How ROWA AUTOMATED MACHINE help pharmacy department in King Fahad Medical City Riyadh SA

Ghadeer Faisal Almutairi[1]

[1] Corresponding Author, Senior pharmacist, Pharmacy Dept., KFMC, Riyadh, SA

Abstract: **Background: Automated medication dispensing systems were introduced in hospital pharmacies in the final decades of the twentieth century to reduce medication dispensing errors and save time and personnel.**

Methods: We described the process of introducing automation to a large outpatient pharmacy department, Rowa Vmax® 160 in King Fahad Medical City hospital, Riyadh SA.

Results: This study confirms a 91% reduction in error rate before and after implementation of the Rowa Vmax® 160 system. AS per management expectation, 88% of the patients are served in 20 mins vs the expectation of 98%

Conclusions: Rowa Vmax 160 introduces a novel dataset for the accurate, efficient, flexible, and scalable standardisation of pharmacy data in King Fahad Medical City hospital in Riyadh, Saudi Arabia

Keywords: **Rowa Vmax® 160, automation dispensing system in pharmacy, robotic dispensing system , ROWA AUTOMATED MACHIN.**

1. INTRODUCTION

Automated medication dispensing systems were introduced in hospital pharmacies in the final decades of the twentieth century to reduce medication dispensing errors and save time and personnel. A robot is essentially a computer, but researchers are beginning to recognise that human-robot interactions differ significantly from human-computer interactions. While the metrics used to evaluate human-computer interactions (such as software interface usability in terms of time, accuracy, and user satisfaction) may be applicable to human-robot interactions, we must determine whether additional metrics should be considered.[1]

Automated dispensing devices can store drugs in a specific location and dispense them only to a specific patient. As Such devices, especially when linked with bar coding and interfaced with hospital information systems, can significantly reduce medication error rates. Ensure the safety of automated medication dispensing systems. Automation may also reduce prescription filling errors.[2]

Robots process information faster and more precisely than humans. Consider the medication dispensary robots in.

They pack medications and dispense them without error at the pharmacy. When people are tired, they make unintentional mistakes. Humans are also susceptible to distraction. As a result, combining humans and robots simplifies day-to-day tasks. People rely on others (both other people and machines). [3]

Automation is suggested as a potential mechanism for increasing efficiency and patient safety. It has been demonstrated that automation can improve the efficiency of medication distribution by reducing medication errors during storage, dispensing, and labelling. Finally, automated dispensing machines will improve patient safety while reducing human interfarence, which can lead to errors. Automation will also help to streamline hospital pharmacy operations, improve accuracy, and increase staff utilisation.

In this study, we used Six Sigma approaches to examine the medication process before and after automation in a refill pharmacy. Refill pharmacies provide medication supply for 24 hours, which necessitates a number of processes such as medication preparation, packaging, and labelling. In 2017, we discovered that the dispensing phase of medications takes an average of 17 minutes (15 steps must be completed in this phase), that 21 medication errors were related to dispensing and preparing medications, and that the expired cost of the top ten most expensive medications is 463650 SR.

2. LITERATURE REVIEW

Generic names, brand names, Drug Identification Numbers (DIN, unique identifiers assigned by Health Canada to all drug products), National Drug Codes (NDC, unique identifiers assigned to drugs by the United States Food and Drug Administration), internal hospital identification codes, route, dose, frequency, and other administrative and prescription information are all included in the pharmacy data. [4]

When medication is scheduled according to the professional's instructions, the goal of a hospital pharmacy is to provide patients with the prescribed medication. However, with increasing patient numbers, this is not an easy task. Although patient safety and care are the ultimate and possibly only priorities, human error in the process of dispensing medication to patients can be fatal at times. These errors can manifest themselves in a variety of ways, such as the administration of the incorrect dosage or the administration of medication at the incorrect time. [5] All of these, however, can and do have serious consequences. Furthermore, this is a major logistical concern because the pharmacy delivers drugs to all hospital units via various dispensing methods and delivery routes [6].

There are numerous technologies available within a hospital pharmacy framework that work to improve patient safety by reducing prescription errors and missing drugs. The pharmacy robot is one of the most important technologies that has contributed significantly to the advancement of hospital pharmacy systems [7]. The pharmacy robot is nearly flawless in medication administration, and the correct algorithm enables the use of the five rights as published in a study [8]. These rights refer to the only way to avoid errors by ensuring that the correct patient received the correct medication and dosage at the correct time.

Using robots reduces the amount of time, money, and waste produced in pharmaceutics and other biological research fields [9]. One of the significant benefits of using robotic technologies is the reduction in time required to prepare the prescription [10]. Furthermore, robotics lowers the percentage of medication errors [11].

Several studies [12,13] found a moderate reduction in both medication dispensing errors and time. Other studies looked at the impact of automated point-of-use distribution systems in hospitals on medication administration errors [14].

Even though robots can handle pharmaceuticals unattended, they still require the attention of an operator because machine errors occur, albeit infrequently. Thus, a major concern is that artificial intelligence (AI) will displace humans in their duties, and while there are ethical concerns when implementing AI in the healthcare sector, human intervention is unavoidable. These human interventions, however, have an impact on both the workflow and throughput. Human intervention could take the form of an operator directing, loading, or unloading products. [15]

Patient pack and unit dose dispensing makes it easier to use automated systems for medicine storage, stock management, picking, and labelling because:

(a)   the need for bulk dispensing of loose tablets and capsules is eliminated

(b)   an automated system can control stock on a pack by pack, or dose by dose, basis rather than having to maintain a complex database of pack details for every medicinal product. [16]

3. METHODS

We described the process of introducing automation to a large outpatient pharmacy department, Rowa Vmax® 160 in King Fahad Medical City hospital, Riyadh SA.

The automated units were linked to hospital information technology (HIT), which handles appointments, medication records, and prescriptions.

The BD Rowa Vmax 160 hardware was chosen based on the previously mentioned criteria for picking and input speed, as well as positive integration characteristics.

As planned, the Rowa machine has a capacity of 21,000 boxes, while also reducing medication errors and patient wait times.

Each unit can hold 12,500 medications and has the potential for high-density storage. capacity of 18,300-21,100 medications.

3.1 Ways to order the machine:

1- The doctor prescribes medication.

2- The chemist received the order.

3- The chemist double-checks the order.
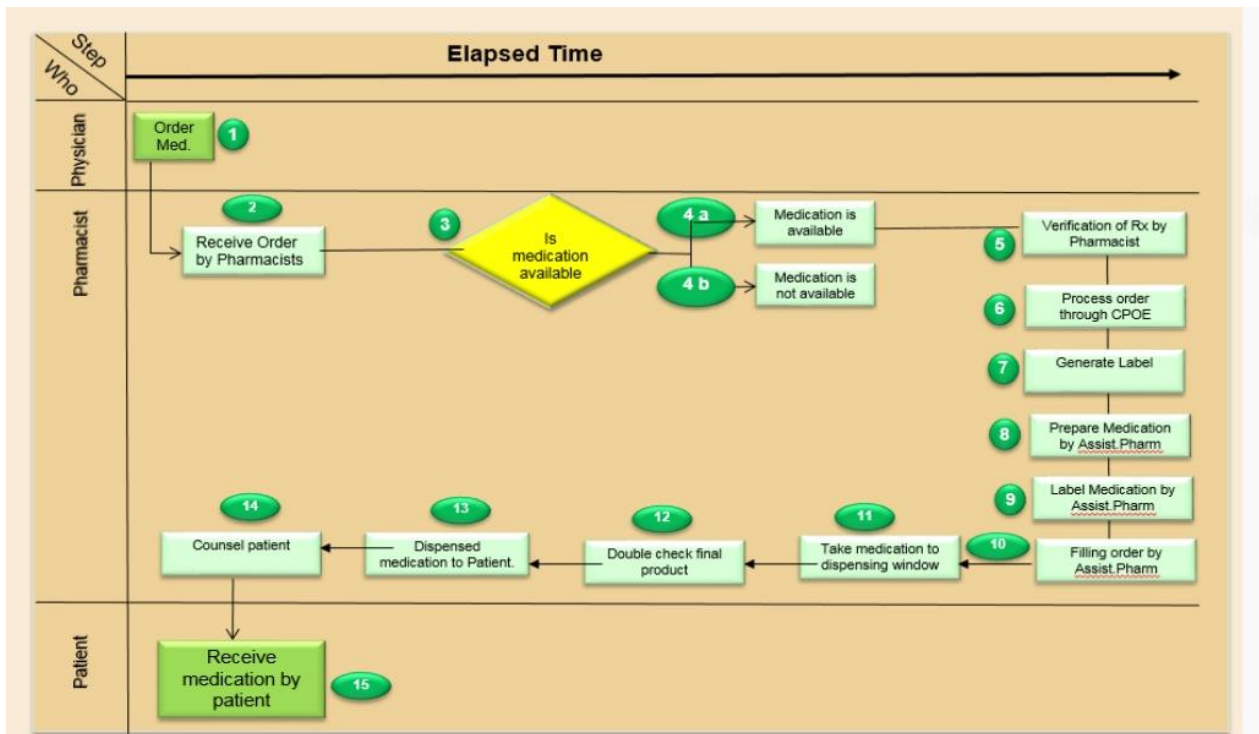
4- Rowa Machine-prepared medication.

Figure (1): Outpatient Medication Flow Deployment Flowchart

The Six Sigma methodology enabled the medication management process to be transformed quickly.

According to Manuel, when we fill the machine with the scanner and let the machine transport the box to the belt, the packing head transports the box to the correct shelf.

Figure (2): Rowa Vmax® 160 hardware

Input from Prologue, when we empty the boxes on the belt and the Prologue machine takes the boxes one by one to the scanner and takes a photo for the boxes to detect the barcodes and put them on the small belt to be ready for picking heads to be stored on the right shelf.

Figure (3): Rowa Vmax® 160 **machine**

4. RESULTS

Functional programming is an effective method for developing a hospital central pharmacy. The new facility layout design can help save time during the medication preparation and dispensing processes.

Figure (4): AS per management expectation, 88% of the patients are served in 20 mins vs the expectation of 98%
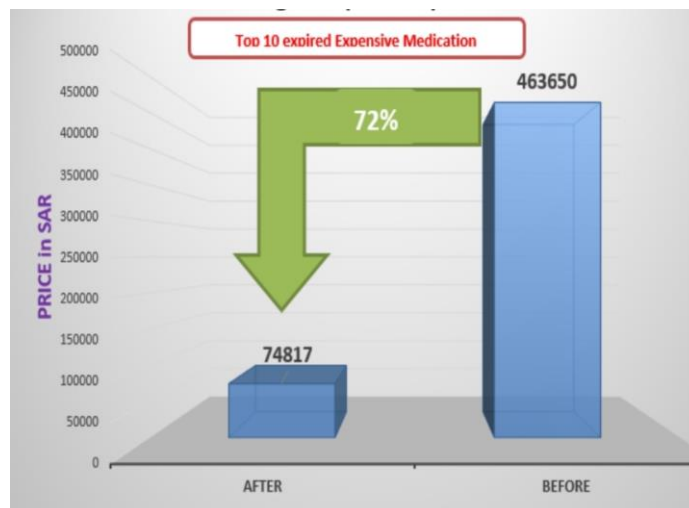

Figure (5): Total Cost Saving of Expired Expensive Medication

This study confirmed that the potential for Expired Expensive Medication reduction in our environment is even greater if we can minimise the Total Cost Saving performed. In particular, a 72% reduction was achieved.
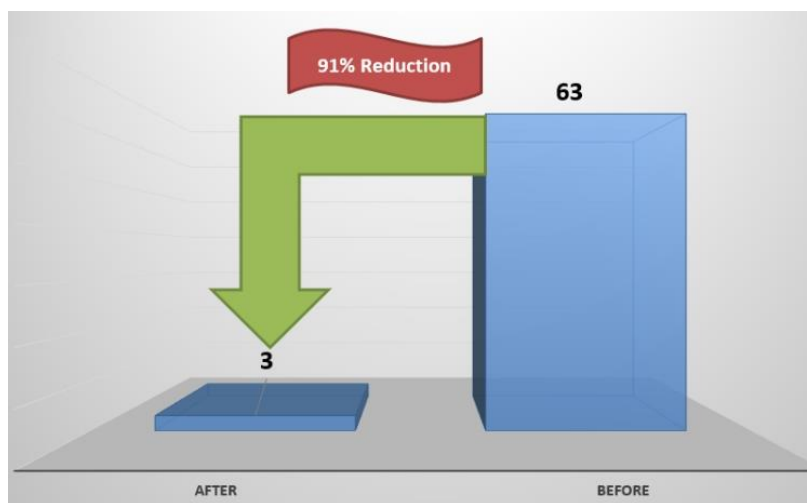

Figure (6): Medication Error Related to Storage and Dispensing before and after implementation of Automation

This study confirms a 91% reduction in error rate before and after implementation of the Rowa Vmax® 160 system.

5. DISCUSSION

Pharmacists at King Fahad Medical City Hospital can reflect on the progress made in medication use and the important role that pharmacy has played in improving it. This is true throughout the medication-use process, including the foundation of pharmacy practise (drug preparation and dispensing).

The main discovery of this advancement was that by directly connecting electronic prescribing and pharmacist validation to the dispensing Rowa Vmax® 160, the correct drug and dose are ensured through barcode reading for each packaged dispensed.

6. CONCLUSIONS

Rowa Vmax 160 introduces a novel dataset for the accurate, efficient, flexible, and scalable standardisation of pharmacy data in King Fahad Medical City hospital in Riyadh, Saudi Arabia. The medication-use system's safety has also been improved by recognising the limits of human performance and implementing more reliable technologies. For verification and documentation, these technologies include the use of robotic technologies and machine-readable coding.[17]

REFERENCES

[1] ROWA Automatisie rungs systeme [online]. [cited 2008 Oct 1]; Available from URL;http://www.rowa.de/Vorteile. 252.0.html

[2] Hewett; Baecker, Card; Carey, Gasen; Mantei; Perlman; Strong; Verplank. "ACM SIGCHI Cunicula for Human-Computer Interaction". ACM SIGCHI. Retrieved 15 July 2014

[3] J. Jacko. Human-Computer Interaction Handbook (3rd Edition). CRC Press. 2012

[4] Goundrey-Smith S: Pharmacy automation. Information Technology in Pharmacy. Springer, London; 2013. 95-119. 10.1007/978-1-4471-2780-2 4

[5] Svirsko AC, Norman BA, Hostetler S: Standardizing pharmaceutical delivery to reduce pharmacy costs while simultaneously reducing missing doses. IISE Trans Healthc Syst Eng. 2020, 10:33-46.0.1080/24725579.2019. 1671924

[6] Alam S, Osama M, Iqbal F, Sawar 1: Reducing pharmacy patient waiting time. Int J Health Care Qual Assur. 2018, 31:834-44.10.1108/I[HCQA-08-2017-0144

[7] Flynn EA, Barker KN: Effect of an automated dispensing system on errors in two pharmacies. I Am Pharm Assoc (2003). 2006, 46:613-5.10.1331/1544-3191.46.5.613.

[8] Flynn Angelo LB, Christensen DB, Ferreri SP: Impact of community pharmacy automation on workflow, and patient interaction. I Am Pharm Assoc. 2005, 45:138-44.10.1331/1544345053623537

[9] The five rights: a destination without a map | institute for safe practices. (2007). June :2022 ,18 .https://www.ismp.org/resources/five-rights-destination-without-map

[10] ASHP Research and Education Foundation. Outsourcing sterile products preparation: contractor assessment tool. Accessed January 6, 2019. www.ashpfoundation.org/MainMenuCategories/AdvancingPractice/SterileProducts Tool

[11] ,Food and Drug Administration. Compounding: inspections, recalls, and other actions. Accessed February 15 .24 https://www.fda.gov/drugs/human-drug- compounding/compounding-inspections-recalls-and-other-actions .2021

[12] ,American Society of Health System Pharmacists. Practice Advancement Initiative 2030. Accessed February 15 .25 https://www.ashp.org/Pharmacy-Practice/PAI .2021

[13] Schneider PJ, Pedersen CA, Ganio MC, Scheckelhoff DJ. ASHP national survey of pharmacy practice in hospital .26 .settings: workforce-2018. Am J Health-Syst Pharm. 2019;76:1127-1141

[14] Verma AA, Pasricha SV, Jung HY, et al. Assessing the quality of clinical and administrative data extracted from hospitals: The General Medicine Inpatient Initiative (GEMINI) experience. J Am Med Inform Assoc 2021; 28 (3): 578-87.

[15] Freimuth RR, Wix K, Zhu Q, Siska M, Chute CG. Evaluation of RxNorm for medication clinical decision support. AMIA. Annu Symp Proceedings AMIA Symp 2014; 2014: 554-63.

[16] McDonough CW, Smith SM, Cooper-DeHoff RM, Hogan WR. Optimizing antihypertensive medication classification in electronic health record-based data: Classification system development and methodological comparison. JMIR Med Inform 2020; 8 (2): e14777.

[17] Hoopes M, Angier H, Raynor LA, et al. Development of an algorithm to link electronic health record prescriptions with pharmacy dispense claims. J Am Med Inform Assoc 2018; 25 (10): 1322-30.