

## STREAMLINING INPATIENT DISCHARGE MEDICATION DISPENSING TO REDUCE PATIENT WAITING TIME

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ARTICLE INFO	ABSTRACT
<p><b>Handling Editor:</b> Rahimah Mahat</p> <p><i>Article History:</i> Received 8 July 2023 Received in revised form 2 September 2023 Accepted 7 October 2023 Available online 1 November 2023</p> <p><b>Keywords:</b> Lean; Inpatient; Bedside dispensing; Discharge counter; Waiting time.</p>	<p>Patients' satisfaction and timely service delivery are key expectations in the healthcare setting. At Miri Hospital, patient waiting time for discharge medication has been a concern. The problem is demonstrated in the mean waiting time for receiving discharge medications and the number of patients waiting at the discharge counter. Lean management strategies aim to enhance efficiency by eliminating waste and improving processes to optimise value. The current state Value Stream Mapping revealed the existing processes involving prescription screening and intervention by the inpatient pharmacists before dispensing. Addressing the time limitations faced by prescribers, this process could be time-consuming. Hence, the implementation of bedside dispensing enables ward pharmacists to expedite interventions by leveraging their in-depth knowledge of patient progress and personalised medication indications, and prompt communication with prescribers, resulting in a more efficient and timely medication dispensing process. The Kaizen Burst analysis revealed factors like inefficient coordination between the discharge counter and wards, prescriber unavailability, lack of clarity in the discharge summaries, and the promotion of the Patient's Own Medications programme. Waste of waiting and motion identified prolongs the patient waiting time. As a countermeasure for these issues and to enact a</p>

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strategic plan, we have established bedside dispensing targets and devised a leave pooling system to ensure an adequate workforce. Pre-Lean data shows the mean patient waiting time was  $16.65 \pm 9.40$  minutes. The ward pharmacist took  $5.25 \pm 6.59$  minutes to complete an intervention, as compared to  $9.61 \pm 8.71$  minutes at the discharge counter. Post-Lean analysis revealed significant waste elimination with a mean of  $6.29 \pm 7.15$  minutes, approximately 10.36 minutes shorter patient waiting time. To ensure the sustainability of the improvements, regular monitoring of the bedside dispensing targets and continuous monitoring of patient waiting time to ensure seamless intervention, hence reducing patient waiting time. The lean methodology may be effective in significantly reducing patient waiting time and increasing discharge medication dispensing process efficiency.

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## 1.0 Introduction

Miri Hospital serves as a secondary healthcare facility catering to the Northern zone of Sarawak. Boasting a bed capacity of 349, the hospital offers a range of specialised services including Medical, Surgical, Ophthalmology, Orthopaedic, Obstetrics and gynaecology, Radiology, anaesthesiology, and Paediatric care. Miri Hospital received a high influx of patients as we are the referral public hospital in northern Sarawak. The consistent rise in patient numbers, coupled with existing resources, has led to congestion and treatment delays [1].

Addressing overcrowding and congestion in Malaysian healthcare facilities has been a priority for the Ministry of Health [1]. The Lean initiative was introduced by the government to enhance efficiency and tackle this issue [2,3]. Prolonged wait times in healthcare centres have impacted patient satisfaction, as evident from the complaints on social media [4].

Lean management strategies aim to enhance efficiency by eliminating waste and improving processes to optimise value. The pharmacy is one of the areas to implement these strategies. For hospital discharge, most patients are supplied with their discharge medications upon discharge. The doctors will prepare a discharge summary, incorporating the prescribed discharge medications into the Pharmacy Information System (PhIS) once a patient is deemed suitable for discharge. Following this, the discharge prescriptions will be directed to the inpatient pharmacist at the discharge counter, who will assume responsibility for meticulously reviewing and cross-checking for any potential errors. Should any discrepancies be identified, the inpatient pharmacist will promptly contact the doctor for necessary interventions.

Subsequently, the discharge counter pharmacist will assemble the discharge medication and facilitate its dispensing. Additionally, the utilisation of the patient's own medications (POMs) for discharge involves a process of medication reconciliation [5]. The pharmacist will have already assessed if there are any remaining medications from prior supplies. If such medications are reusable, they should be reutilised to the extent possible. Any excess or discontinued medications from the ward should be returned to the pharmacy for appropriate handling.

The waiting area at the pharmacy discharge counter accommodates only ten chairs, primarily due to the constraints of limited available space. Delays in discharges not only lead to patient dissatisfaction but also hinder new admissions due to ward occupancy [6]. Patients in the wards without ward pharmacists will obtain their medications at the discharge counter. On the other hand, a ward pharmacist is responsible for preparing the discharge medications for bedside dispensing for the patients housed in the wards with dedicated ward pharmacists. The medications will be delivered by the ward pharmacist for direct bedside dispensing. Therefore, bedside dispensing could serve as an alternative and has been a consistent practice across major government hospitals in Malaysia [7].

Besides, ward pharmacists also play a pivotal role in this process, as they possess a comprehensive understanding of the patient's overall health condition and specific disease. This knowledge is crucial

for engaging patients in drug therapy plans, particularly during medication counselling sessions. By interacting with patients, ward pharmacists can provide personalized guidance, enhance medication adherence, and empower patients to take an active role in managing their health.

The objective of this lean initiative is to expedite the discharge process for patients, thereby elevating their overall satisfaction [8]. In this study, we assessed changes in patient waiting time and discharge medication dispensing process efficiency after the application of the lean.

## **2.0 Research Methodology**

This was a cross-sectional study conducted at the pharmacy discharge counter and wards in Miri Hospital, focusing on the patients from the adult medical and adult surgical wards. The study was conducted in two phases: the initial phase involved the intervention process, followed by the second phase dedicated to post-lean data collection. Each phase lasted for a duration of 14 days. Data collection was conducted from June 28, 2021, and July 23, 2021, for all discharge prescriptions received during office hours.

The project commenced by acquainting team members with Lean principles and their application to enhance workflow and address prevailing issues such as extended discharge waiting times, including delays related to medication supply. Both Value Stream Mapping and the Spaghetti Diagram facilitate in identifying the process inefficiencies, with subsequent strategies aimed at waste reduction.

The study started once the patient reached a stage where discharge from the ward was confirmed. This point was marked by the nurse's provision of the discharge plan to the patient, accompanied by an explanation of its details. The duration of time spent during the discharge process was gauged using the standard time indicated in the Pharmacy Information System (PhIS). This waiting time was manually documented by either the discharge counter pharmacists or the ward pharmacists. For every service point evaluated across the entirety of measurements, the cumulative waiting time was recorded. Among the 341 prescriptions received during the study period, 156 were prescriptions from the adult medical and surgical wards.

Data was analysed with SPSS version 23 using the appropriate statistical tests. Numerical variables, such as waiting time were expressed as mean and standard deviation (SD) whereas the categorical variable, such as type of dispensing (discharge counter/ bedside dispensing) was expressed as frequency (n) and percentage (%). The Independent t-test was utilised to compare the pre- and post-lean waiting times.

## **3.0 Result and Discussion**

### **3.1 Value Stream Map (VSM)**

VSM illustrates the movement of materials and information across the entire workflow. The outcomes presented compelling evidence of the effectiveness in reducing lead times, encompassing the combined process time (P/T) and waiting time (W/T) at each service node. Figure 1 illustrates the waiting times prior to the implementation phase.

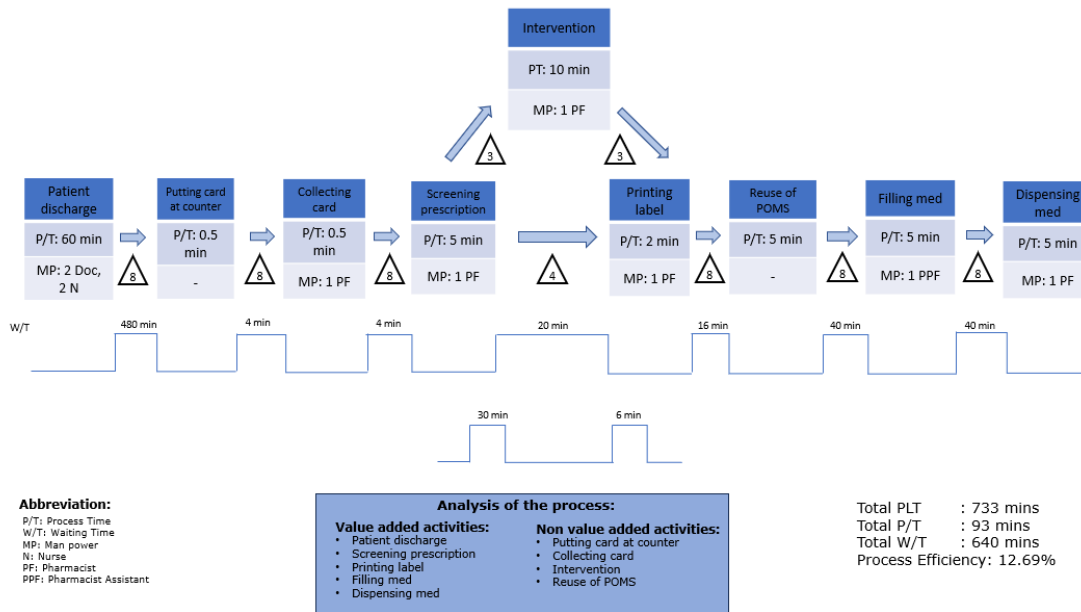


Figure 1. Pre-lean VSM

Figure 2 presents a post-lean VSM. Remarkably, the process has been streamlined, reducing the total number of steps from 9 to 5. The Kaizen burst analysis identified several factors contributing to the issue at hand such as inefficient coordination between the discharge counter and wards, prescriber unavailability, lack of clarity in the discharge summaries, and the promotion of the POMs programme [8].

The outcome of these changes is a significant enhancement in overall efficiency. The total efficiency has surged from the initial 12.7% to 26.3% in the post-lean VSM iteration.

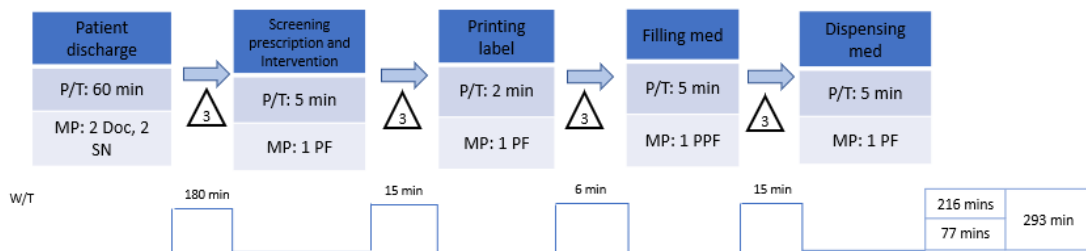


Figure 2. Post-lean VSM

### 3.2 Spaghetti Diagram

The Spaghetti Diagram highlighted inefficient process layouts, undue travel distances between process steps, and overarching process inefficiencies. Figure 3 depicts the patients' movement path at various stages: it starts from their individual ward, leading to the discharge counter for medication collection. After that, they return to the ward to pack their remaining belongings and subsequently proceed to the payment counter for discharge settlement. Occasionally, they may need to go back to the ward due to unresolved queries, especially when the counter staff are unable to locate the prescribers or obtain medications for POMs relabelling. This necessitates patients to traverse back

and forth, resulting in suboptimal movement patterns. The distances covered by patients in completing these processes range from 70 meters to 605 meters, contingent upon the location of the respective ward.

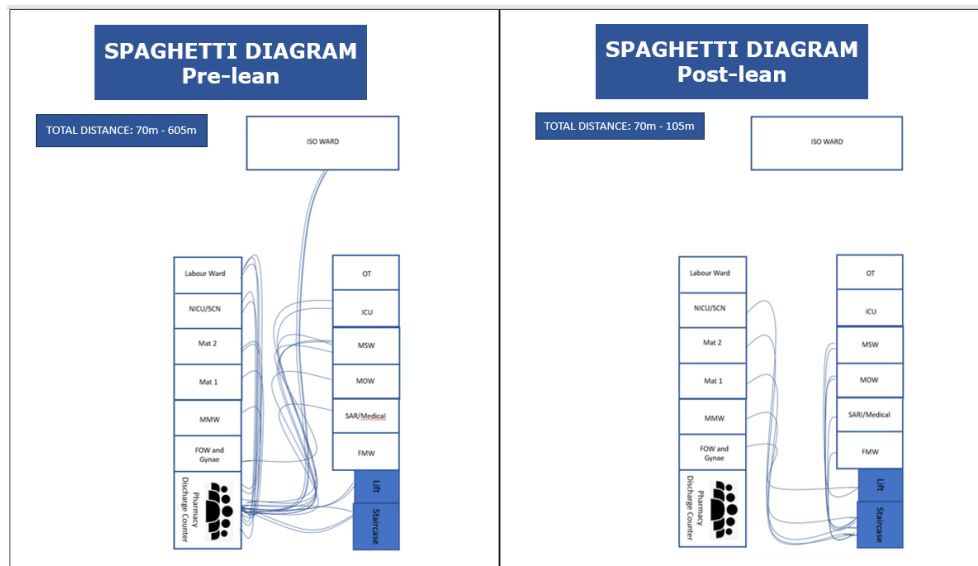


Figure 3. Pre- and Post-lean Spaghetti Diagrams

### 3.3 Root Cause Analysis (Fish Bone Diagram)

Figure 4 illustrates that the prolonged waiting period for discharge medication arises primarily from factors related to the environment, management, tasks, and staff. These challenges involve several aspects, including the constraint on available seats at the discharge counter due to space limitations. All discharge patients who require discharge medications should possess a valid prescription in the PHIS. There are instances where prescribers overlook the discharge medications, prompting pharmacists to initiate communication with the prescribers. Additionally, the lack of clarity in the written discharge summaries occasionally leaves pharmacists uncertain about the reasons for changes in the medication regime. The reusing of POMs or interventions also emerges as a concern. Pharmacists at the discharge counter often encounter difficulties when trying to communicate and resolve these interventions, consequently being unable to process the prescriptions for the subsequent patients, resulting prolonged waiting period.

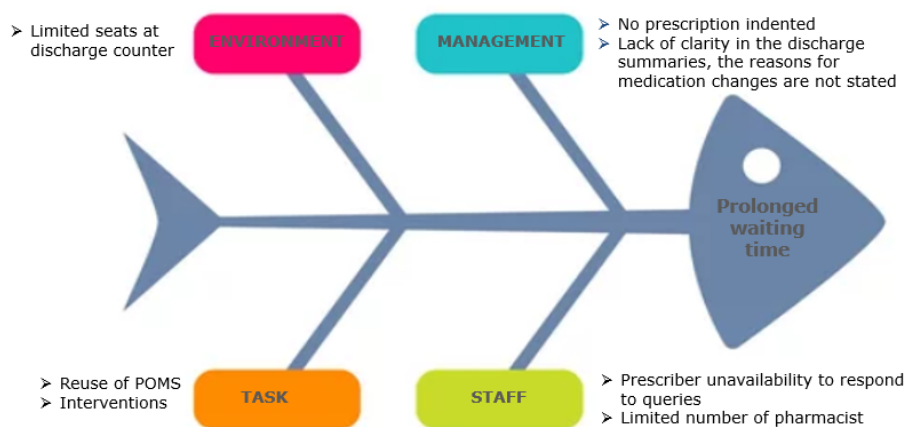


Figure 4. Fishbone Diagram

In the current study, a total of 60 prescriptions were processed at the discharge counter while 96 prescriptions were dispensed at the bedside (Table 1). The patient waiting time to collect medications

at the discharge counter ranged from 3 to 39 minutes, with a mean (SD) of 16.65 minutes (9.40 minutes). In the post-lean phase, where medications were dispensed by the ward pharmacists, the waiting times ranged from 1 to 45 minutes, with a mean (SD) of 6.29 minutes (7.15 minutes).

Comparing the mean waiting times for obtaining discharge medications, the post-lean phase demonstrated a remarkable improvement. The mean waiting time was 10.36 minutes shorter compared to the pre-lean period, representing a substantial decrease of approximately 62.2% in waiting time.

Table 1. Comparison of waiting time and intervention for counter dispensing and bedside dispensing.

Variables		n	Mean (SD)	Mean Difference (95% CI)	t-statistics (df)	P-value <sup>a</sup>
Waiting time (min)	Pre-lean	60	16.65 (9.40)	10.36	7.79 (154)	<0.001
	Post-lean	96	6.29 (7.15)	(7.73, 12.99)		
Intervention time (min)	Pre-lean	18	9.61 (8.71)	4.36	2.11 (56)	0.040
	Post-lean	40	5.25 (6.59)	(0.21, 8.51)		

<sup>a</sup>Independent t-test

Among 60 prescriptions received at the discharge counter, 18 prescriptions required intervention that necessitated confirmation with the prescribers. The time for these interventions ranged from 2 to 37 minutes, with a mean (SD) of 9.61 minutes (8.71 minutes) for discharge prescriptions at the counter.

Upon implementation of the lean initiative, 40 prescriptions required intervention. The time for these interventions spanned from 1 to 30 minutes, with a mean (SD) of 5.25 minutes (6.59 minutes).

Comparing the interventions, the post-lean phase exhibited a notable improvement. The mean waiting time was 4.36 minutes faster compared to the pre-lean period, signifying a significant 45.4% reduction in waiting time for interventions. Independent t-tests indicated statistically significant differences in the waiting time and intervention time between the two groups.

#### 4.0 Discussion

This study demonstrates the role of bedside dispensing to improve patient waiting time and discharge medication dispensing process efficiency. Undeniably, the duration of a patient's stay in a hospital is subject to a multitude of factors, one of which involves the assembly of documents and medications pertinent to their discharge process. When a patient is deemed fit for discharge, doctors need to compile essential materials such as the discharge summary, blood test forms, radiology forms, appointment dates for follow-up, referral letters, and discharge medications. These elements collectively impact the duration of the patient's stay in the hospital [9].

Recognising the significant time patients spend in hospital wards, it becomes evident that corrective measures are essential. Leveraging the services provided by ward pharmacists in medication preparation and bedside dispensing can further expedite the discharge process. Once the patients receive their clinic card and complete the necessary payment procedures, they can promptly pack their belongings and be ready for discharge.

An early discharge from the hospital holds multiple advantages. It particularly benefits patients who have a considerable distance to travel back to their hometown, whether by land or air. Minimising the length of hospitalisation not only contributes to patient satisfaction but also promotes efficient resource utilization and enhances the overall patient experience [8].

Patient waiting times at the counter can be influenced by a variety of factors, some of which include computer downtime that impedes swift retrieval of patient medication profiles and prescription label generation. Furthermore, prescriptions requiring interventions are designed to ensure accurate medication details, including dosage, frequency, and duration. This process can be time-consuming due to the need to contact the appropriate prescriber responsible for the patient. These prescribers might be occupied with tasks like following specialist rounds, blood collection, or wound dressing, which makes direct communication challenging. Additionally, some junior doctors may be inexperienced in making certain decisions independently and may need to consult senior medical officers for guidance. This dynamic can contribute to delays in prescription resolution.

In the current study, we also found that interventions carried out by ward pharmacists tend to exceed those by discharge counter pharmacists in the medication dispensing process. This finding is similar to the study conducted by Oh et al. which reported that ward pharmacists detected significantly more medication errors compared to the dispensing at the discharge counter [10]. This could possibly be due to a more comprehensive understanding of the patient's progress and medical history among the ward pharmacists. Consequently, they can discern the precise indications and requirements for each medication prescribed, enabling them to detect and intervene the potential errors effectively.

However, there were several limitations commonly encountered in healthcare facilities, such as the challenge of insufficient staffing leading to multitasking responsibilities, particularly on weekends. This constraint may restrict the application of the lean healthcare approach exclusively to office hours.

### **Countermeasures and action plan**

To address this challenge and to ensure effective measures are taken, we have implemented several strategies. One such approach involves the introduction of bedside dispensing objectives, encompassing specific and measurable goals for both ward and inpatient pharmacists. These objectives are designed to be precise and quantifiable, serving as benchmarks for both ward and inpatient pharmacists. After establishing these goals, a routine monitoring process is initiated to ensure their steady achievement.

Additionally, we have introduced a leave pooling system aimed at ensuring an optimal presence of skilled personnel. This system operates by organising pharmacists' leave schedules within a shared pool. For example, in the context of a group of 3 pharmacists responsible for covering the adult medical ward, the system indicates that only one pharmacist is allowed to take leave at any given time. This careful allocation of leaves helps maintain sufficient manpower availability and continuity of services.

### **Sustainability**

As part of our commitment to sustainability, we maintain an ongoing monitoring of performance throughout the entire year. This ensures a consistent evaluation and allows for continuous enhancements.

To demonstrate our accomplishments and the advancements made within every three-month span, we generate quarterly reports [11]. These reports serve as a platform to highlight achievements and the progress realized during each specific period.

## **5.0 Conclusion**

In conclusion, the findings emphasise the favourable outcomes resulting from the implementation of the bedside dispensing service. This service is in accordance with lean methodology and has notably shortened the duration for obtaining discharge medication. Moreover, it has illuminated facilitation

in the medication dispensing process efficiency and streamlining of procedures for obtaining medications at the inpatient counter, making the discharge process more seamless. Thus, this initiative marks a successful stride in improving patient experiences and enhancing the overall operational efficiency of healthcare services.

## 6.0 Acknowledgement

I would like to show our appreciation to all pharmacists in Miri Hospital for their assistance in data collection and hard work in the lean implementation.

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