



# Impact of Decentralized Automated Dispensing Robotics Machine on Patient Medication Compliance in an Institutional Ward at the Sam Rayburn Memorial Veterans Center

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### Abstract

Sam Rayburn Memorial Veterans Center Pharmacy Service located in Bonham, Texas fills about 400 to 500 outpatient prescriptions for Veterans per day. With significantly increased workload demands and complexities over the past three years in the Veterans Affairs healthcare system, pharmacy staff were having an increasingly hard time keeping up with the workload and domiciliary nursing staff and eligible patients were having a difficult time making multiple 8 to 10-minute trips to the pharmacy to pick up prescriptions. As a result, patients were often not getting their medication supply, leading to noncompliance, a frustrated nursing staff, and poorer patient rehabilitation outcomes. To solve these problems, an automated dispensing robotics machine offering 24 hours-a-day, 7 days-a-week prescription pickup service was installed in the domiciliary to reduce pharmacy pickup window traffic and improve patient and nursing satisfaction, by allowing Veterans to pick up their medications without waiting in line, even when the pharmacy is closed. Veteran medication compliance rates were analyzed by comparing return to stock prescription data from before implementation of the machine, to after go-live training. Post implementation return to stock prescription data was collected over one year post training. The decentralized automated dispensing machine reduced trips to the pharmacy from the domiciliary by transitioning domiciliary prescriptions to an alternate, convenient pickup location situated within the domiciliary and also improved patient medication compliance by 34%.

### Keywords

Automation; Decentralized; Medication Compliance; Veterans

### Introduction

Sam Rayburn Memorial Veterans Center (SRMVC), part of the VA North Texas Health Care System (VANTHCS) located in Bonham, Texas provides a full range of primary and geriatric care programs as well as outpatient mental health services to Veterans in North Texas and Southern Oklahoma. In Fiscal Year 2015, we handled 18,898 unique outpatients along with 151,576 outpatient

visits. The 78-acre campus also includes a 116-bed nursing home care unit for extended care, a 5-bed psychiatric residential rehabilitation therapy program, and a 190-bed domiciliary for rehabilitative care. The domiciliary is a highly controlled and closed unit, and includes a substance abuse program that provides special intervention protocol, health maintenance program for Veterans with multiple medical problems and limited resources, as well as supportive work program and compensated work therapy. The domiciliary service is being expanded to include additional substance abuse beds, a secured women Veterans area and residential PTSD program.

Veterans who are admitted to the SRMVC domiciliary are assessed for their level of dependence on medication management as one of the following: dependent (level 1), semi-independent (level 2), or independent (level 3). Depending on their level of dependence, Veterans may require close nursing monitoring and supervision of their medication management, to full independence of handling their own medications with minimal nursing intervention. While the goal of the program is to transition patients to full independent functionality (level 3), setbacks occasionally do occur, prolonging the patient's rehabilitation duration. The SRMVC domiciliary average patient length of stay is 90 to 120 days. A part of the therapy process is to teach patients to take ownership of their own care and medications management. As such, all Veteran rooms and belongings are routinely inspected by domiciliary staff for contraband, including unauthorized medications or the lack thereof of needed medications. Given nursing's busy schedules and the location of the domiciliary being about 8 to 10 minutes away from the pharmacy, patients were not always getting their medications as intended, leading to missed doses, lost productivity, and suboptimal patient therapy.

We hypothesized that the implementation of an automated dispensing robotics machine located in the domiciliary would help increase medication compliance for domiciliary patients by means of improving access for pick up, thereby decreasing medications being returned to stock, and improving patient and nursing satisfaction. Around the world, use of pharmacy automation solutions have been well documented to aid with pharmacy operations and help move the pharmacy profession forward [1-4]. The results of this review could potentially reinforce and advance clinical practical knowledge, improve patient care, and contribute to future practice.

### Methods

Return to stock prescription data was compared from before implementation of the automated dispensing machine to after go-live training. Return to stock prescription data for post implementation was collected after all relevant pharmacy and domiciliary nursing staff were trained, and after all domiciliary patients were educated on the process of how to use the machine. Post implementation return to stock prescription data was collected at one month, three months, six months, and one year post training. Only the number of prescriptions loaded and number of prescriptions returned to stock were collected, via the reporting system of the automated dispensing machine software. No patient information, identifiers, or drug names were collected. This study satisfied category 4 Institutional Review Board exemptions as the research involved the collection of existing

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numerical data only and no actual patient information, patient identifiers, or prescription information was seen or used at any time during the process. Continuous percentage data was analyzed using the two-sample unpaired *t*-test between proportions. For all analyses, a significance level of 0.05 was used.

## Results

The return to stock rate for domiciliary prescriptions was between 25%-33% prior to the implementation of the automated dispensing machine. A total of 12,895 domiciliary prescriptions were filled during the year prior to machine installation. After implementation and go-live training was completed, a total of 1421 prescriptions were loaded during the first month, 1628 prescriptions were loaded during the third month, 1072 prescriptions were loaded during the sixth month, and 893 prescriptions were loaded during the twelfth month post go-live. Of these, the number of prescriptions that had to be unloaded and returned to stock at the end of the month was 49, 54, 77, and 29, respectively. This equated to a return rate of 3.45% in month one (49/1421), 3.32% in month three (54/1628), 7.18% in month six (77/1072), and 3.25% in month twelve (29/893). Differences in return to stock rates from before to after implementation was statistically significant at all points, with  $P < 0.0001$  for all ranges.

## Limitations

It was not possible to obtain the exact numbers of domiciliary prescriptions that were returned to stock prior to the implementation of the automated dispensing machine because our computer system did not have the capability to make this differentiation, and all it showed was whether a domiciliary prescription was filled or not. However, pharmacy staff who handled the domiciliary return to stock process gave a range as low as 25% and as high as 33% of domiciliary prescriptions that were consistently left sitting on the pharmacy shelf that they had to return to stock. This provided a fairly accurate — though not precise — measure for the return to stock rate for domiciliary prescriptions pre-implementation. We used this range as our baseline comparator.

## Discussion

Prior to the implementation of the automated dispensing machine, about 25%-33% of SRMVC domiciliary patient prescriptions were consistently not picked up and ended up being returned to stock. Since its implementation, after all staff and domiciliary patients were trained and educated, the prescription return rates dropped down to a range of 3.25% to 7.18% during the first year of machine use, meaning a nearly 6-time average decrease in prescription noncompliance from patient medications not being picked up (range of 3.5 to 10.1 times). In other words, the medication compliance rate before the machine was installed in the domiciliary was between 67%-75%. After implementation, the domiciliary medication compliance rate jumped to 92.82%-96.75%. This translated to about a 34% increase in patient medication compliance in the domiciliary, with a range of 23.8% to 44.4%. This was in line with reported benefits of using automated dispensing, such as fewer numbers of missed doses and increased efficiency [1,3].

The systematic steps to how the automated dispensing machine works made these results achievable. First, pharmacy staff loaded domiciliary prescriptions into the automated dispensing machine and provided claim checks to the domiciliary nursing staff. Nursing

staff then provided patients with their unique claim checks. Semi- and fully independent patients would then at their convenience use their unique claim check and birth date to pick up their prescriptions from the automated dispensing machine. The patient could then during the prescription pickup process enroll themselves into the automated dispensing machine system by creating their personal User ID and PIN to use for future pickups. With the machine's security features, Veterans are only able to obtain their own medications and are unable to see anyone else's medications. Any remaining prescriptions not picked up within a two-week window are automatically sorted into the return to stock bin by the robotic arm inside the machine for pharmacy personnel to retrieve.

We recognize that implementing a new machine is a challenge at any facility, and factors that come with implementation may vary from one site to another. Not only does the complexity and size of the facility matter, but so does a site's staffing levels between departments, and their level of drive to learn something new and go with it. However, automation is the future of medication distribution [1,2,4], and the results we experienced at our facility are a simple reminder of why. Benefits to disruptive innovation implementation nevertheless must be weighed against the associated nuances that come with it. Before deciding on whether to invest in a decentralized automated dispensing robotics machine for a patient care ward, one should consider not only the cost and functionalities of the machine, but also the feasibility and likelihood it would solve the identified problems that one is facing. Additional technical steps required to operate and troubleshoot the machine are also extremely important to consider, seeing if there would be any substantial workflow changes and if so, whether they are significant enough to negatively impact staff. As anticipated, robotic automation requires management and maintenance, which usually fall on the workload of pharmacy technicians [4]. Therefore getting buy-in from frontline staff is crucial also, as it can determine success or failure of the project.

## Conclusion

For our facility, this 24/7 automated pharmacy machine located in the domiciliary yielded many benefits. Pharmacy lines were shorter, patient satisfaction and medication compliance was improved, and with the automated dispensing machine service pharmacy and nursing were able to safely and securely transition domiciliary patients into a lifestyle of improved self-care and personal responsibility.

## Implications

Sam Rayburn Memorial Veterans Center reduced nursing trips to the pharmacy to pick up patient prescriptions. By placing these prescriptions in an automated dispensing robotics machine located in our institution's domiciliary for domiciliary patients to pick up, SRMVC increased patient medication compliance and increased the satisfaction of domiciliary patients and nursing staff. Such results and experiences could potentially be explored and be of benefit to other medical facilities around the world.

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