

# Implementing a Home-Grown Barcoded Medication Administration System in a Quaternary Care Hospital

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**Abstract:- Medication management in a quaternary care hospital is a complex process that requires high quality standards and technology driven solution. Besides Safety and accuracy, it also requires integration of the fragmented process of medication management from prescribing till point of administration and discharge. One of the challenges encountered by pharmacy services were the presence of look-alike sound alike drugs and potential to cause dispensing errors. The objective of this study was to enhance safety, efficiency, and effectiveness of medication management System from dispensing till administration through home grown barcode medication dispensing Process. PDSA (PLAN-DO-STUDY-ACT) methodology was adopted for this project. Pharmacy services with information technology team Re-engineered various business processes including inventory replenishment, unit dose refill, routine medication dispensing, and medication returns. Since very few Products were provided by Pharmaceutical Companies with Manufacturer's barcode, therefore instead of opting for manufacturer's barcode, the entire Medication inventories were labelled with in house-barcode label [QR Codes]. The Project was implemented in total 401 beds including children's hospital, surgery units and Private wing units during initial phase and later extended in 580 beds.**

**Conclusion: Judicious use of barcode technology in inventory management, drug dispensing and administration enhances Patient's safety, efficiency, and quality of care.**

**Keywords:- Barcode, Patient's safety, Medication Errors, PDSA.**

## I. INTRODUCTION

Medication management in a hospital care Setting is a multifaceted process, comprising of Procurement, Storage, Ordering, Preparing, dispensing and administration of drugs. Each Step of Medication Management Cycle is prone to error due to Complexity and fragmented Processes and therefore requires high quality standards and technology driven solution. Literature suggests that 28% of Adverse events are due to Preventable Medication Errors [1] and 25% of all dispensing errors were due to LASA Medications [2].

Aga Khan University hospital is a 750 bedded quaternary care hospital. Computerized Physician's order entry [CPOE] and Electronic Medication administration record [EMAR] were implemented in Pharmacy Services in 1999. Both the Projects Played significant roles in enhancing overall efficiency and curtail Medication errors due to ambiguous manual Prescriptions, duplicate orders, contraindications, allergies, and various other aspects of Medication Management. However, look alike & Sound Alike Medications Commonly abbreviated as LASA remains one of the challenges for accurate and safe dispensing and administration Processes. Another challenge was the business Process inability & lack of technological support to find the traceability of Medication lot number (mostly Tablets or Capsules) once it is cut from the strip and dispensed in the Ward against Medication Orders. **American society of hospital pharmacy** and other health care organizations encourages hospitals and health care systems for the implementation of barcode technology in inventory management, drug preparation, dispensing and administration to improve Core processes and quality of care. **Institute of Safe Medication Practices [ISMP]** also recommends that 90% of Unit doses reaching Patient floors should be barcoded. The hospital undertook and started journey for the Implementation of Barcode Medication dispensing and administration Processes in 2018 comprising of several Phases including development of Prototypes, transfer of entire drug dictionary data in barcoded enabled drug dictionary, designing of inhouse barcode labels for individual Products and medication order labels with specified information, Testing & Pilot phases, training plans, Purchasing of equipments, Implementation Phase and Post implementation challenges. In the initial Phase the Project was implemented in Children's hospital and later expanded in other areas of the hospital. The main objectives of the Barcode Medication administration Project [BCMA] were:

- Major re-engineering in dispensing & administration process to ensure right drug (ordered by Physician) to the right Patient.
- Traceability of lot and expiry date of medication after dispensing in the unit.
- Efficiencies in medication management process.

**II. METHOD**

PDSA (PLAN-DO-STUDY-ACT) methodology was adopted for this project. Pharmacy services with information technology team Re-engineered various business processes including inventory replenishment, unit dose refill, routine medication dispensing, medication returns along with system alerts for wrong or expired drug. Each process flow requires verification of the reviewed drug order against respective drug's bar code label. All Process flows were verified on test server & recommendations were shared with Information

technology department for continual improvement. The hospital wide bed coverage plan and staff training plans were designed. The pilot process was initiated in Q1- 2018, implemented in first week of April and extended to 24/7 Centralized bar code medication administration services for children's hospital, surgical units, and other areas till Q-4 2019. The Post Project trouble shooting was effectively addressed and resolved with able support of IT. The Process control teams were designed for Initiation of 60-minute group observation sessions to monitor system and workflow compliance.

<b>PHASE-1: Design and Quality Assurance</b>	<b>PHASE -2: Testing and Training</b>
<ul style="list-style-type: none"> <li>• Development of prototypes.</li> <li>• Changes in master drug dictionary for all formulary drugs to enable barcode check and related Parameters.</li> <li>• Designing barcoded Medication label and Pick Plan.</li> <li>• Designing of Barcoded Product Label.</li> <li>• Stock keeping of Barcoded Inventories in Main Store</li> <li>• Replenishment of Barcoded inventories in Satellite Pharmacies.</li> <li>• Checking and reconciliation of barcoded stock</li> </ul>	<ul style="list-style-type: none"> <li>• Testing of prototypes for each business process - sharing of observations, recommendations for continual improvement</li> <li>• Closure of observations with the able support of IT department.</li> <li>• Staff training and scheduling.</li> <li>• Coordination with IT for trouble shooting and resolution of problems in CPOE during pilot phase</li> </ul>

Table 1:- Project Implementation Steps.

<b>Process before Implementation of Project</b>	<b>Process after Implementation of Project</b>
<ul style="list-style-type: none"> <li>• Pt. receives wrist band with addressograph at the time of admission.</li> </ul>	<ul style="list-style-type: none"> <li>• Pt. receives BARCODED wrist band at the time of admission</li> </ul>
<ul style="list-style-type: none"> <li>• Physician enters order through CPOE</li> </ul>	<ul style="list-style-type: none"> <li>• Physician enters order through CPOE.</li> </ul>
<ul style="list-style-type: none"> <li>• Pharmacists review the order, check, and dispense medication (ensuring 5 Rs i.e. : Dispensing of Medication to the Right Patient at Right time in Right location with Right dose and Right route .</li> </ul>	<ul style="list-style-type: none"> <li>• Pharmacists review the order, Order transferred to another verification's screen. Medication scanned, checked, and dispensed in the ward (In case of right drug filling transaction on the screen will become green. In case of wrong drug filling, system will generate alert for wrong drug selection.</li> </ul>
<ul style="list-style-type: none"> <li>• Nurse reviews medication order and administer medication ensuring 5 Rs</li> </ul>	<ul style="list-style-type: none"> <li>• Nurse reviews medication order and scan Patient's MR # from medication BIN and medication Rx from medication label (5 Rs) Nurse scan Patient's wrist band to verify the patient and administer the drug.</li> </ul>
<ul style="list-style-type: none"> <li>• Nurse completes documentation in electronic medication record.</li> </ul>	<ul style="list-style-type: none"> <li>• Nurse completes documentation in electronic medication record.</li> </ul>

Table 2:- Pre Versus Post Implementation Process of Medication dispensing & administration

## Barcode Verification - Alerts

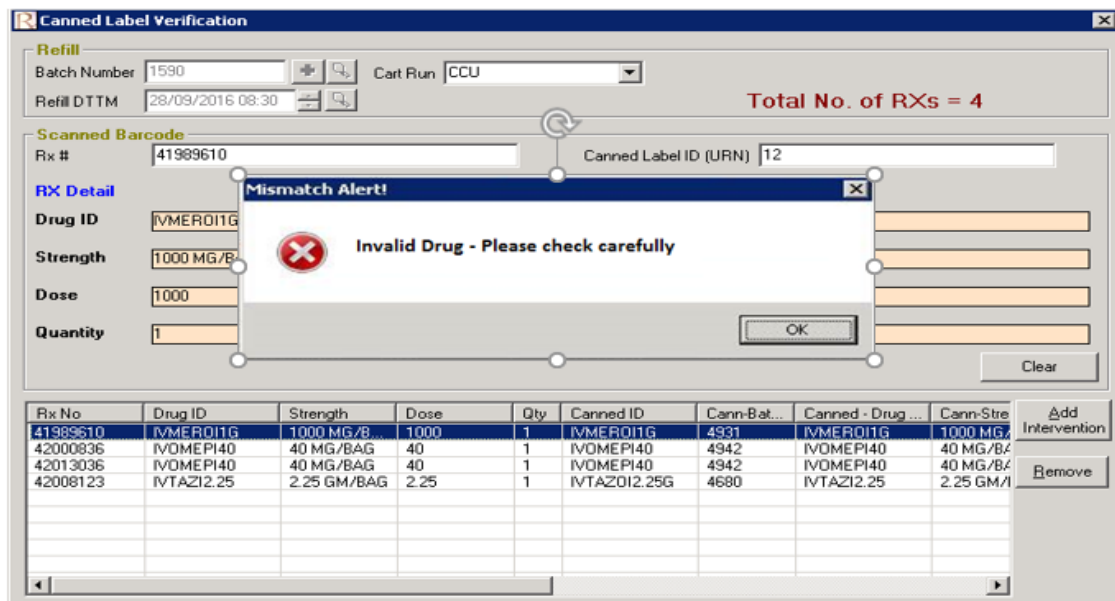


Fig 1:- Invalid drug Alerts

## Barcode Verification

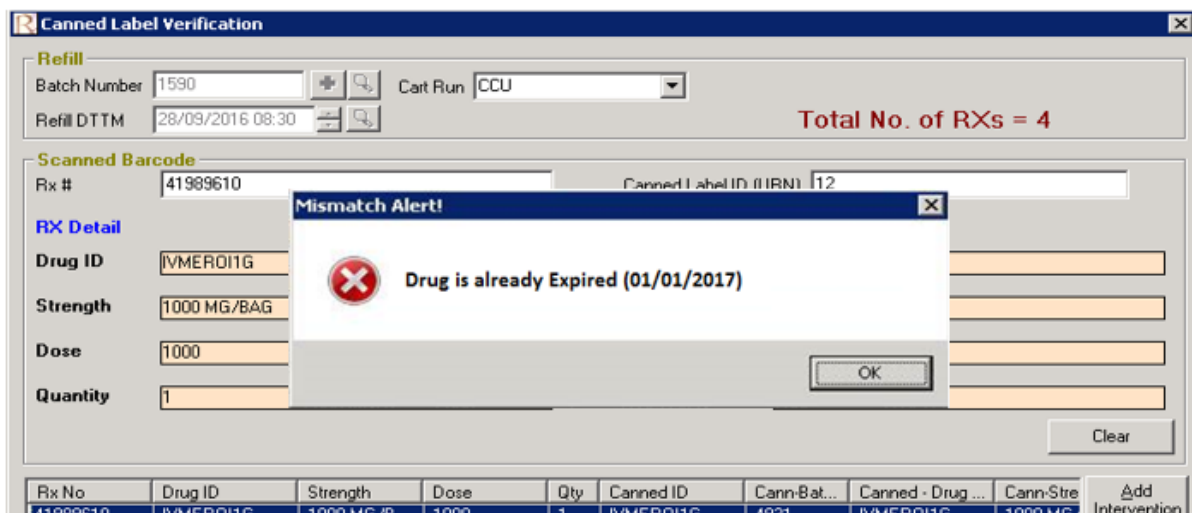


Fig 2:- Expired Drug Alert

### ➤ Post Implementation – trouble shooting:

A dedicated team of Pharmacy and IT [Information technology] scheduled daily huddles for identification, Monitoring & resolution of Post Implementation Problems including Printing issues, barcode disabled drug Mnemonics, scanning issues in nursing Units, direct Printing without Scanning, barcode disabled drug frequencies, order disappearance after saving. All the issues were successfully resolved.

### ➤ Home-Grown BCMA solution – Control team Audits – Code Controls:

In the Control Phase of the Project, the project team-built authority matrix to control manual entry of QR codes and related information.

## III. RESULTS

Home grown barcode medication administration system was implemented in total 580 beds including Children’s hospital, Surgery, Medicine, Gynecology and Private wing. Project went well with Medication dispensing and administration errors related to wrong drug and wrong Patient identification respectively reduced by 100% in barcoded units.

## IV. CONCLUSION

Barcode Medication administration is a complex project and provides an excellent opportunity to quantify and improvise Operational processes and ultimately care of patients. The Project requires an in-depth understanding of critical Processes of Medication Management and Usage and

it's reengineering as per best practices and requirements. Judicious use of barcode technology in inventory management, drug dispensing and administration enhances Patient's safety, efficiency, and quality of care. The benefits included Improved drug expiry & lot management, traceability, and reduction in dispensing errors through System alerts and scanning Process.

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