

Chapter 79

Use of Barcodes to Improve Safety in Healthcare

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ABSTRACT

The application of barcode technology for verification, that is, confirming that the right procedure or medication is administered to the right patient, at the right time, can improve safety significantly in many healthcare processes. Details of applying barcodes in transfusion and medication administration are described to illustrate how they can help to reduce errors. However, the effectiveness of barcodes in error reduction relies on the compliance of staff. Workarounds – omission of steps, steps out of sequence, or unauthorized steps – can compromise patient safety. The technical, organizational, patient-related, and environmental factors, which encourage those practices, need to be understood to prevent their occurrence. Also, the introduction of barcodes can lead to a workflow change and increased workload, which may lead to adverse effects. Successful introduction of barcodes must take into account the design of the process, the change management, the human factors issues, as well as related organizational issues.

INTRODUCTION

The Institute of Medicine described six aspects of quality in healthcare: safety, effectiveness, patient-centeredness, efficiency, timeliness and equitability (Corrigan, 2001). Use of barcodes can certainly improve efficiency, e.g. wastage can be reduced by rendering inventory control easier and more effective, but most importantly this technology can enhance safety, and that is the focus of this chapter. It is now more than a decade since the Institute of Medicine published its report warning healthcare professionals that medical errors resulted in more deaths than many

diseases such as carcinoma of breast, traffic accidents or AIDS (Kohn, 1999). This has inspired efforts from multiple parties in an attempt to mitigate the risk. Most of these efforts utilize one or more of the following three strategies: 1) change the attitude and behavior of healthcare workers through training and use of new communication tools, as exemplified by crew resource management; 2) redesigning of process, a noted example being use of surgical safety checklist; and 3) adoption of technology to avoid human error, the use of barcodes belongs to this category. Many medical errors are due to administration of wrong medications or procedures to patients.

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Barcodes contribute to safety through ensuring accuracy in verification. While there is evidence demonstrating the effectiveness of barcodes in improving safety (Askeland, 2008; DeYoung, 2009; Helmons, 2009; Paoletti, 2007; Patterson, 2002; Poon, 2010; Puckett, 1995; Sandier, 2005), the introduction of barcodes to healthcare is also challenging. Introduction of barcodes without adequate preparation can lead to more problems than solutions (Koppel, 2008; McDonald, 2006; Wideman 2005). Barcodes can certainly play an important role in many procedures, and there are a lot of similarities in both the mechanism and precautions in implementation of technology in various procedures. The author has selected two procedures, blood transfusion and administration of medication, to illustrate how barcodes can enhance safety and strategies to ensure successful implementation.

Overall, the objectives of the chapter include:

1. To understand the basics of a barcode system by using transfusion and medication administration as example
2. To evaluate the effectiveness of a barcode system in healthcare, and
3. To explore the potential problems and possible solutions in implementing a barcode system.

BACKGROUND

A barcode is a graphic representation of data that is optical machine readable. Its origin dates back to 1948 when a graduate student in Philadelphia, Bernard Silver, undertook research to develop a system to automatically read product information during checkout for a local food chain. The first working system used ultraviolet ink, which proved was subject to fading and expensive. Silver improved his work based on the Morse code by extending the dots and dashes downwards and made narrow line and wide lines out of them. He formed his first

barcode from the sand on the beach. The technology was subsequently applied to different fields with varying success and ultimately popularized in US supermarkets. In mid-1970, the National Association of Food Chains (NAFC) established a set of guidelines for barcode development and a standardized 11-digit code to identify any product was developed (Seideman, 1993)

Barcodes were introduced into healthcare more recently as they proved to be a tool, which enables quick and accurate data entry. Its important advantages include:

- Enhanced accuracy, by eliminating error related to manual entry of information;
- Reduced effort, through automation; and
- Facilitated decision, as decision making can be based on data captured in real time.

Barcodes can be applied to serve traceability, inventory control, and verification.

Traceability is important in healthcare, whether for a product throughout the supply chain or in the clinical workflow. For example, it would be important to find out whether a specimen taken in the operating room has arrived at the pathology laboratory, or which pieces of equipment were used in a patient proven to have Creutzfeldt-Jakob Disease, or the source of medication which is found to be contaminated. Barcodes can be used to track a particular item. As a result, they have been used extensively in medical records, radiology, pharmacy, laboratory and central supplies for this purpose.

Maintaining accurate inventory in healthcare is important so that we know what is currently available, in which location, the value of those items and whether reordering is required. However, this is extremely complex because of the large number of inventory items, staff and parties involved. Barcodes help the management of inventories so that the right materials are available when and where they are needed. It also enables monitoring usage patterns and creates a more realistic

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