction in non-timing administration errors and a 51 percent reduction in potential adverse drug events from these errors. Errors in the timing of medication administration fell by 27 percent[5].

2. Blood Transfusion Verification

A blood transfusion involves several complicated steps between the time it's first ordered, properly cross-matched and labeled, to finally delivering the proper blood product that's delivered and administered to the correct patient. Once in the patient's room, two nurses are expected to correctly identify the patient, blood product, and the unit number; compare the patient's blood type with the product's blood type; and verify the physician's order and the patient's consent for the blood. Even with these numerous checks, the primary means for a blood transfusion error is when a nurse gives the properly labeled blood to the wrong patient. When barcode technology is used at the bedside, the nurse scans his or her name badge, scans the patient's wristband, and through a series of electronically displayed prompts, scans the blood product, the blood

product type, the patient's blood type, the blood unit number, and expiration date. If all prompts are accurately executed, the nurse is directed to start the blood transfusion. If any of the prompts are inaccurately executed (e.g., the patient's wristband identification number does not match the patient identification number on the blood product bag), an alert is generated.

Bedside barcoding systems used in transfusions can significantly increase accurate patient identification for blood products. Prior to barcoding, these (identification) processes would have involved manual keystroke entry of identification numbers, producing approximately one error in every 300 entered characters. In contrast, barcoding reduces misidentification errors at rates ranging from one character in 15,000 to one character in 36 trillion[6].

3. Laboratory Specimen Identification

Collecting blood specimens is akin to the blood transfusion specimen process. A physician orders a laboratory test, a technologist or nurse verifies the physician's order for the test, identifies the patient, draws the blood, places the blood specimen in the correct type of test tube, and places a label on the tube identifying the patient and requested test. Because lab specimens may guide the physician's care, they are drawn frequently on most patients. Some laboratories print labels that identify the patient and expected test in advance. As the phlebotomist arrives on a clinical unit and proceeds from patient to patient, the labels are attached after the sample is placed in the test tube. It is at this point that most blood specimen errors occur, as patients are transferred to other units or discharged, test requests are modified, and/or specimens are required on an urgent basis. Using barcoding at the bedside to properly identify the patient and test results, accurate specimen labeling can prevent additional testing and patient discomfort. In addition, barcoding can assist hospitals in meeting federal and state legislation concerning patient safety and reduction of medical mistakes as well as ensuring compliance with hospital regulatory requirements calling for positive patient identification and other safety measures.

The barcode symbology most frequently used in the healthcare industry:

Currently, the most frequently used symbologies are Code 128 and Code 39. The 2D barcode is becoming more widely used, since it can hold more information in a smaller area.

Code 128

Code 128 is an alphanumeric bar code specifically designed to reduce the amount of space the barcode occupies.

Code 39

Code 39 is the most commonly used barcode. It can encode both numbers and letters, which is ideal for most industrial and non-retail applications.

Two-Dimensional Barcode

Two-dimensional barcodes are special rectangular codes that 'stack' information in a manner that allows for more information storage in a smaller amount of space. These are also referred to as 'Stacked' Barcodes or 'Matrix' Barcodes. A standard barcode is limited to 20 to 25 characters.

4. Respiratory Therapy Treatment at the Bedside

A physician typically generates an order for respiratory therapy treatments. Once in the pharmacy, a pharmacist reviews and fills the order. A respiratory therapist reviews all of the medications and treatments

he or she is responsible for administering during a shift. Medications are retrieved from the unit prior to administration. When barcoding is used, the respiratory therapist scans his or her name badge. The therapist then scans the patient's wristband, which allows the patient's medication record, as ordered by the physician and transcribed by the pharmacist, to appear on the computer screen. The therapist conducts a critical double check by comparing the order presented on the point-of-care system with the physician's original order in the chart. Next, the therapist scans the prescribed medication. The software performs a series of checks to make sure that the medication is scanned for the "five rights." The therapist then completes a final review of the medication and dose about to be administered. When the medication has been administered to the patient, the therapist confirms in the system that the dose was given. As the medication administration is confirmed, the electronic medication administration record is updated.

5. Dietary Management

Barcodes can play a useful role in streamlining and safeguarding the dietary management process of meal preparation and tray distribution throughout the hospital.

Dietary management systems manage all information regarding patient diets, including menu printing, patients' choices of meals, and restrictions set by allergies or doctors' orders. In addition, they may support the logistics of food preparation and distribution, provide tools to accurately calculate dietary intake requirements, and enable caregivers to ensure that all meals affected by restrictions from doctors are cross-checked and verified by a dietitian before delivery to patients. Certain tests and procedures require that a patient not consume food or drink for a specified number of hours prior to their commencement. When interfaced with a dietary management system, a BPOC application using barcode scanning can automatically ensure that the right meals get to the right patient in the right portions. At mealtime, the caregiver identifies the patient by scanning his or her barcoded wristband. This pulls up a patient profile that includes the latest diet order. A barcoded meal ticket on the tray is scanned and cross-checked with the patient's diet order. If the ticket and order match, the tray can safely be delivered.

Summary

Although this white paper focuses on how wristband barcode technology can improve patient safety and the delivery of healthcare in the clinical environment, there are many other non-clinical barcode applications that have great potential to increase efficiency and accuracy in healthcare organizations. Almost every back-end function, such as supply chain management and receiving, can benefit from barcode utilization. However, the greatest potential to reduce medical errors and improve patient safety in healthcare comes from the utilization of barcoded wristbands throughout the healthcare delivery continuum.

References:

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(6) Health and Human Services Agency for Healthcare Research and Quality website