UNDERSTANDING THE CLINICAL PHARMACY GDA TEAM'S EFFICIENCY FOR MEDICATION DELIVERY FROM THE CENTRALISED IN-PATIENT PHARMACY TO PATIENT BED-SIDE IN DIFFERENT IN-PATIENT CLINICAL AREAS, IN A MULTI-SPECIALTY, TERTIARY CARE HOSPITAL

Dissertation Submitted to

IIHMR UNIVERSITY

The IIHMR University, Jaipur

for the partial fulfilment for the award of the degree of

Master of Business Administration (MBA)

in

Hospital and Health Management

by

Dr. Bharat Singh Rathore

Under the Supervision and Guidance of

Dr(Col) Mahender Kumar

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DECLARATION BY STUDENT

I hereby declare that this dissertation titled *UNDERSTANDING THE CLINICAL PHARMACY GDA TEAM'S EFFICIENCY FOR MEDICATION DELIVERY FROM THE CENTRALISED IN-PATIENT PHARMACY TO PATIENT BED-SIDE IN DIFFERENT IN-PATIENT CLINICAL AREAS, IN A MULTI-SPECIALTY, TERTIARY CARE HOSPITAL* is the bonafide record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.

(Signature)

Name of Student: **Dr. Bharat Singh Rathore**

Date:

Global Health
Limited

Date: 02.06.2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Dr. Bharat Singh Rathore** has completed his **Internship** in the department of **Medical Administration & Clinical Operations** from 01.03.2023 to 31.05.2023 with Global Health Ltd. (GHL) Medanta – The Medicity.

We wish him all the best for his future endeavors.

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CERTIFICATE

This is to certify that dissertation titled *UNDERSTANDING THE CLINICAL PHARMACY GDA TEAM'S EFFICIENCY FOR MEDICATION DELIVERY FROM THE CENTRALISED IN-PATIENT PHARMACY TO PATIENT BED-SIDE IN DIFFERENT IN-PATIENT CLINICAL AREAS, IN A MULTI-SPECIALTY, TERTIARY CARE HOSPITAL* is a record of the research work undertaken by *DR. BHARAT SINGH RATHORE* in partial fulfillment of the requirements for the award of the degree of MBA - Hospital and Health Management from the IIHMR University, Jaipur under my guidance and supervision and his/her approach to the research study has been sincere, scientific, and analytical.

Faculty Guide IIHMR University, Jaipur	School Dean IIHMR University, Jaipur
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ABSTRACT

Medication errors, and medication management are two of the most critical aspects of healthcare delivery, as they impact patient safety. This study aimed to investigate an important part of the medication dispensing process which may lead to medication delay and leading delay in administration. While studying the medication delivery process and understanding the porter management of the multi-specialty, tertiary care hospital - Medanta. The research was centered around observing the number of trips made by the clinical pharmacy GDA team and the number of medicine packets delivered.

Data collection took place over a time period of 17 days. During the study capturing of the hourly delivery of medicine packets throughout the hospital was done. Mean, mode, median, and the standard deviation were calculated to analyze distribution of trips and medicine packets. Additionally, the data was examined at the staff level to assess variations in efficiency. A correlation test was also conducted.

The results brought forward intriguing insights into the medication management process, specifically medication dispensing. An hourly number of trips and medicine packet data was analysed, which varied throughout the day, revealing peak and lean time periods. Staff members made varied numbers of trips whereas they were supposed to make 36 trips throughout the day. The average number of trips per hour being 13.53. GDA 8 had the fewest trips (9), while GDA 6, 12, 13, and 16 all had the most number of trips (16). Descriptive statistics revealed that the mean number of medicine packets delivered every hour was 86.06. The lowest number of medicine packages delivered being, 34, was by GDA 14, while the highest number being, 141, was by GDA 4. Overall efficiency rate was found to be 37.58% which is below 50% showing inefficiency in the team's work.

Correlation test provided us with a "moderately positive relationship" between the number of trips and the number of medicine packets delivered. And a cause and effect analysis helped us in identifying potential reasons for the inefficiency that was observed.

For the hospital management and operations team it is an important finding. The study has exhibited the inefficiency in the current process. This leads to a discussion of the potential factors behind the inefficiencies and their implication on patient care. Further, resource allocation, staff training, and process optimization are key areas of focus.

Lastly while concluding, this research study helps shed light on a key area of the medication management process. Also, it demonstrated the significance of efficient porter management. The findings highlight the necessity of proper resource allocation. Hospitals can optimise the medicine dispensing process, increase efficiency, ultimately deliver medicines in shorter time spans, and better patient care by addressing these issues.

Keywords: medication management, porter management, GDA, medicine delivery

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ABBREVIATIONS

Abbreviations	**Full Form**
IP	In-Patient
OP	Out-Patient
IPD	In Patient Department
OPD	Out-Patient Department
GDA	General Duty Assistant
COVID	Coronavirus Disease
AIDS	Acquired Immune Deficiency Syndrome
HCC	Heart Command Center
ICU	Intensive Care Unit
HDU	High Dependency Unit
OT	Operation Theater
ADS	Automated Dispensing System
AIDC	Automatic Identification and Data Capture
RFID	Radio Frequency Identification
LASA	Look Alike/ Sound Alike
CPOE	Computerized Physician Order Entry System

CHAPTER 1: INTRODUCTION

The Indian population will surpass that of China by mid-year, 2023 according to

UNFPA (1). With the world's highest population comes a greater responsibility of catering towards their healthcare needs. The burden of diseases continues to grow day by day, encompassing a wide range of conditions such as COVID-19, Malaria, Tuberculosis, AIDS, and many others (2). This leads us as a country in a new era with new possibilities and even newer challenges. "Increased morbidity and mortality rates" (3) due to the sudden surge of diseases has led us to reevaluate our current system protocols.

During the recent pandemic of COVID-19 we saw an increase in hospitalisation rates, unavailability of ICU beds and critical care beds (4,5), shortage of oxygen supply (6), lack of life saving medications to treat the illness (7), and unclear treatment pathway for the unknown illness (8,9). These were some of the highlighted issues by the news media during the pandemic. Learning from the recent tumultuous times it is important to focus on the shortcomings.

Unravelling the deeper fascia about the lack of medication and unclear medical pathway, one can discover the significance of medication management. Medication management plays a pivotal role in ensuring safe and effective healthcare delivery. It involves the comprehensive process of prescribing, dispensing, administering, and monitoring medications to optimize patient outcomes (10). Appropriate medication management is a very crucial part in preventing medication errors, while improving patient adherence to treatment regimens, and this leads to minimization of adverse drug reactions. Nevertheless, it is a critical aspect of the healthcare ecosystem as it is not without its own set of challenges and difficulties.

Medication management is of paramount importance due to several key reasons. Firstly, it ensures precise administration of appropriate medications at correct dosages, thereby facilitating optimal therapeutic outcomes. Effective medication management effectively controls disease progression, mitigates symptoms, and enhances overall patient well-being (11). Secondly, it significantly contributes to patient safety by minimizing the occurrence of medication errors, adverse drug interactions, and preventable complications. This involves meticulous prescribing practices, accurate dispensing procedures, and adherence to proper administration techniques, all aimed at reducing the probability of harm (12).

Despite its importance, medication management is not without challenges. Several problems can arise, compromising patient safety and treatment outcomes. One significant issue is medication errors, which encompass prescribing mistakes, dispensing inaccuracies, administration errors, or documentation failures (13).

Prescription errors can occur when a medical professional prescribes an inaccurate medication, dosage, or frequency (14). Dispensing errors occur when a pharmacy dispenses the wrong medication, dose, or strength (14). Administration errors occur when a medical professional administers the inaccurate medication, dosage, or route (14). These errors can lead to patient harm, adverse reactions, or ineffective treatment.

The medication dispensing process involves the systematic and controlled distribution of prescribed medications to patients. It is a crucial step in the medication management cycle and typically follows the medication ordering and preparation stages. The process can vary depending on the healthcare setting, but it usually involves the following steps:

Prescription verification, the clinical pharmacist or healthcare professional verifies the prescription details, ensuring its accuracy and appropriateness for the patient's condition. They may cross-check the prescription against patient records, medication history, and any relevant guidelines or protocols (14).

Medication selection and retrieval is done once the prescription is verified, the pharmacist or pharmacy technician selects the specific medication, dosage form, and strength as prescribed. They retrieve the medication from the pharmacy inventory or dispensing system, ensuring its integrity and expiration date (14).

Labeling and packaging done for the selected medication. With labels containing essential information, including the patient's name, medication name, dosage instructions, warnings, and any other relevant details. This labeling ensures proper identification and safe use of the medication (14). Post dispensing of medication patient counseling is an important step (14). With all this a safe and secure record keeping of the documents is also required.

It is crucial to understand the process from medication order until the delivery of medication to the patient's bedside. As this affects the drug administration time, while also increasing the chances of medication errors as the staff has to work on a time crunch (15).

A observational study will aid in understanding a singular aspect of the bigger problem. The outcome of this study will help in developing an understanding how if we optimise a single aspect of the process can speed up the entire process, while saving us time, money and efforts.

AIM

The aim is to examine the current medication delivery process, real time practices related to medication management and porter management to identify areas for improvement.

OBJECTIVES

The objective is to evaluate the efficiency of the clinical pharmacy GDA team's medication delivery process from the centralised IP pharmacy to various patient care areas in a multi-specialty, tertiary care hospital.

This observational study will aim to identify inefficiencies in the medication delivery process. Additionally providing the recommendations for improving the process to optimize medication delivery time and improving the medication management.

HYPOTHESIS

Null Hypothesis (H0): There will be no significant difference in the number of trips made by the GDA team throughout their 12-hour shifts from 08 AM - 08 PM as compared to the expected number of 36 trips which they are supposed to make.

Alternative Hypothesis (HA): There will be a significant difference in the number of trips made by the GDA team throughout their 12-hour shifts from 08 AM - 08 PM when compared to the expected number of 36 trips which they are supposed to make.

CHAPTER 2: REVIEW OF LITERATURE

Table 2.1: Literature review

S. no	Investigators and year	Study location	Sample size	Sampling technique	Salient features	Findings of the study
1.	"Sharad Chand , Shivakumar Hiremath , C.S. Shastry , Juno J. Joel , C.H. Krishna Bhat, Manoj S. Dikkatwar" (2022)	India	1852	Prospective observational study	The study was conducted over 15 months. Patients which got prescription medicine from hospital pharmacy,who spoke with patient at the counselling desk got selected at random Prescription audit was conducted and an audit of the drugs dispensed was also done. The prescription was compared to the pharmaceuticals at the time of dispensing to ensure that the dosage strength, form, frequency, mode of administration, and length of treatment were all specified. Dispensing errors recorded and analysed.	Drugs dispensed on the 1852 prescriptions were 5353. On an average 3 drugs were ordered on each prescription. Highest drugs on a prescription was 12 and the least was 1. Dispensing errors reported were 26 which were part of 21 prescriptions which accounted for 1.40% Incorrect drug and dosage was the most frequent type of error in DEs, and then wrong labelling and incorrect quantity (16).
2.	Geetha Kandasamy, Palanisamy Sivanandy, Dalia Almaghaslah, Mona Almanasef, et al (2021)	India	500	Prospective cross-sectional study	Prescription audit as well as an audit of pharmacy records was conducted to find prescription errors and dispensing errors by the researchers for the patients seeking treatment at a tertiary care hospital.	Out of the 500 prescriptions audited 65.60% contained either of the errors. Handwritten prescriptions made 96.04% and 3.96% were typed. Amongst the 328 prescriptions 32.62% contained PEs and 37.80% contained DEs and 29.58% contained both the types of errors. Polypharmacy made 74.09% of 328 prescriptions (17).
3.	Sarah Batson, Ana Herranz, Nicolas Rohrbach, Michela Canobbio, Stephen	UK	4320	Systematic review	Papers in english-language were examined for any automated dispensing systems (ADSs) that were part of the inpatient area, including central pharmacies and ward-based systems, were carried out in	45 of 175 full publications containing inclusion criteria in the title and/ or abstract were screened out of 4320 total publications. 48 publications on ADSs were thus qualified for inclusion. Although a large corpus of data was discovered to include the current S-R, designs and techniques for

	A Mitchell, Pascal Bonnabry (2021)				“MEDLINE, Embase, and the Cochrane Library”.	reporting outcomes of the eligible research differed greatly. According to research, financial and clinical results, ward- and centralised pharmacy based ADSs are superior to conventional manual dispensing approaches. Advantages included less medication errors, shorter times to administer medications, and lower ADS system costs. Studies evaluating these systems' looked at the optimisation, inventory management tactics, and refilling program indicate that the ADS must be implemented as effectively as possible (18).
4.	Susan G. Poole, Elaine Kwong, Bianca Mulqueeny, et. al. (2021)	Austr alia	-	Systemat i-c review, and Meta-analysis	Frequency of allotment mistakes in hospital pharmacies were searched on “Medline, Embase, CENTRAL,and CINAHL”. The “Scottish Intercollegiate Guidelines Network Checklist-3” was used for qualitative analysis. Random effect model was utilised in performing meta-analysis. The risk ratios and 95% confidence intervals of the results were displayed.	There were 11 studies that were included. Parameters included implementing dispensing technology, having certified professionals verify prescriptions, and dealing with look alike medications. Five studies found prevented or nearly-prevented dispensing errors during final verification; five studies found unavoidable dispensing errors; and one study compared the two. In the control group, 0.080% was discovereed, compared to “0.043 %” between in the “intervention” group. The pooled “rate” of dispensing errors decreased statistically significantly “rate difference 0.037%, 95% CI 0.033-0.042%”. According to the meta- analysis's findings, the risk of preventable dispensing mistakes decreased by 34% and the risk of unavoidable dispense errors by 68% “RR 0.66, 95% CI 0.46-0.93” (19).
5.	“Osama Mohamed Ibrahim, Rana M Ibrahim,	UAE	350	Random sampling	A mixed-method strategy was used to perform the study over a six-month period in 350 randomly selected community pharmacies	6.7% of prescripptions were dispensed incorectly “n=30912/ 464222”, of which 2.60% “n=12274/464222” were connected to prescriptions,

	Ahmad Z. Al Meslamani, Nadia Al Mazrouei" (2021)				employing prospective concealed observation of dispensing errors and pharmacist interviews to identify the reasons for these errors. The severity of errors was assessed by a multi- disciplinary team that included an ENT doctor, a general physician, and a CP. Data analysis was performed using SPSS (ver. 26).	and "4.1% n=18638/464222" were errors related to pharmacist advice. Incorrect quantity(30.00%), errors due to inaccurate counselling by CP lead to incorrect drug being dispensed and that was (32.1%). Replacement of a medication with near expiry (24,7%) and LASA medications (22,3%) were the main contributors to errors. 8.7% of the errors were significant, whereas the remainder were moderate (46.8%) and minor (44.5%) (20).
6.	Alison Craswella, Kate Bennett, et al (2020)	Australia	186	Cross sectional - observational study	A total of 186 participants—174 registered nurses and pharmacy twelve assistants—were in the study. These participants, who were actively involved in using the automatic medicine dispensing cabinet as part of their regular duties, were chosen from the general ward and specialist departments of the hospital. The methods employed in this study consisted of two main approaches. Firstly, a comprehensive survey was conducted across the entire hospital to gather insights and feedback from the users of the automated medication cabinets. Additionally, an observation study was conducted in specific clinical areas to closely examine the nursing workflow in relation to the utilization of these cabinets. A thorough insight of usage patterns, trends and the effects of the automated medication cabinets on nursing practises was provided	The findings revealed that a majority of the staff expressed satisfaction with the automated medication dispensing cabinet system and recognized its positive impact on safety and security. The staff did express certain worries about access delays, greater walking distances, and interference from other staff members. The employees believed that using the automated cabinets caused drug administration protocol to take longer as a result of queuing, which had an impact on workflow. On the other hand, the system was found to advance the drug administration processes related to controlled/narcotic drugs. Operational challenges were observed in terms of restocking requirements, with pharmacy assistants having to wait for suitable opportunities to complete these tasks amidst competing clinical demands. Furthermore, it was noted that nurses from general wards expressed higher levels of satisfaction with the system compared to those from specialty areas. These findings provide valuable insights into the experiences

					by these combined methodologies.	and perceptions of the staff regarding the implementation and usage of the automated medication dispensing cabinets (21).
7.	Hanne Katriina Ahtiainen, Miia Marjukka Kallio, Marja Airaksinen, Anna-Riia Holmström (2019)	Finland	30	Systematic review	Tech was utilised in the “medicine distribution and administration process in acute care hospitals” that were concerned. Results pertaining to medication safety, timing, and cost were noted and examined.	The review had categorised studies into centralised, decentralised or hybrid. It was revealed that both the centralised and decentralised systems aided in medication delivery in the hospital. But it wasn’t to say that one was better than the other. The different systems did help in decreasing medication errors and increasing patient safety and quality of care (22).
8.	“Yilin Sng, Chin Kheng Ong, Yi Feng Lai” (2019)	Singapore	13	Systematic review	A planned search concentrated “on the context of function, implementation, and automation was utilised” to find research publications that had been published within the previous 10 years. The data points were filtered by “title, abstract, and full text using pre-established inclusion/exclusion criteria”. This activity was carried out independently by two researchers. Another researcher was included to help resolve the bias of opinions. “Data extraction and quality assessment were done using a standard form” (23).	Data extraction process utilised thirteen references, from America and Europe. 37% less drug-related reportable incidents, there were improvements in the medication safety it was most frequently observed. The number of full-time equivalents of labour required was found to decrease by 0.3 to 1.4, although productivity increased by roughly 4 items per person/hour. Although staff workload was unchanged and no time was saved, patient wait times and prescription filling times also fell, from an average of 19 to 49 seconds to 17 to 20 seconds. The perceived level of the work stress was lower, but job satisfaction remained the same. Significant cost savings and” an increase in over-the-counter sales were also seen after automation” (23).
9.	“Raymonde Charles Y. Uy, Fabricio P. Kury, Paul A. Fontelo” (2015)	USA	-	Census survey	HIMSS Analytics® Database was searched for non-federal hospital with more than 100 beds with aspects related to pharmacy automation, and AIDC technology. Survey participants	Overall, it was discovered that from 2008 to 2012, the yearly growth rate for both bar code (7%) and RFID (0.4%) technology was highest in the drug administration industry. This can be the result of healthcare legislation like the

					indicated whether they were currently using each data element, and some elements also included information on future adoption plans.	HITECH Act from 2009, which encouraged investments in health IT and established timelines to achieve particular meaningful use criteria. In 2012, barcode usage was high in laboratory (84.2%) and pharmacy (73.9%) departments, which may be attributed to FDA requirements and the quantity of inventory tracking inherent in these departments. It also detected low acceptance rates for breast milk administration and transfusion verification, which may be attributable to lower error rates compared to general drug delivery, as well as a lack of consensus and economic resources. RFID technology adoption is also generally poor, which is consistent with prior studies that identified price and negative perceptions as primary impediments to use. Biometrics also had less acceptance due to cost implications (24).
10.	Nilay D. Solanki, Chaital Shah (2013)	India	300	Cross sectional and observational study	IPD patients admitted in ICU were considered, as well as general ward/ semi general ward and who were willing to participate were included. Disease or diagnosis was not part of the inclusion criteria. Prescription audit was conducted randomly. Scrutiny of incidences of age, sex and different types of medication errors were recorded.	117 prescriptions were recorded out of 300 containing MEs making it 39% Demographic distribution was 62% male and 38% females. Transcription errors made 28%, PEs were 62%, DEs were 11%, and AEs were 16%. The age group of patients between 40-60 years had the highest percentage of medication errors with 51%. RCAof the incidents revealed that illegible handwriting was the major reason of the MEs. Dosage form was not provided, the incorrect brand name was given, the incorrect drug was transcribed, the incorrect dosage was administered, via the incorrect route, the wrong drug was administered, and the

						incorrect dosage was dispensed due to an urgent dispensing process was not completed within 10 to 15 minutes (25).
11.	Marconi, Greg P; Claudius, Ilene (2012)	USA	-	Retrospective review	Retrospective evaluation of medication omissions, delays in a large children's hospital with tertiary-care services was conducted for this study. The analysis spans three distinct time periods: the month preceding the “inclusion of a clinical pharmacist (April 2007), the month immediately after the inclusion of a clinical pharmacist (April 2009), and the six months following the inclusion of a clinical pharmacist (October 2009)”. The study focuses on classifying prescription omissions and delays according to urgency, distinguishing between urgent and non-urgent drugs. A subgroup analysis was also performed to “determine the frequency of medication omissions and delays among patients admitted to the hospital and detained in the emergency department (ED) for 8 hours” or more(26).	When clinical chemists were added, there was an immediate reduction of drug omissions and the delay for both urgent(P=0.007) and nonurgent (P=0.0001). Even after six months, this drop remained persistent, with a tendency towards significance for urgent medications (P=0.06) and statistical significance for nonurgent medications (P 0.0001). Prior to the inclusion of a clinical pharmacists, 52.8% of patients who were detained in the emergency department (ED) for 8 hours or more encountered drug omissions or delays. However, this rate dropped dramatically to 28.6% immediately after the inclusion of a clinical chemist and marginally climbed to 36.2% six months later”(26)
12.	“A.M. Álvarez Díaz, E. Delgado Silveira, C. Pérez Menéndez-Cond”e, et al (2010)	Spain	54,169	Prospective observational study	Dispensing process was studied in five different stages: “unitary dose dispensing systems (UDDS) without computerised prescription order entry (CPOE), CPOE-UDDS, automated dispensing systems (ADS) without CPOE and	Out of “54,169 instances 2181 errors were recorded. Error-rate: Stock, 10.7%; no-CPOE-UDDS, 3.7%, CPOE-UDDS, 2.2%, no-CPOE-ADS, 20.7%; CPOE-ADS, 2.9%. Most frequently, errors were made during the following stages: stock, order preparation;

					CPOE-ADS”.	no-CPOE-UDDS and CPOE-UDDS; filling of the unit dose cart; and no-CPOE-ADS and CPOE-ADS The most common errors are: stock, no-CPOE-ADS, omission, and CPOE-ADS; CPOE-UDDS, different dosage, and no-CPOE-UDDS, extra medication. Stock, CPOE-ADS and no-CPOE-ADS, stock out/supply issues; CPOE-UDDS, inexperienced staff and inadequate professional communication system; no-CPOE-UDDS”, inadequate professional communication system (26).
13.	“Woan Shin Tan , Siang Li Chua, Keng Woh Yong, Tuck Seng Wu” (2009)	Sing apore	-	-	To evaluate “operational performance and service standards in an outpatient pharmacy, a discrete event simulation model and a prototype automated dispensing system” were built(27).	According to the study's findings, even after “automating the prescription filing process using a technological prototype that mechanically picks and packs each item in the inventory within 20 seconds”, the drugstore was unable to fulfil the 30-minute waiting time objective. To meet the waiting time target, regardless of the extent of automation, two extra chemists are necessary to work around process bottlenecks at point of medicine delivery. But, if automatic dispensing is to be implemented, the system must be twice fast as it was previously in order to “lower the 95th percentile patient waiting time to less than 30 minutes” (27).
14.	Jennifer L. Cina, Tejal K. Gandhi, William Churchil l, et al (2006)	USA	140, 755	Direct observati on	The medication dispensing process was directly observed by the researchers to record any errors, if observed.	Pharmacy staff had filled a total of 140,755 prescription drugs over a course of seven months, out of which 3.6% (5,075) contained dispensing errors. Only 79% of times dispensing errors were detected by the pharmacist, leading to 0.75% prescriptions with errors. Potential “adverse drug events (ADEs) made for 23.5% of all unreported errors, of which 28% were

						serious and 0.8% were life-threatening. Inappropriate drugs (36%), inappropriate strengths (35%), and incorrect dosage forms (21%) were the most frequent probable" ADEs (28).

CHAPTER 3: METHODOLOGY

KEY RESEARCH QUESTIONS:

1. Are there any variations in the number of trips made to the different patient care areas by the GDAs?
2. Do the trips made by the GDA staff to travel from the in-patient pharmacy to patient care areas vary by time of day?
3. Does the quantity of medicine being delivered impact the number of trips made to the different patient care areas?
4. Are there any recommendations that could be made for improving the inefficiency of the medication delivery process?

RESEARCH DESIGN:

Study design for this research study would be of an observational kind, as the aim is to observe and record the number of trips and medicine packets taken by GDA staff to travel from the centralised IP pharmacy to different patient care areas of the multi-speciality hospital. Direct observation of the GDA staff would be done for 17 days as there are 17 staff members and we require data on each staff and their working patterns.

STUDY SETTING:

The setting of the study would be Medanta - The Medicity, Gurgaon. Specifically the setting inside the hospital would be the centralised IP pharmacy which is located on the lower ground floor.

STUDY POPULATION:

The study population for this study would be the GDA staff members who are part of the clinical pharmacy GDA team. They travel from a centralised in-patient pharmacy to various patient care areas within a hospital with various quantities of medication packets. The study population includes the 17 GDA male staff members who perform these duties, regardless of their level of experience, age, education qualification. The list of areas are as follows:

Table 3.1: Tabular representation of the 17 GDA staff members and the different patient care areas catered by them.

GDA	Patient care area
GDA 1	5th floor B wing
GDA 2	6th floor A & B wing
GDA 3	7th floor A & B wing
GDA 4	8th floor A & B wing
GDA 5	9th floor A & B wing
GDA 6	10th floor B wing
GDA 7	11th floor A & B wing
GDA 8	12th floor A & B wing
GDA 9	14th floor A & B wing
GDA 10	15th floor A & B wing
GDA 11	HCC
GDA 12	ICU 1 & 2
GDA 13	ICU 3 & 4
GDA 14	ICU 5 & 6
GDA 15	ICU 7 & 8
GDA 16	ICU 9 & 10
GDA 17	ICU 11

INCLUSION:

1. The clinical pharmacy GDA team which has 17 members, as mentioned above.
2. Areas included are the 11 ICUs, HCC and various specialty IPD areas.
3. Specialities included under this study are as follows:
    3.1. Institute of musculoskeletal disorders and orthopedics
    3.2. Cancer institute
    3.3. Breast cancer
    3.4. Head and neck oncology

3.5. Medical and haemato-oncology
3.6. Radiation oncology
3.7. Institute of critical care and anesthesiology
3.8. Institute of digestive and hepato-biliary sciences
3.9. Gastroenterology
3.10. GI surgery, GI oncology and Bariatric surgery
3.11. “Institute of chest surgery – ChestOnco surgery and lung transplantation”
3.12. Heart hospital
3.13. Institute of obstetrics and gynaecology
3.14. Clinical and preventive cardiology
3.15. Cardiac surgery
3.16. Electrophysiology and pacing
3.17. Interventional cardiology
3.18. Kidney and urology institute
3.19. Nephrology
3.20. Urology and andrology
3.21. Institute of liver transplantation and regenerative medicine
3.22. Institute of neurosciences
3.23. Clinical immunology and rheumatology
3.24. Dermatology
3.25. Trauma care
3.26. Endocrinology and diabetology
3.27. Gynae - oncology
3.28. Internal medicine
3.29. ENT, head and neck surgery
3.30. Ophthalmology
3.31. Paediatrics
3.32. Peripheral, vascular and endovascular sciences
3.33. Plastic, aesthetic, and reconstructive surgery
3.34. Respiratory medicine and sleep medicine

EXCLUSION:

1. Any other GDA staff who is not part of the clinical pharmacy GDA team
2. Patient care areas not serviced by the clinical pharmacy GDA team:
    2.1. Emergency
    2.2. OT
    2.3. Daycare
    2.4. Chemo-daycare
    2.5. Ayurveda
    2.6. Dental sciences
    2.7. Interventional radiology

RESEARCH APPROACH:

The clinical pharmacy GDA team members will be identified and the respective patient care areas they cater to would be recorded. For privacy reasons the names of the GDA staff will not be revealed. Required permissions and approvals are taken from the higher management and stakeholders of the process. Thereafter for seventeen days the seventeen clinical pharmacy GDA team members will be tracked. Starting from 13th March, 2023 until 31st March, 2023. This will be done by tracking a single clinical pharmacy GDA staff for their entire shift.

We will begin at 08:00 AM when the shift of the team begins and track them until 08:00 PM when their shift ends. In this 12 hour time period we will record the exact time when the GDA leaves from the centralised IP pharmacy to the patient care area which is designated to them in Microsoft excel. This process will be repeated until the end of their shift. The entire process will be repeated for all the GDAs one after the other.

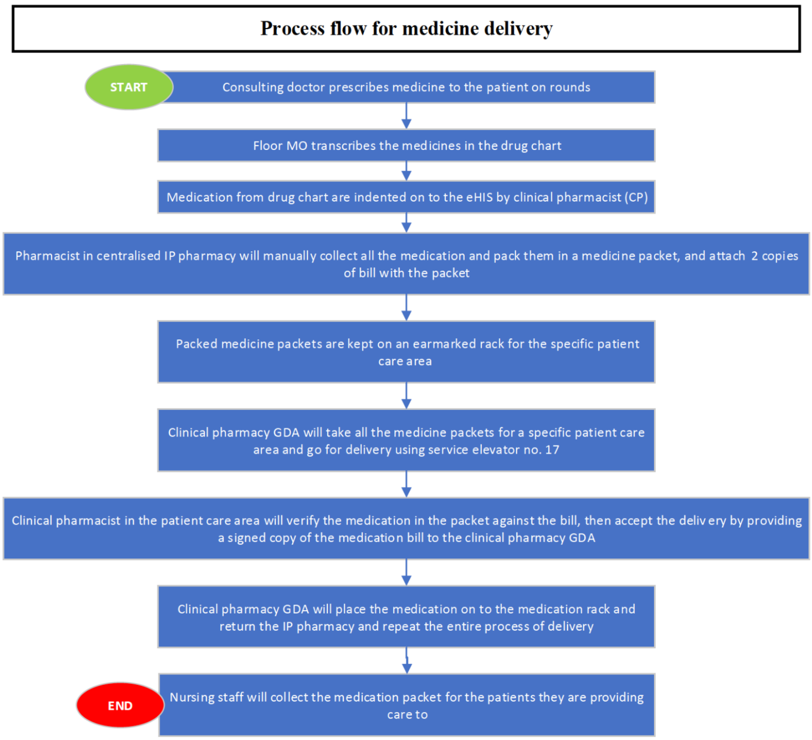


Figure 3.1: Illustrates the sequential steps involved in the medication ordering and delivery process within a multispeciality hospital.

SAMPLE SIZE CALCULATION

In a study like this, sample size calculation is an important step in ensuring that the study has sufficient statistical power to detect meaningful differences in staff movements between the centralized in-patient pharmacy and various patient care areas.

If we assume that each GDA staff member is supposed to make 36 trips throughout a 12-hour shift, we can use this information to estimate the expected variation in staff movements and calculate the necessary sample size to detect differences in the number of trips taken.

Assuming that we want to detect a 25% reduction in the average number of trips taken by GDA staff (from 36 to 27 trips), “we can calculate the necessary sample size”:

$$“n = (Z\alpha/2 + Z\beta)2 * (2\sigma2) / (\mu1 - \mu2)2”$$

here "n is the sample size, $Z\alpha/2$ is the critical value for the desired level of significance (e.g., 1.96 for a 95% confidence level), $Z\beta$ is the critical value for the desired power level (e.g., 0.84 for 80% power), σ is the standard deviation, and $\mu1 - \mu2$" is the difference in means that we want to detect.

Assuming that the standard deviation is 5 trips, we can calculate the necessary sample size as follows:

$$n = (1.96 + 0.84)2 * (2 \times 52) / (36 - 27)2 = 7.16$$

Based on this calculation, we would need to recruit at least **8 GDA** staff members to participate in the study to have a reasonable chance of detecting a significant difference in the number of trips taken with a desired level of precision.

SAMPLING TECHNIQUE

Census sampling or complete enumeration, is a type of sampling technique that involves studying the entire population group instead of just a sample pool (28).

All the clinical pharmacy GDA team members who are part of the delivery process will be included as we are using census sampling technique. Doing so will most accurately measure the number of trips made by the entire GDA team to deliver the number of medicine packets. Moreover providing a more comprehensive understanding of staff movements throughout the facility.

Using a census approach has several advantages, including increased accuracy. By including all members of the population in the study, we can ensure that our results are accurate and representative of the entire population. Reduced sampling error is another benefit of the study. Since the entire population is being studied, there is no sampling error that can arise from selecting a sample that may not be representative of the population. Also it will provide a comprehensive understanding. By studying the entire population, we can obtain a comprehensive understanding of staff movements and identify any patterns or variations in movement across different types of staff or shifts (29).

STUDY INSTRUMENTS

A watch to record exact time for dispatch

A laptop to record time and medicine packets in excel sheet and process the data

OPERATIONAL DEFINITIONS

1. Productivity: Evaluating the overall productivity of the staff movements, including the number of trips completed per hour, the amount of medication delivered per hour, and the efficiency of the overall process.
2. Trip: A single instance of travel made by a GDA staff member from the in-patient pharmacy to a patient care area.
3. Clinical pharmacy GDA team: For the purposes of this study, the clinical pharmacy GDA team refers to the group of General Duty Assistants responsible for delivering medications from the IP pharmacy to various patient care areas.
4. Multi-specialty hospital: The multi-specialty hospital refers to the healthcare facility where the study is being conducted, which provides medical care across multiple specialties as mentioned in inclusion criteria.
5. Barrier or challenge: Any obstacle encountered by a GDA staff member during the movement process, such as crowded hallways or equipment malfunctions.

STATISTICAL METHODS

Descriptive statistics will be used to describe “mean, median, and standard deviation” of number of trips made, and distribution of data across different time periods.

Efficiency percentage will also be calculated using the actual number of trips made vs the number of trips the staff is supposed to make.

Pearson’s correlation test would be conducted to identify the type of correlation amongst the number of trips made and number of medication packets delivered.

CHAPTER 4: RESULTS AND DISCUSSION

RESULTS

Table 4.1: Tabular representation of number of trips made to deliver number of medicine packets by GDA 1 to the 5th floor B wing from 08AM-08PM

GDA 1 - 5th B		
Time	**Number of trips**	**Number of medicine packets**
8 AM	00	00
9 AM	01	01
10 AM	01	05
11 AM	01	07
12 PM	02	08
1 PM	00	00
2 PM	02	15
3 PM	01	01
4 PM	02	07
5 PM	01	01
6 PM	00	00
7 PM	02	02
Grand Total	**13**	**47**

Graph 4.1: Graphical representation of number of trips made to deliver number of medicine packets by the clinical pharmacy GDA number 1 from IP pharmacy to 5th floor B wing from 08AM-08PM

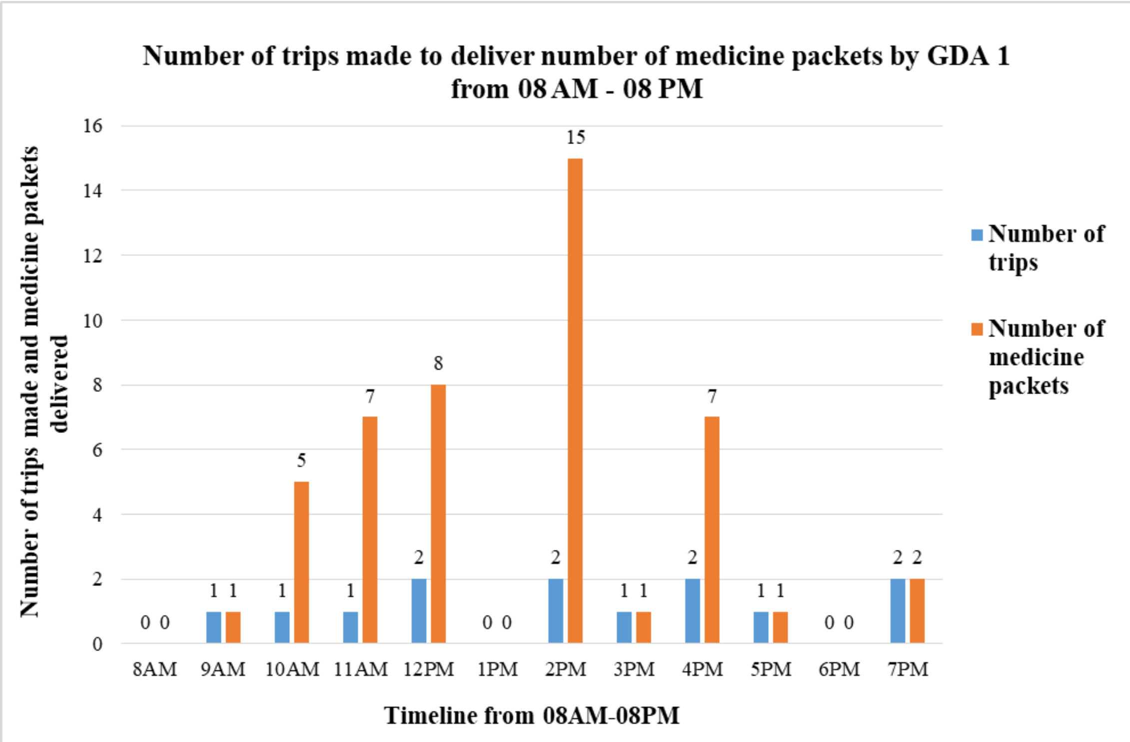


Table 4.2: Tabular representation of number of trips made to deliver number of medicine packets by GDA 2 to the 6th floor from 08AM-08PM

GDA 2 - 6th FLOOR		
Time	**Number of trips**	**Number of Medicine Packets**
8 AM	00	00
9 AM	00	00
10 AM	02	14
11 AM	01	12
12 PM	03	31
1 PM	01	16
2 PM	01	01
3 PM	01	06
4 PM	02	09
5 PM	01	04
6 PM	01	06
7 PM	01	17
Grand Total	**14**	**116**

Graph 4.2: Graphical representation of number of trips made to deliver number of medicine packets by the clinical pharmacy GDA number 2 from IP pharmacy to 6th floor from 08AM-08PM

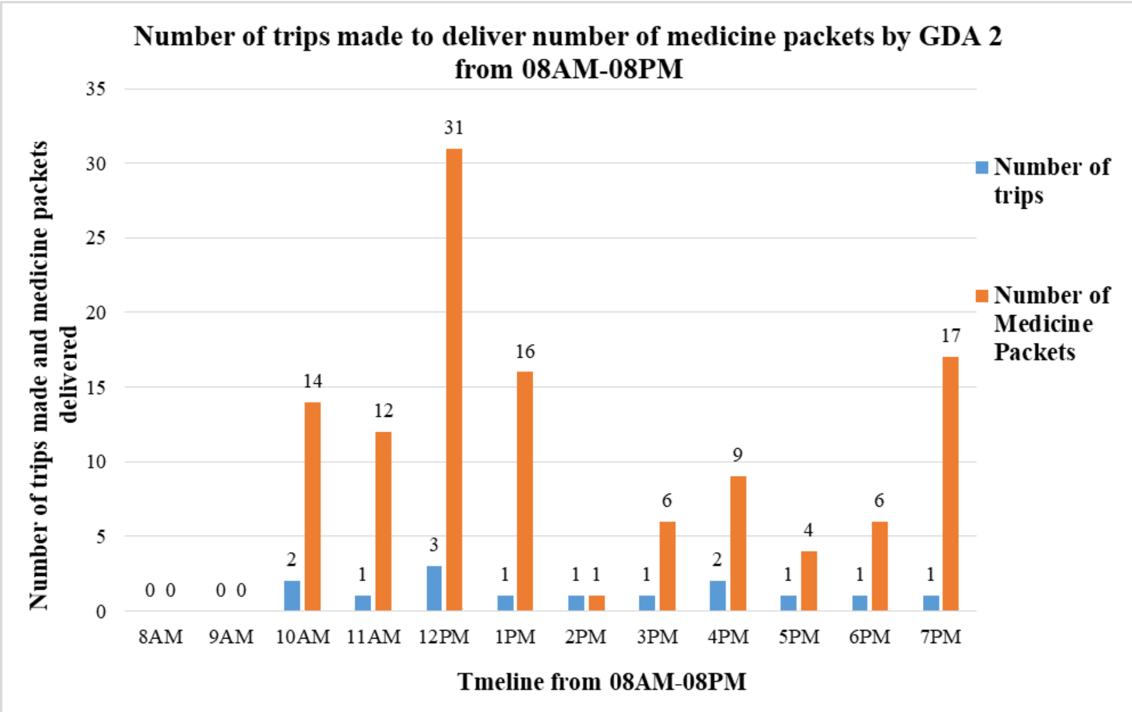


Table 4.3: Tabular representation of number of trips made to deliver number of medicine packets by GDA 3 to the 7th floor from 08AM-08PM

GDA 3 - 7th FLOOR		
Time	**Number of trips**	**Number of Medicine Packets**
8 AM	00	00
9 AM	01	14
10 AM	01	02
11 AM	01	02
12 PM	01	14
1 PM	00	00
2 PM	02	17
3 PM	01	19
4 PM	01	03
5 PM	01	11
6 PM	01	09
7 PM	02	13
Grand Total	**12**	**104**

Graph 4.3: Graphical representation of number of trips made to deliver number of medicine packets by the clinical pharmacy GDA number 3 from IP pharmacy to 7th floor from 08AM-08PM

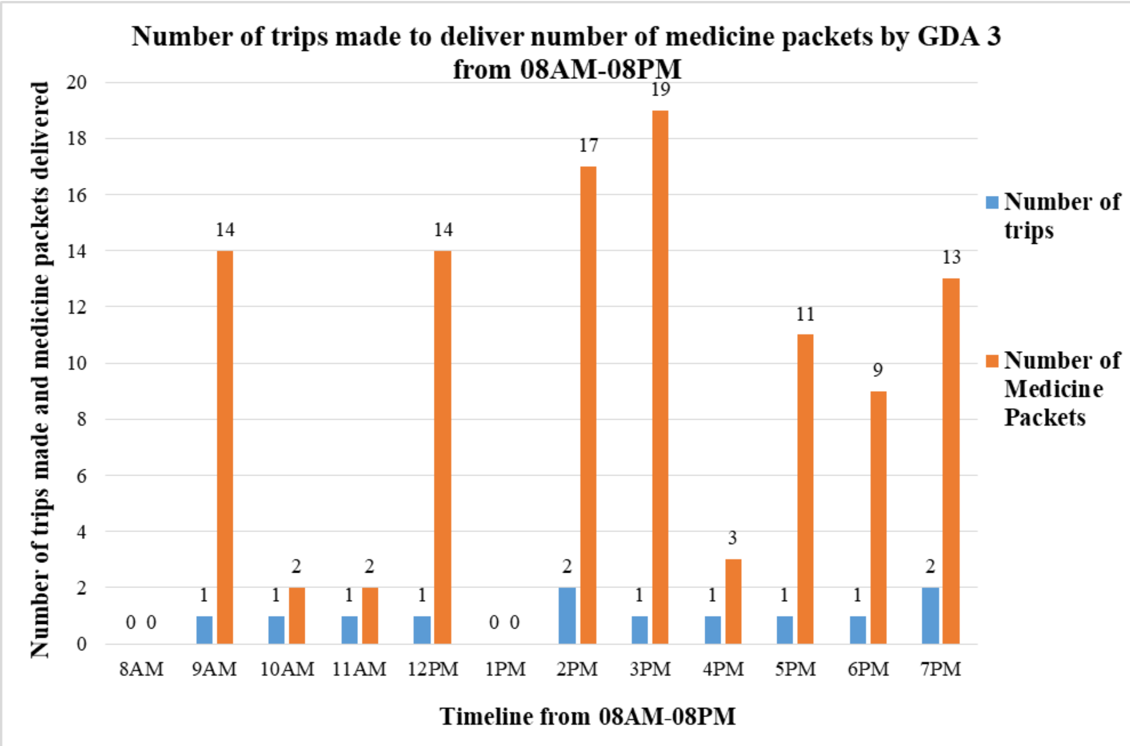


Table 4.4: Tabular representation of number of trips made to deliver number of medicine packets by GDA 4 to the 8th floor from 08AM-08PM

GDA 4 - 8th FLOOR		
Time	**Number of trips**	**Number of Medicine Packets**
8 AM	00	00
9 AM	00	00
10 AM	02	15
11 AM	01	18
12 PM	01	10
1 PM	02	56
2 PM	01	01
3 PM	01	02
4 PM	02	15
5 PM	01	02
6 PM	01	10
7 PM	02	12
Grand Total	14	141

Graph 4.4: Graphical representation of number of trips made to deliver number of medicine packets by the clinical pharmacy GDA number 4 from IP pharmacy to 8th floor from 08AM-08PM

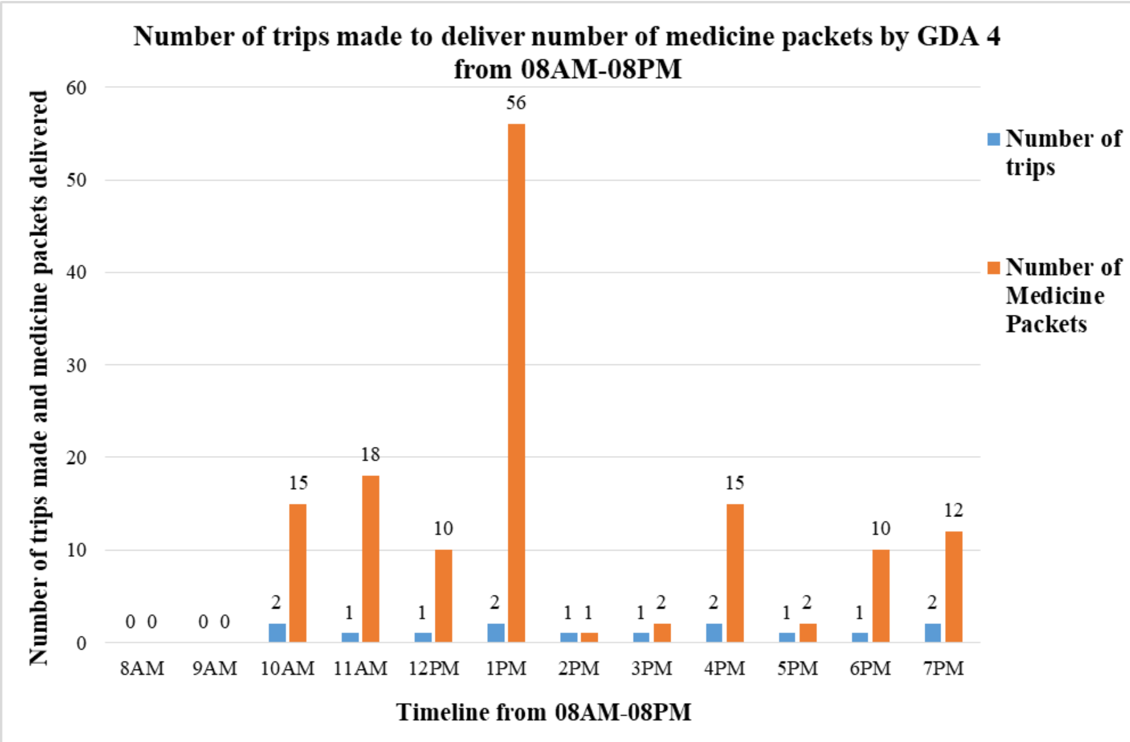


Table 4.5: Tabular representation of number of trips made to deliver number of medicine packets by GDA 5 to the 9th floor from 08AM-08PM

GDA 5 - 9th FLOOR		
TIME	**Number of trips**	**Number of Medicine Packets**
8 AM	00	00
9 AM	02	03
10 AM	02	05
11 AM	01	05
12 PM	01	10
1 PM	02	14
2 PM	00	00
3 PM	02	07
4 PM	01	05
5 PM	01	06
6 PM	01	02
7 PM	01	13
Grand Total	**14**	**70**

Graph 4.5: Graphical representation of number of trips made to deliver number of medicine packets by the clinical pharmacy GDA number 5 from IP pharmacy to 9th floor from 08AM-08PM

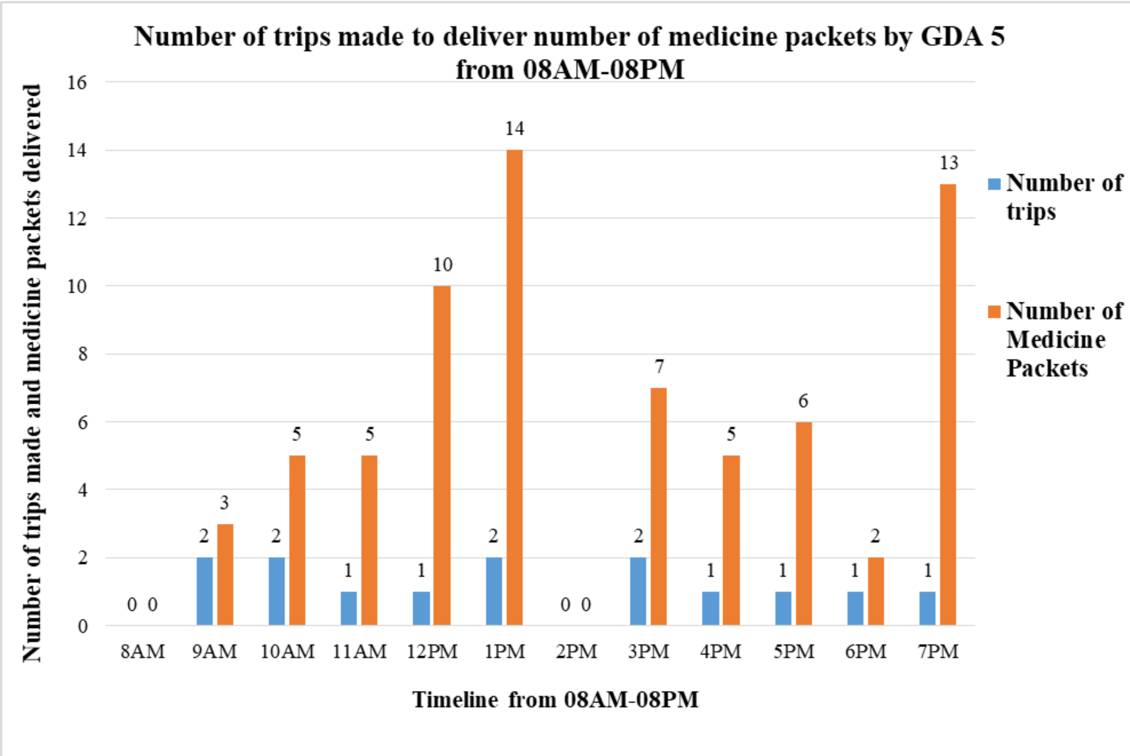


Table 4.6: Tabular representation of number of trips made to deliver number of medicine packets by GDA 6 to the 10th floor B wing from 08AM-08PM

GDA 6 - 10th B		
TIME	**Number of trips**	**Number of Medicine Packets**
8 AM	00	00
9 AM	01	01
10 AM	02	09
11 AM	01	03
12 PM	02	26
1 PM	00	00
2 PM	02	27
3 PM	01	04
4 PM	02	03
5 PM	02	10
6 PM	01	05
7 PM	02	06
Grand Total	**16**	**94**

Graph 4.6: Graphical representation of number of trips made to deliver number of medicine packets by the clinical pharmacy GDA number 6 from IP pharmacy to 10th floor B wing from 08AM-08PM

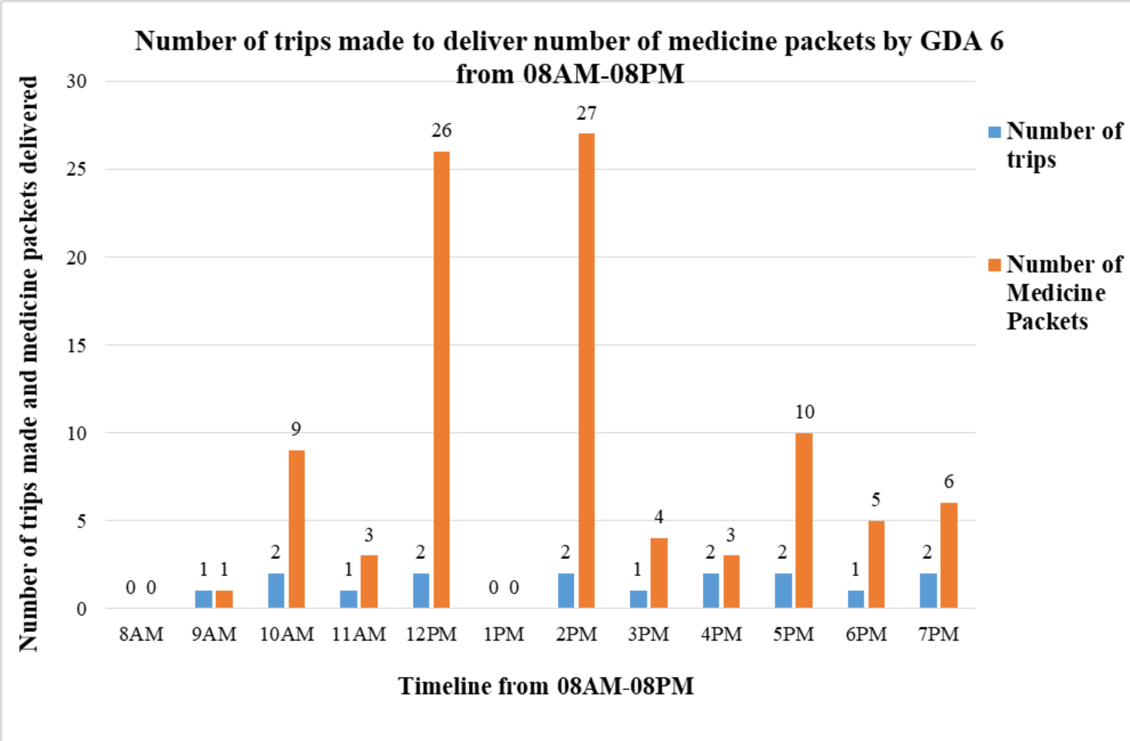


Table 4.7: Tabular representation of number of trips made to deliver number of medicine packets by GDA 7 to the 11th floor from 08AM-08PM

GDA 7 - 11th FLOOR		
TIME	**Number of trips**	**Number of Medicine Packets**
8 AM	00	00
9 AM	01	07
10 AM	01	02
11 AM	01	02
12 PM	02	27
1 PM	01	40
2 PM	00	00
3 PM	02	06
4 PM	02	08
5 PM	01	04
6 PM	02	09
7 PM	01	09
Grand Total	**14**	**114**

Graph 4.7: Graphical representation of number of trips made to deliver number of medicine packets by the clinical pharmacy GDA number 7 from IP pharmacy to11th floor from 08AM-08PM

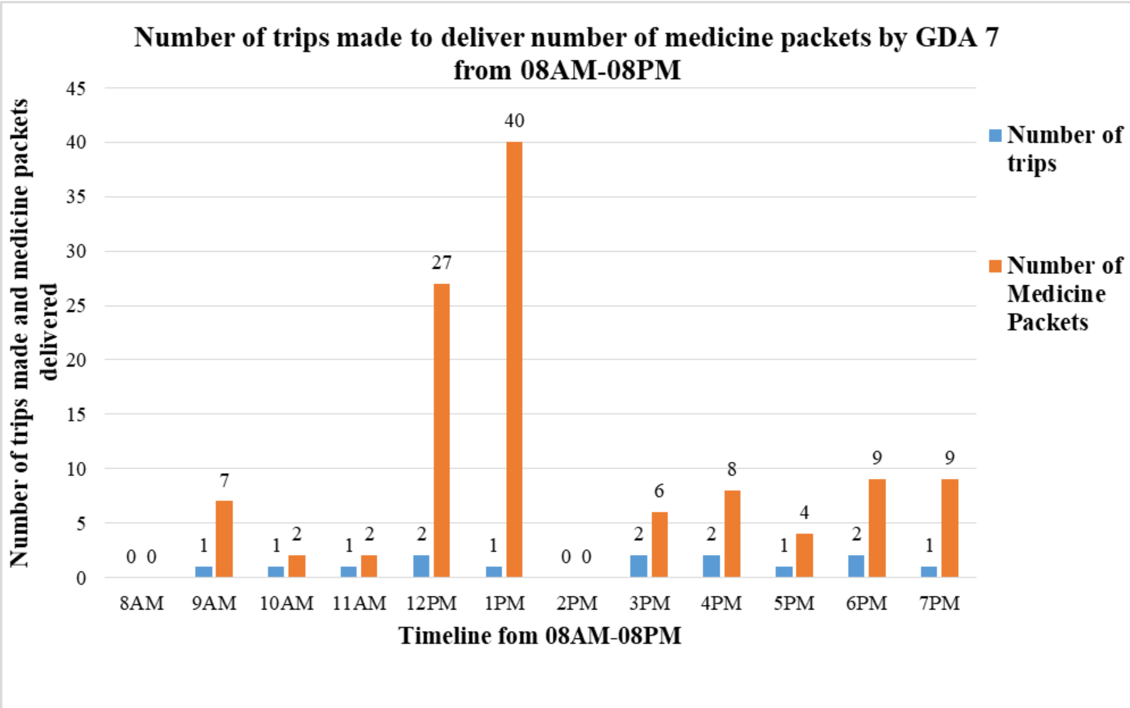


Table 4.8: Tabular representation of number of trips made to deliver number of medicine packets by GDA 8 to the 12th floor from 08AM-08PM

GDA 8 - 12th FLOOR		
TIME	**Number of trips**	**Number of Medicine Packets**
8 AM	00	00
9 AM	00	00
10 AM	02	06
11 AM	01	09
12 PM	01	06
1 PM	01	31
2 PM	02	26
3 PM	02	10
4 PM	01	03
5 PM	01	08
6 PM	01	03
7 PM	03	17
Grand Total	**15**	**119**

Graph 4.8: Graphical representation of number of trips made to deliver number of medicine packets by the clinical pharmacy GDA number 8 from IP pharmacy to 12th floor from 08AM-08PM

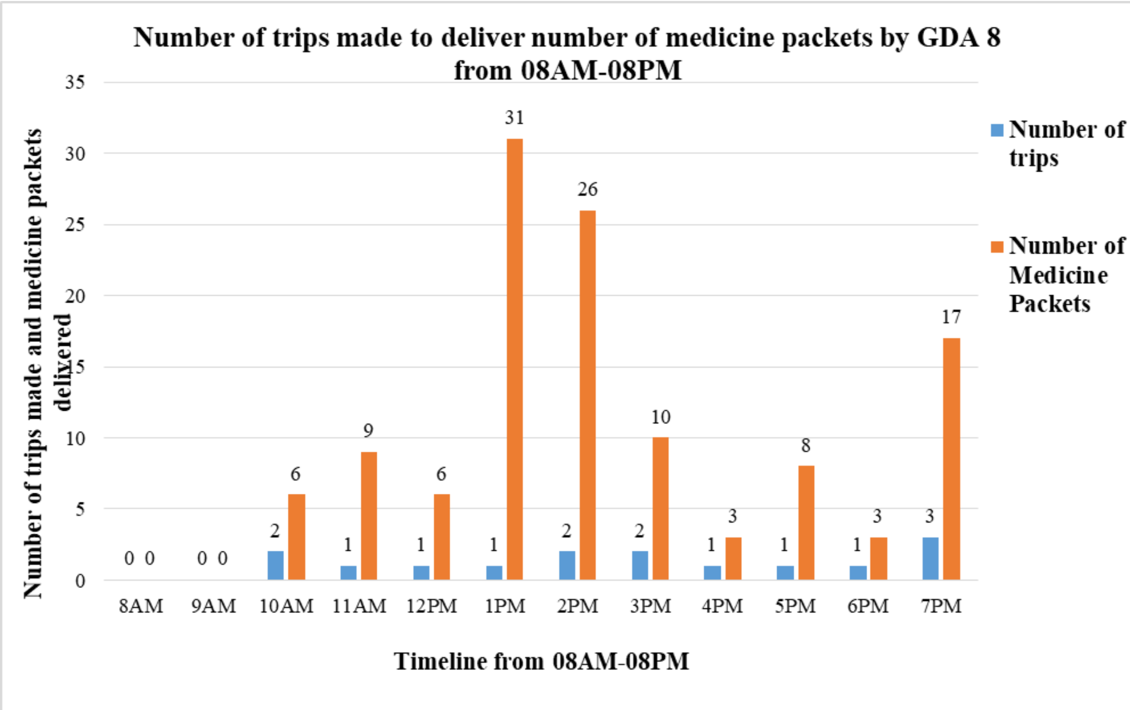


Table 4.9: Tabular representation of number of trips made to deliver number of medicine packets by GDA 9 to the 14th floor from 08AM-08PM

GDA 9 - 14th FLOOR		
TIME	**Number of trips**	**Number of Medicine Packets**
8 AM	00	00
9 AM	00	00
10 AM	01	11
11 AM	01	07
12 PM	01	04
1 PM	02	17
2 PM	00	00
3 PM	01	07
4 PM	00	00
5 PM	01	06
6 PM	01	06
7 PM	01	02
Grand Total	**9**	**60**

Graph 4.9: Graphical representation of number of trips made to deliver number of medicine packets by the clinical pharmacy GDA number 9 from IP pharmacy to 14th floor from 08AM-08PM

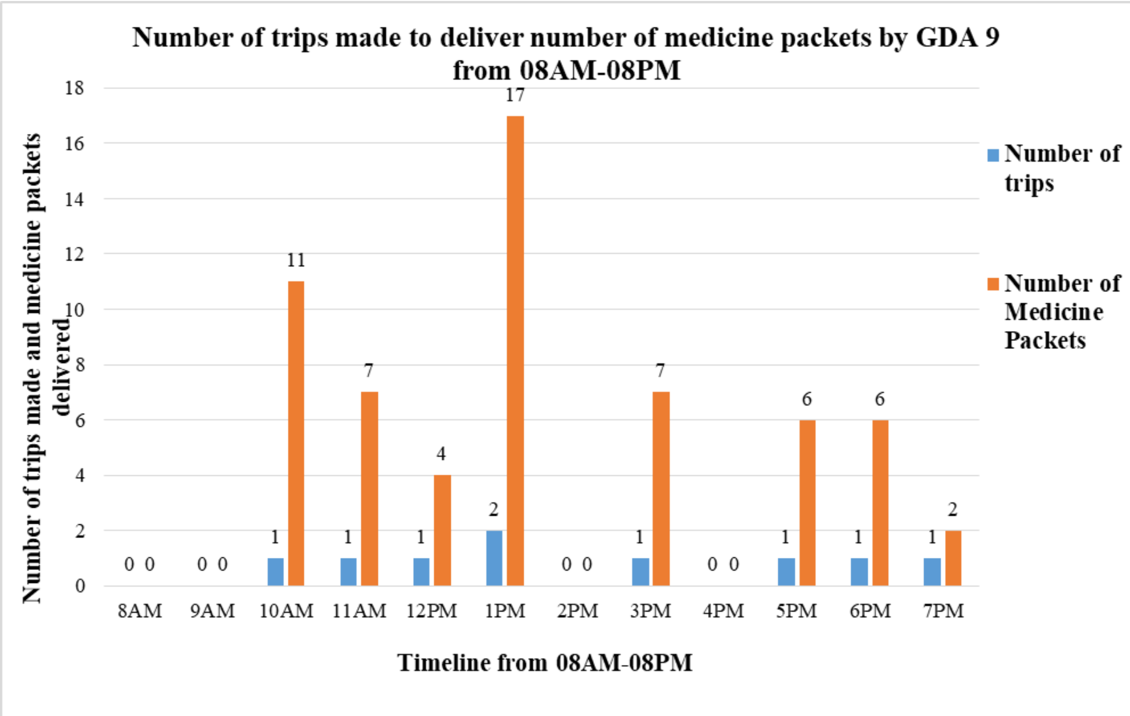


Table 4.10: Tabular representation of number of trips made to deliver number of medicine packets by GDA 10 to the 15th floor from 08AM-08PM

GDA 10 - 15th FLOOR		
TIME	**Number of trips**	**Number of Medicine Packets**
8 AM	00	00
9 AM	02	03
10 AM	01	04
11 AM	01	03
12 PM	01	11
1 PM	00	00
2 PM	02	14
3 PM	00	00
4 PM	02	15
5 PM	01	03
6 PM	00	00
7 PM	01	03
Grand Total	**11**	**56**

Graph 4.10: Graphical representation of number of trips made to deliver number of medicine packets by the clinical pharmacy GDA number 10 from IP pharmacy to 15th floor from 08AM-08PM

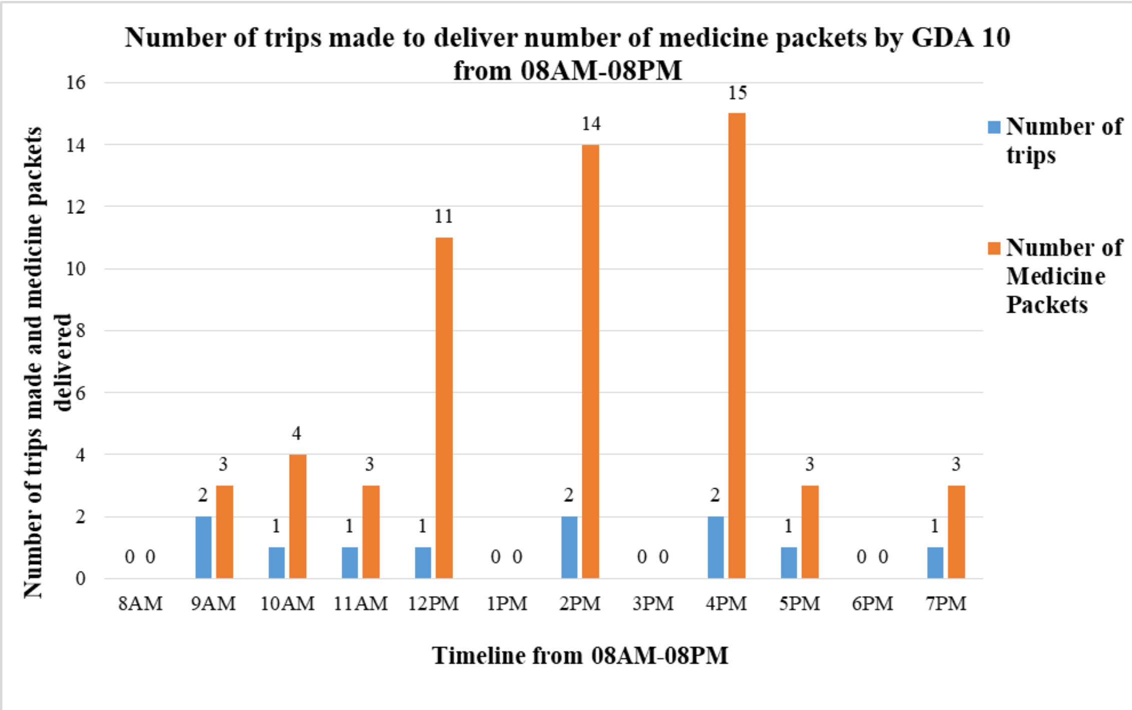


Table 4.11: Tabular representation of number of trips made to deliver number of medicine packets by GDA 11 to HCC from 08AM-08PM

GDA 11 - HCC		
TIME	**Number of trips**	**Number of Medicine Packets**
8 AM	00	00
9 AM	00	00
10 AM	02	06
11 AM	02	07
12 PM	01	01
1 PM	01	06
2 PM	01	02
3 PM	01	07
4 PM	01	03
5 PM	01	01
6 PM	00	00
7 PM	02	06
Grand Total	**12**	**39**

Graph 4.11: Graphical representation of number of trips made to deliver number of medicine packets by the clinical pharmacy GDA number 11 from IP pharmacy to HCC from 08AM-08PM

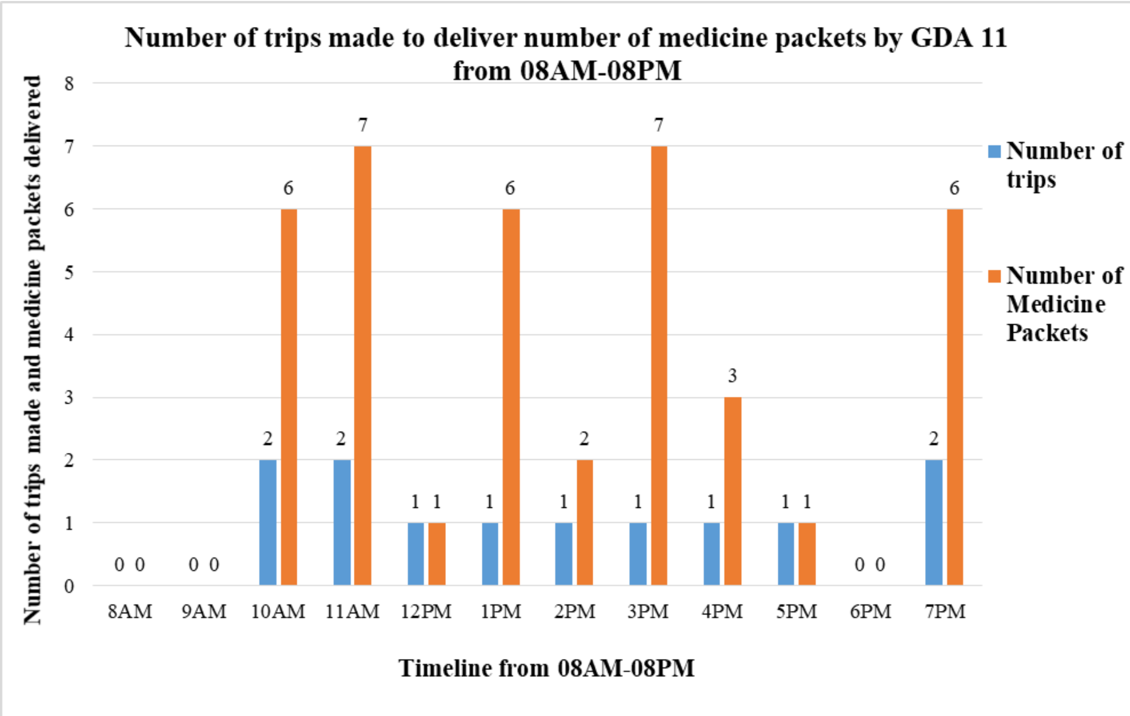


Table 4.12: Tabular representation of number of trips made to deliver number of medicine packets by GDA 12 to the ICU 1 & 2 from 08AM-08PM

GDA 12 - ICU 1 & 2		
TIME	**Number of trips**	**Number of Medicine Packets**
8 AM	00	00
9 AM	01	03
10 AM	01	09
11 AM	02	16
12 PM	01	20
1 PM	02	17
2 PM	00	00
3 PM	02	20
4 PM	01	02
5 PM	01	02
6 PM	03	14
7 PM	02	07
Grand Total	**16**	**110**

Graph 4.12: Graphical representation of number of trips made to deliver number of medicine packets by the clinical pharmacy GDA number 12 from IP pharmacy to ICU 1 & 2 from 08AM-08PM

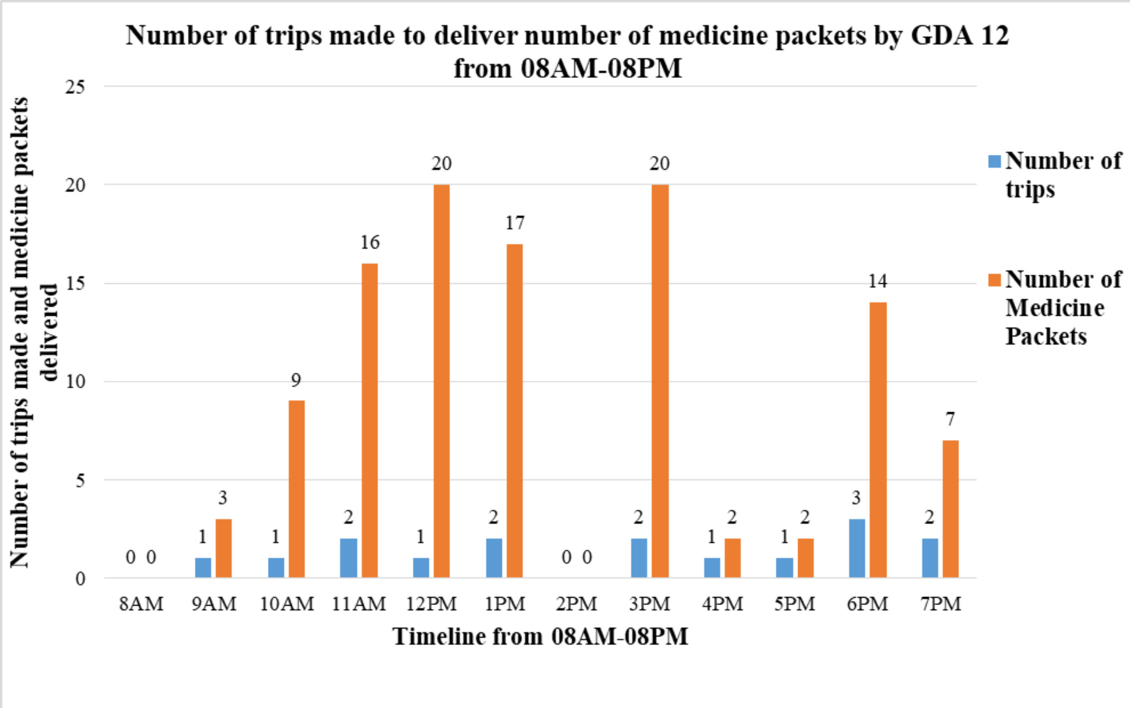


Table 4.13: Tabular representation of number of trips made to deliver number of medicine packets by GDA 13 to the ICU 3 & 4 from 08AM-08PM

GDA 13 - ICU 3 & 4		
TIME	**Number of trips**	**Number of Medicine Packets**
8 AM	00	00
9 AM	01	03
10 AM	01	16
11 AM	01	01
12 PM	03	23
1 PM	01	01
2 PM	03	18
3 PM	01	09
4 PM	00	00
5 PM	02	17
6 PM	01	02
7 PM	02	14
Grand Total	**16**	**104**

Graph 4.13: Graphical representation of number of trips made to deliver number of medicine packets by the clinical pharmacy GDA number 13 from IP pharmacy to ICU 3 & 4 from 08AM-08PM

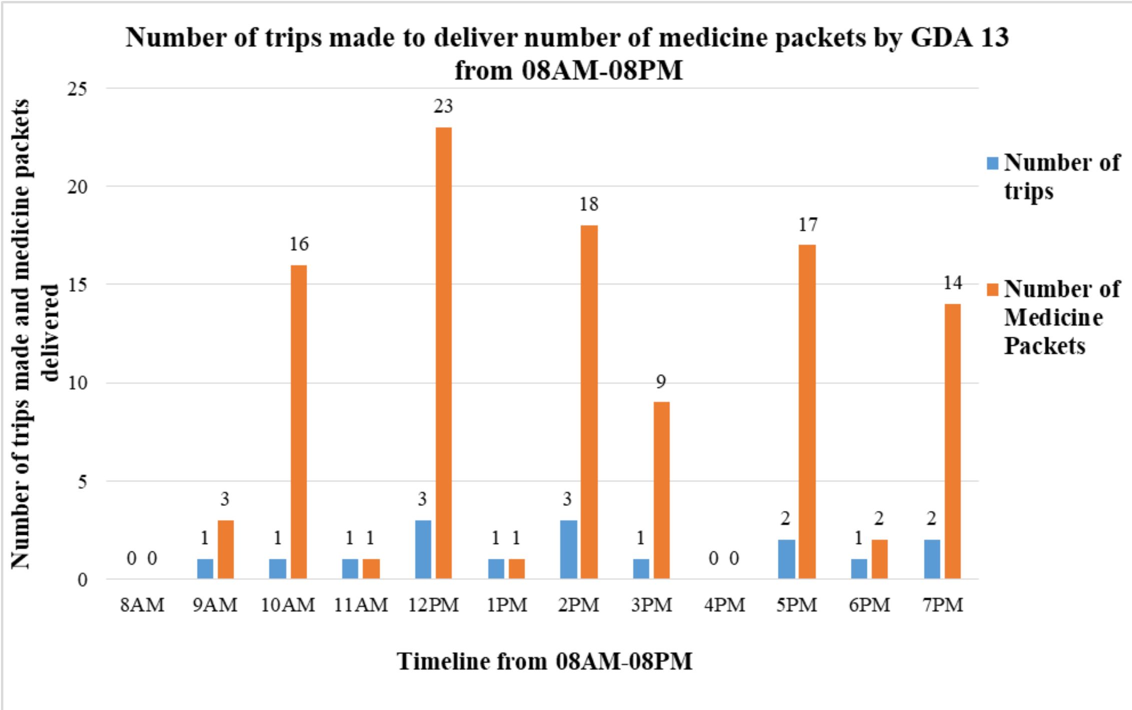


Table 4.14: Tabular representation of number of trips made to deliver number of medicine packets by GDA 14 to the ICU 5 & 6 from 08AM-08PM

GDA 14 - ICU 5 & 6		
TIME	**Number of trips**	**Number of Medicine Packets**
8 AM	00	00
9 AM	01	02
10 AM	02	08
11 AM	01	04
12 PM	02	04
1 PM	01	02
2 PM	00	00
3 PM	02	07
4 PM	00	00
5 PM	02	05
6 PM	01	01
7 PM	01	01
Grand Total	**13**	**34**

Graph 4.14: Graphical representation of number of trips made to deliver number of medicine packets by the clinical pharmacy GDA number 14 from IP pharmacy to ICU 5 & 6 from 08AM-08PM

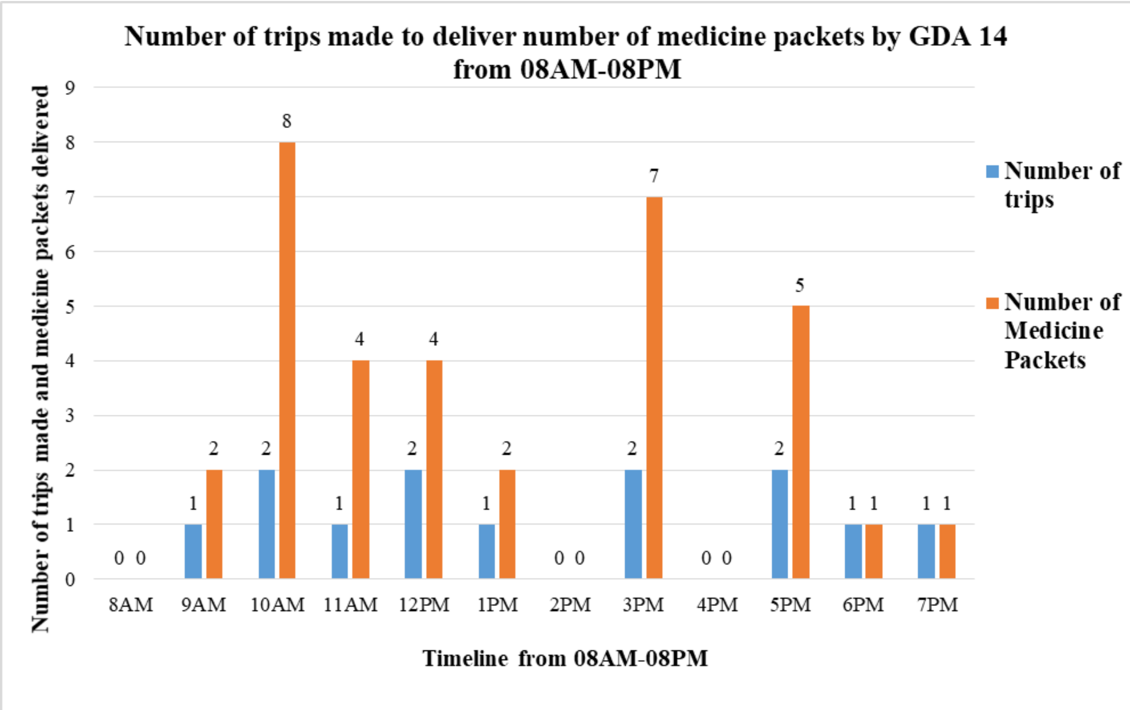


Table 4.15: Tabular representation of number of trips made to deliver number of medicine packets by GDA 15 to the ICU 7 & 8 from 08AM-08PM

GDA 15 - ICU 7 & 8		
TIME	**Number of trips**	**Number of Medicine Packets**
8 AM	00	00
9 AM	01	01
10 AM	02	15
11 AM	01	07
12 PM	02	34
1 PM	00	00
2 PM	01	15
3 PM	01	10
4 PM	02	10
5 PM	02	11
6 PM	01	14
7 PM	01	04
Grand Total	**14**	**121**

Graph 4.15: Graphical representation of number of trips made to deliver number of medicine packets by the clinical pharmacy GDA number 15 from IP pharmacy to ICU 7 & 8 from 08AM-08PM

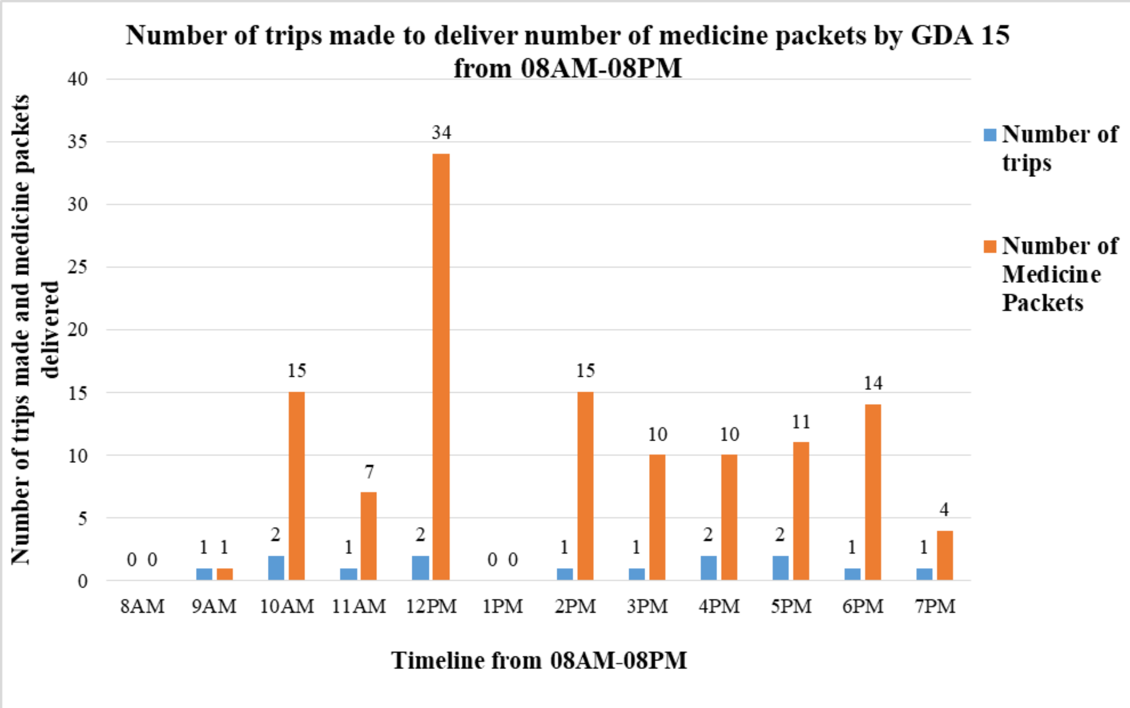


Table 4.16: Tabular representation of number of trips made to deliver number of medicine packets by GDA 16 to the ICU 9 & 10 from 08AM-08PM

GDA 16 - ICU 9 & 10		
TIME	**Number of trips**	**Number of Medicine Packets**
8 AM	00	00
9 AM	02	08
10 AM	01	01
11 AM	01	13
12 PM	03	37
1 PM	02	17
2 PM	00	00
3 PM	01	04
4 PM	01	06
5 PM	02	03
6 PM	01	04
7 PM	02	02
Grand Total	**16**	**95**

Graph 4.16: Graphical representation of number of trips made to deliver number of medicine packets by the clinical pharmacy GDA number 16 from IP pharmacy to ICU 9 & 10 from 08AM-08PM

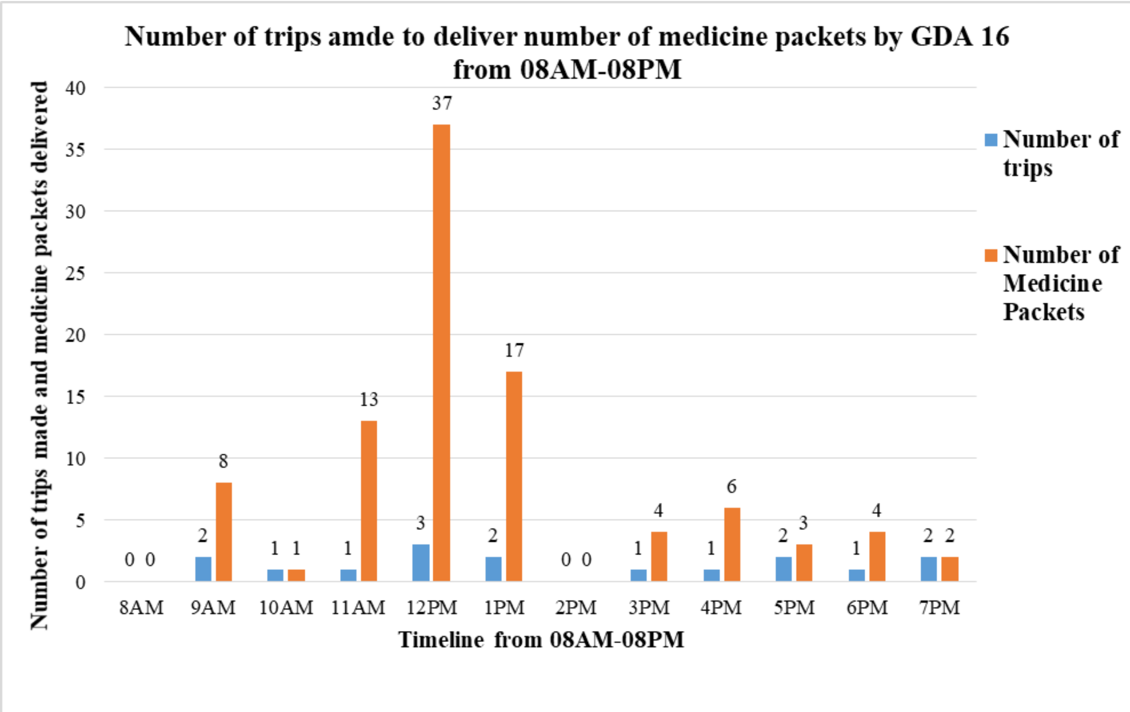


Table 4.17: Tabular representation of number of trips made to deliver number of medicine packets by GDA 17 to the ICU 11 from 08AM-08PM

GDA 17 - ICU 11		
TIME	**Number of trips**	**Number of Medicine Packets**
8 AM	00	00
9 AM	01	03
10 AM	02	10
11 AM	01	06
12 PM	02	06
1 PM	01	04
2 PM	01	02
3 PM	00	00
4 PM	00	00
5 PM	00	00
6 PM	00	00
7 PM	03	08
Grand Total	**11**	**39**

Graph 4.17: Graphical representation of number of trips made to deliver number of medicine packets by the clinical pharmacy GDA number 17 from IP pharmacy to ICU 11 from 08AM-08PM

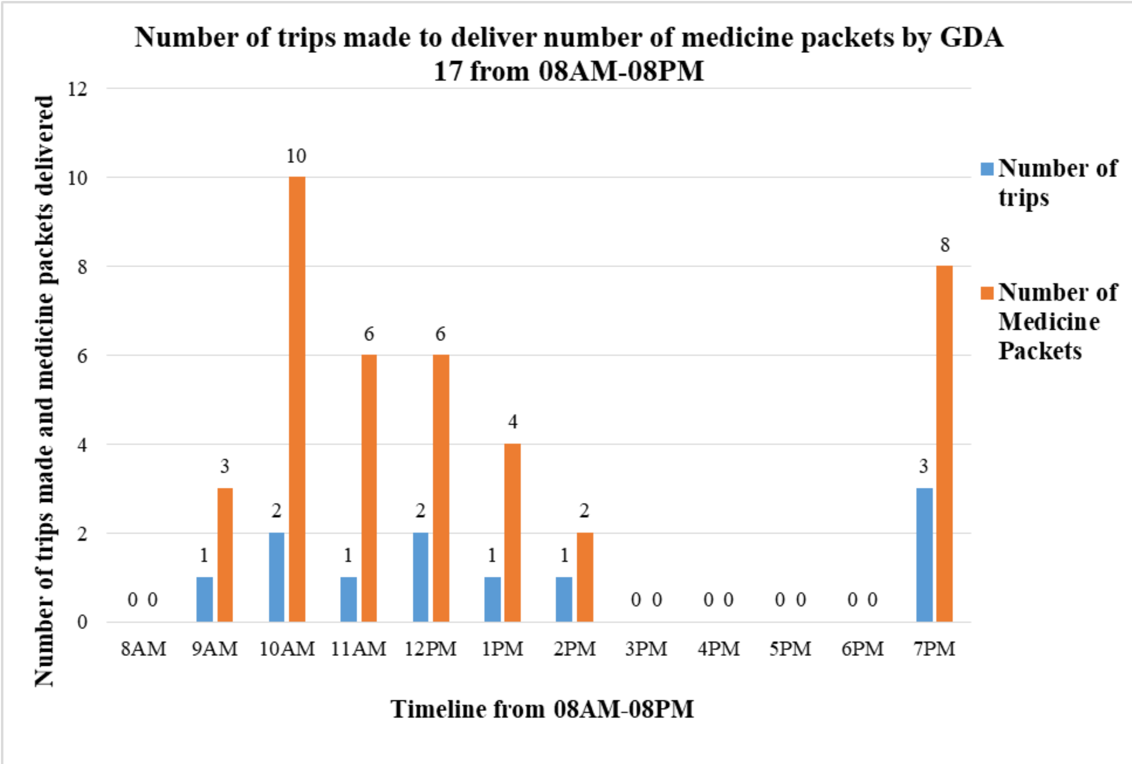
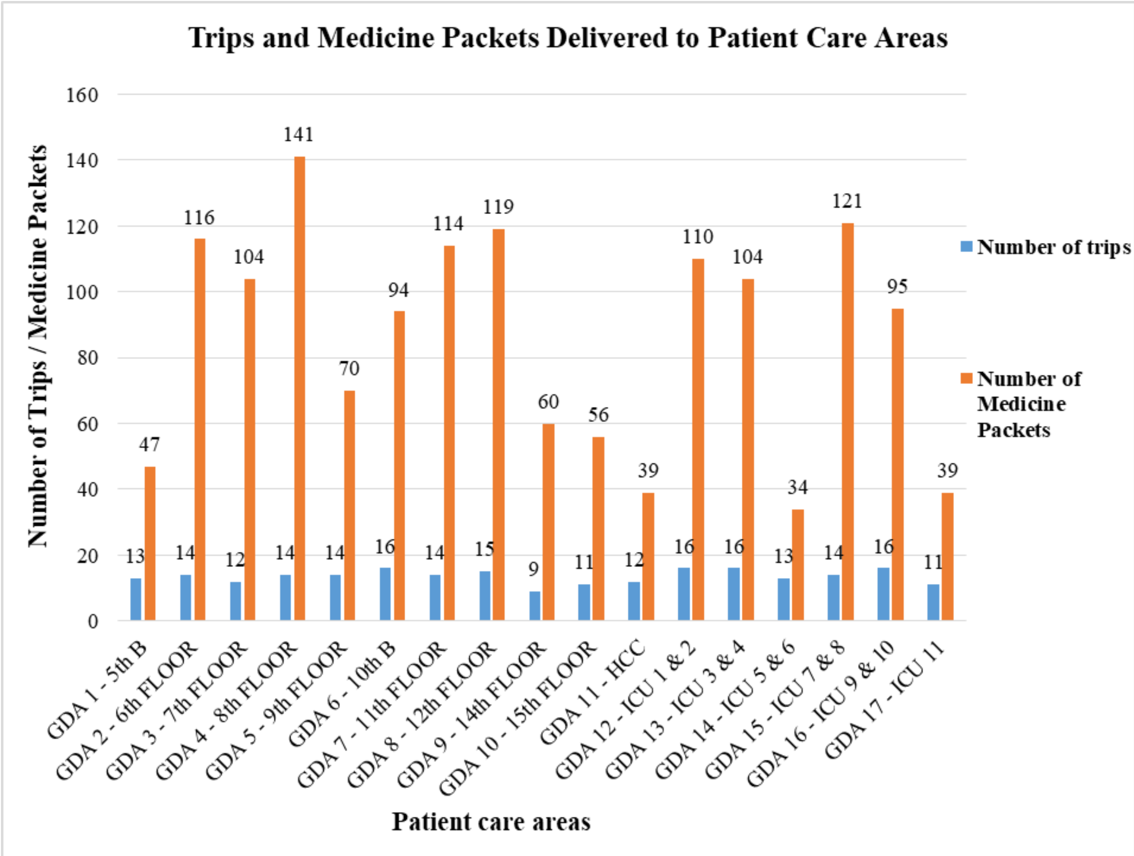


Table 4.18: Tabular representation of clinical pharmacy GDA team and the number of trips made by them.

Patient care areas	Number of trips	Number of Medicine Packets
GDA 1 - 5th B	13	47
GDA 2 - 6th FLOOR	14	116
GDA 3 - 7th FLOOR	12	104
GDA 4 - 8th FLOOR	14	141
GDA 5 - 9th FLOOR	14	70
GDA 6 - 10th B	16	94
GDA 7 - 11th FLOOR	14	114
GDA 8 - 12th FLOOR	15	119
GDA 9 - 14th FLOOR	9	60
GDA 10 - 15th FLOOR	11	56
GDA 11 - HCC	12	39
GDA 12 - ICU 1 & 2	16	110
GDA 13 - ICU 3 & 4	16	104
GDA 14 - ICU 5 & 6	13	34
GDA 15 - ICU 7 & 8	14	121
GDA 16 - ICU 9 & 10	16	95
GDA 17 - ICU 11	11	39
Grand Total	**230**	**1463**

Graph 4.18: Graphical representation of clinical pharmacy GDA team and the number of trips made by them from 08AM-08PM

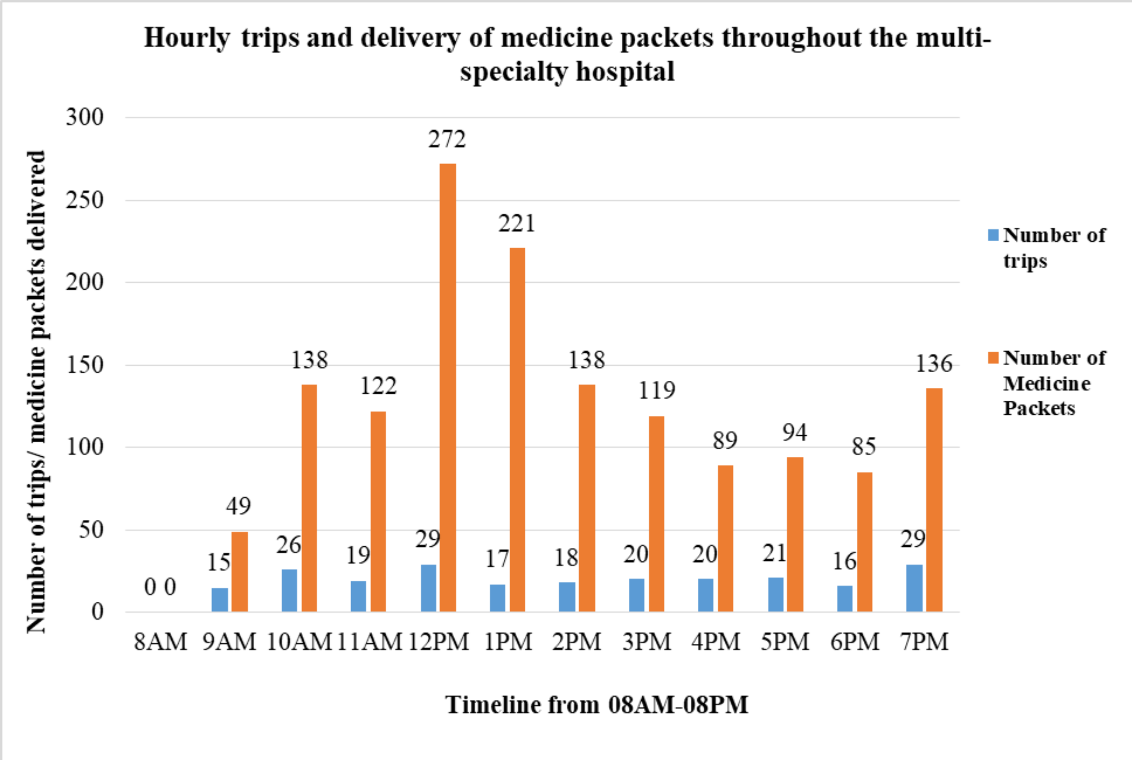


The GDAs assigned to the intensive care units - ICU 1 & 2, ICU 3 & 4, and ICU 9 & 10 have consistently recorded the highest number of trips, with 16 trips each. This pattern indicates a higher demand for GDA presence in these areas maybe due to patient condition. Similarly, GDA 6 assigned to the 10th B has also made 16 trips, indicating a notable demand for their services in that particular ward section. This point is also reconfirmed with the number of medicine packets delivered which is well above the average of 86.06. The reasons behind this elevated frequency could be attributed to specific patient needs, medical procedures, or care responsibilities. Conversely, GDA 9, assigned to the 14th floor, has the fewest trips with only 9 and 60 medicine packets being delivered which is below the average. This comparatively lower number of trips could imply a relatively lower demand or reduced activity on that specific floor. The trend for number of trips showcases a steady trend between the number of trips made by various staff members. On the other hand there is a clear decreasing trend for the number of medicine packets delivered by the clinical pharmacy GDA team.

Table 4.19: Tabular representation of hourly delivery of medicine packets between 08AM - 08PM throughout the multi-specialty hospital.

Overall for all GDAs		
Time	**Number of trips**	**Number of Medicine Packets**
8AM	0	0
9AM	15	49
10AM	26	138
11AM	19	122
12PM	29	272
1PM	17	221
2PM	18	138
3PM	20	119
4PM	20	89
5PM	21	94
6PM	16	85
7PM	29	136
Grand Total	**230**	**1463**

Graph 4.19: Hourly delivery of medicine packets between 08 AM - 08 PM throughout the multi-specialty hospital.



The number of trips made and medicine packets delivered at 08 AM are both zero, this could be due to the start of shift, varied morning doctor's round timings. At 9 AM, there were 15 trips made. The highest number of trips occurred at 12 PM with 29 trips and highest medicine packets delivered with 272. The number of trips gradually decreased from 12 PM to 6 PM, ranging from 29 to 16 trips. At 7 PM, the number of trips increased again to 29. Generally, there was an upward trend in the number of medicine packets delivered from 8 AM to 12 PM, with a peak at 12 PM. After 12 PM, the number of medicine packets gradually declined, reaching the lowest point at 6 PM (85 packets). There was a slight increase in the number of medicine packets delivered during the last hour, with a peak of 136 packets at 7 PM. The trend for both indicates an increasing trend throughout the day.

Table 4.20: Presents the "mean, median, mode, and standard deviation calculated" on an hourly basis for the number of trips and medicine packets delivered by the 17 clinical pharmacy GDA staff members from 08 am to 08 pm.

Hourly					
	Grand Total	**Mean**	**Median**	**Mode**	**Standard deviation**
Trips	230	20.91	20	29	4.72
Medicine packets	1463	133	122	138	60.49

The total number of trips made by the clinical pharmacy GDA team throughout the day was 230. The mean number of trips per hour was approximately 20.91. The median number of trips per hour was 20, indicating that half of the hours had fewer than 20 trips and the other half had more than 20 trips. The mode, representing the most frequently occurring number of trips per hour, was 29. The standard deviation, measuring the variability or dispersion of the data, was approximately 4.72, indicating that the number of trips per hour was relatively consistent.

The total number of medicine packets delivered throughout the day was 1463. The mean number of medicine packets delivered per hour was approximately 133. The median number of medicine packets delivered per hour was 122, indicating that half of the hours had fewer than 122 packets and the other half had more than 122 packets. The mode, representing the most frequently occurring number of medicine packets per hour, was 138. The standard deviation, measuring the variability or dispersion of the data, was approximately 60.49, indicating that the number of medicine packets per hour had a relatively higher level of variation.

Table 4.21: Showcases the calculated “mean, median, mode, and standard deviation” for the number of trips and medicine packets delivered by the 17 clinical pharmacy GDA staff members over the course of their shift.

Overall staff wise					
	Grand Total	**Mean**	**Median**	**Mode**	**Standard deviation**
Trips	230	13.53	14	14	1.97
Medicine packets	1463	86.06	95	104	33.31

The total number of trips made by the staff members was 230. The mean number of trips per clinical pharmacy GDA member was approximately 13.53. The median number of trips per clinical pharmacy GDA staff member was 14, indicating that half of the staff members made fewer than 14 trips and the other half made more than 14 trips. The mode, representing the most frequently occurring number of trips per staff member, was 14. The standard deviation, measuring the variability or dispersion of the data, was approximately 1.97, indicating that the number of trips per staff member had a relatively low level of variation.

The total number of medicine packets delivered by the staff members was 1463. The mean number of medicine packets delivered per staff member was approximately 86.06. The median number of medicine packets delivered per staff member was 95, indicating that half of the staff members delivered fewer than 95 packets and the other half delivered more than 95 packets. The mode, representing the most frequently occurring number of medicine packets per staff member, was 104. The standard deviation, measuring the variability or dispersion of the data, was approximately 33.31, indicating that the number of medicine packets per staff member had a relatively higher level of variation.

EFFICIENCY PERCENTAGE

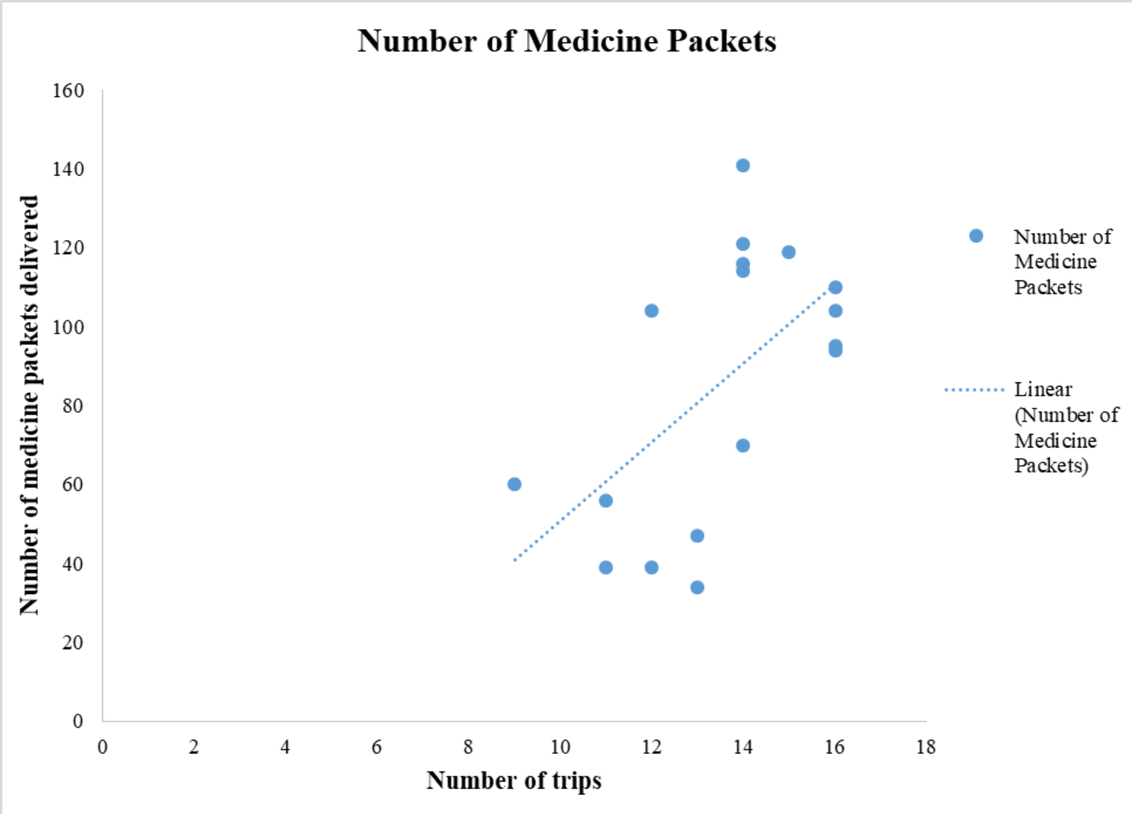
Table: 4.22: Number of Trips and Efficiency Percentage by GDA

Patient care areas	Number of trips	Efficiency percentage
GDA 1 - 5th B	13	36.11
GDA 2 - 6th FLOOR	14	38.89
GDA 3 - 7th FLOOR	12	33.33
GDA 4 - 8th FLOOR	14	38.89
GDA 5 - 9th FLOOR	14	38.89
GDA 6 - 10th B	16	44.44
GDA 7 - 11th FLOOR	14	38.89
GDA 8 - 12th FLOOR	15	41.67
GDA 9 - 14th FLOOR	9	25.00
GDA 10 - 15th FLOOR	11	30.56
GDA 11 - HCC	12	33.33
GDA 12 - ICU 1 & 2	16	44.44
GDA 13 - ICU 3 & 4	16	44.44
GDA 14 - ICU 5 & 6	13	36.11
GDA 15 - ICU 7 & 8	14	38.89
GDA 16 - ICU 9 & 10	16	44.44
GDA 17 - ICU 11	11	30.56
Grand Total	**230**	**37.58**

Efficiency percentages indicate the proportion of successful trips made by each GDA. The overall efficiency percentage for all GDAs combined is calculated to be 37.58%. This means that, on average, approximately 37.58% of the trips made by GDAs were successful in delivering medicine packets to the designated patient care areas.
When looking at individual GDAs, GDA 6, 12, 13, and 16 achieved the highest efficiency percentage of 44.44% each. This suggests that these GDAs were relatively more effective in their delivery tasks compared to others. On the other hand, GDA 9, responsible for the 14th floor, had the lowest efficiency percentage of 25.00%.

CORRELATION

Graph 4.20: Graph showcasing the correlation between number of trips made and number of medicine packets delivered.

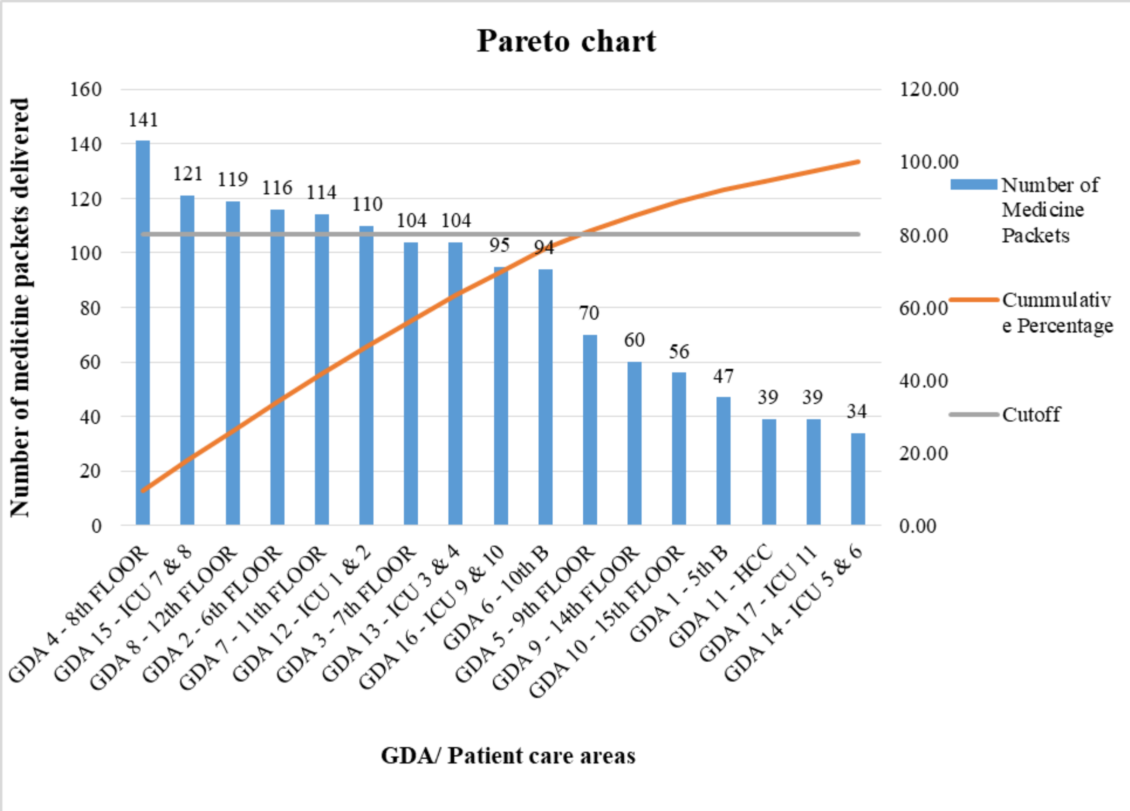


Pearson's correlation test was conducted in microsoft excel which resulted in:

Correlation coefficient of = 0.59

This clearly indicates that there is a "moderately positive correlation between the number of trips made and the number of medicine packets delivered by the GDA staff". This is not to exclude the fact that the highest delivery which was made by GDA 4 onto the 8th floor was 141 medicine packets but the trips made were not the highest.

Graph 4.21: Pareto chart showcasing the floors and GDAs delivering the 80% of the medicine packets.



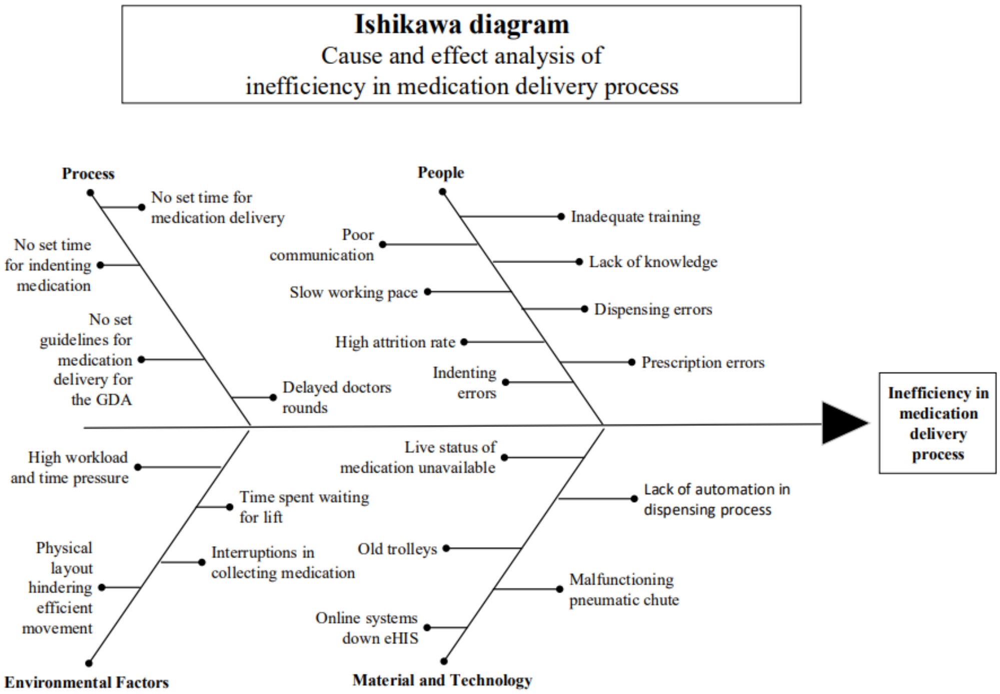


Figure 4.1: Ishikawa diagram showcasing the root cause analysis of possible factors leading to the inefficiency

Medanta can enhance the overall performance and the efficacy of drug distribution by addressing the multiple variables that have been identified and maybe contributing to the inefficiency of the GDA team. There could be in-depth training sessions and orientation programs for the GDAs involved in the process, ensuring sufficient staffing levels, promoting effective communication and coordination amongst the entire team. Upgrading the pneumatic chute's parts which are faulty. Also, ensuring that there are proper communication routes, establishing standardised procedures and protocols regarding the delivery process, and indenting process. Improving resource management by looking back at the staffing levels, while streamlining the work environment for efficiency, and cultivating a culture for ongoing support for the team.

DISCUSSION

The clinical pharmacy GDA team which is assigned to various specific floors within Medanta, Gurgaon. Patient care areas included "5th floor B wing, 6 th floor, 7 th floor, 8th floor, 9 th floor, 10 th floor, 11 th floor, 12 th floor, 14 th floor and 15 th floor" - these were the IPD wards/rooms, as well as all the ICU from 1 - 11 were part of the study. Additionally, one GDA was assigned to the Heart Command Centre on UG.

After analysing the data it was revealed to us that there is a clear variation in the number of trips made by all the GDAs throughout the various patient care locations. Indicating a clear pattern that not all the floors possess the same kind of demand for medication delivery, as this may be subject to specialty.

ICU 1 & 2, ICU 3 & 4, ICU 9 & 10, and 5th B consistently made the highest number of trips (16). This could mean that as 6 of the 11 ICU are having these high demands it could mean that there is more requirement of frequent deliveries potentially due to higher patient condition, greater need of care, or larger patient volumes. GDA 9, assigned to the 14th floor, has the fewest trips with only 9. This relatively lower number of trips indicates that there is a decreased requirement for GDA assistance.

The range of medicine packets delivered spans from 34 to 141 packets, suggesting unequal distribution of level of work amongst the GDAs. Highest medicine packets (141) were delivered with only 14 trips by GDA 4 to 8th floor which is not the highest number of trips in the collected data. While GDA 6 who delivers on the 10th floor B wing made the highest delivery while the demand was not close to other floors, also there is only one wing the staff has to cater to unlike other GDAs.

Pearson's correlation test was conducted between the number of trips made by GDAs and the quantity of medication packets delivered. The coefficient was calculated to be 0.59 indicating a moderate positive correlation. This means that the patient care areas where the GDAs made higher numbers of trips tend to have higher medication deliveries. Also, indicating a link between patient care demands and medication requirements. ICU 1 & 2, ICU 3 & 4, ICU 9 & 10, and 5th B all consistently made the highest number of trips and also delivered a relatively higher number of medication packets.

Efficiency was calculated by calculating the efficiency percentage. Which indicates the percentage of successful trips made by each GDA, which revealed that the overall efficiency percentage for all GDAs combined was found to be 37.58%. This means that the rest 62.42% were uneventful time spent by the GDAs. These results address the importance of strengthening the efficiency of the medicine delivery process within the hospital to improve overall medication management.

The variance in the efficiency percentages between GDAs could be caused due to multiple factors, which needs to be studied further. This inefficiency could lead to a domino effect with delay in effective medication administration in some patient care areas due to the lack of a uniform process and resource planning. Variations in efficiency may also be caused by elements like time taken to go from centralised IP pharmacy which is located in the LG floor to different patient care locations in a horizontal structure of delivery locations. The design of the patient care spaces could be another contributing factor, as there A and B wings on each floor and the staff goes, caters to whatever seems convenient to them. Finding the underlying factors of these variances amongst the staff might assist and guide targeted efforts to amp up the overall efficiency and help in streamlining the delivery process. All this will lead to improving the effectiveness and efficiency of the delivery system, this information can serve as a decision-making tool for staff training, process optimisation, and resource allocation.

A correlation test was also applied using Karl Pearsonon's correlation test. This was done on the data to see if there was any "correlation between the number of trips made and the number of medicine packets delivered". The correlation coefficient was found to be 0.59 indicating that there is a moderately positive correlation.

The Pareto analysis revealed that 6 out of 17 patient care areas made the 80% of the demands for medicine. This clearly makes them more patient-heavy areas, needing closer attention and support. Lastly, the Ishikawa diagram aids us in pointing out few possible factors causing these inefficiencies in the current process, which needs to be looked into.

STRENGTHS OF THE STUDY

Census study: The observational study collected data for both the number of trips made by the clinical pharmacy GDA team and the number of medicine packets delivered to various patient care areas. This comprehensive approach of the study provides a detailed understanding of the medication management processes within the tertiary care hospital.

Multiple Variables: The study evaluated multiple variables, such as the number of trips made by the clinical pharmacy GDA team, number of medicine packets delivered, and the various patient care areas of the hospital. By incorporating all these variables, the observational study provides a broader perspective on the medication management process, allowing for comparisons and analysis across different aspects of the process.

Internal Consistency: The study demonstrated internal consistency by performing descriptive statistical calculation including mean, median, mode, and standard deviation. All these measures help to summarize, analyse and describe the data, by providing insights into the central tendency and variability of the multiple variables under the purview of investigation.

Practical Implications: Findings of the study have practical implications for the medication management process of the hospital. The identification of all the areas with high demand for medication, as well as those with specialized or lower medication demands, can aid us in performing better resource allocation, scheduling, and workflow optimization and management to ensure efficient and effective medication delivery.

Real-world Relevance: As the study is focused on a real-world healthcare setting, specifically a multispecialty hospital in India. Which improves the study's importance, relevance and applicability, as the findings may be able to inform the decision makers about the process improvements that are required in tertiary healthcare environments.

LIMITATIONS

Single Institution: As this study only focused on a single multispecialty hospital in North India, which may have unique characteristics and practices unlike others. This creates a limit on the generalizability of the results to other healthcare settings across India, as different hospitals in different parts of India or even the same city may have unique medication management processes and staff dynamics.

Lack of Control Group: A control group was not part of the study so we do not have anything to compare to. With a lack of a control group, it becomes difficult to evaluate the efficiency of the medication management process and strategies. Also the strategies implemented to determine if the recorded results are solely based on the interventions.

Data Collection Method: Data collected of the number of trips and medicine packets delivered was done manually. This introduces the potential for human error, a bias or subjective interpretation of the event.

External Factors: External factors that could have influenced the number of trips, number of medicine packets delivered were not taken into account. Factors including patient volume, severity, or any changes in the hospital protocols or policies were not considered, this may impact the outcomes and limit the ability to draw definitive conclusions.

CHAPTER 5: RECOMMENDATIONS

ICU 9 & 10 are being served by a single GDA and so is ICU 11 - the hospital can allocate a single GDA to deliver for all these ICUs as they are located on the same floor (2nd floor). This recommendation is based on the fact that 95 medicine packets were delivered to ICU 9 & 10 and 39 medicine packets were delivered to ICU 11 which collectively made 134 packets. Which is not that high not to be delivered by a single GDA. The efficiency percentage was 44 and 31 respectively which is not a very good indicator, so repurposing the already existing staff can be done.

5th B and 6th floor can also be served by a single GDA, as medicine packets delivered to 5th B was 47 and to 6th floor was 94 which makes the total of 141 medicine packets. If we look at the highest medicine packets delivered was also 141 and that was done by a single GDA in 14 trips. All this with an efficiency percentage of 36 and 39 respectively. Overall the understanding is that there needs to be efficient resource planning and this alteration would be very cost effective as well for the hospital.

Process Optimization: Bottlenecks or areas of inefficiency in the medication delivery process need to be identified other than delay in dispensing of medication. Look for opportunities to streamline workflows, reduce wait times, and improve overall process efficiency.

Prioritize high-demand areas: Patient care areas such as 8th floor, 11th floor, 12th floor, ICU 7 & 8 with consistently higher demand for medicine packets needs to be allocated with resources accordingly. This could involve adjusting delivery frequencies to meet the needs of these areas.

Grouping deliveries: Group deliveries based on the proximity of patient care areas. This involves planning routes that minimize travel distance and time between areas that are geographically close to each other. For example ICU 1 & 2 and ICU 3 & 4 are all on the same floor so they can be served by a single GDA rather than having 2 separate GDAs assigned for the same floor. By grouping nearby areas together, GDAs can reduce the number of trips required and optimize their travel route.

Re-evaluating staffing levels and schedules: By carefully monitoring the movements of GDA staff, hospital administrators may be able to identify areas where staffing levels are inadequate or where scheduling changes could improve efficiency. For example, by adjusting schedules to ensure that GDA staff are available during peak demand periods, it may be possible to minimize wait times and reduce the number of trips required.

Staff Training: It is important to regularly provide staff training to the clinical pharmacy GDA staff members on the accurate utilization of the pneumatic chute system. This training should focus on proper handling, loading, unloading and operation of the system to minimize errors and maximize efficiency. By improving staff competency in using the pneumatic chute, the overall workload can be reduced, leading to smoother and faster medication delivery.

Implementing technology solutions: By investing in technology solutions such as automated medication dispensers (30) or real-time tracking systems such as porter management system (PMS) (31) hospital administrators may be able to optimize the movement of GDA staff throughout the facility. Using PMS can provide us with the relevant information such as real time location of the GDA staff, which can be utilised to better utilise the staff for delivery purpose. This system can also be integrated with the current hospital information system (HIS) so that the system can automatically alot a GDA staff once the medication is ready for delivery. This can also help us to avoid staff slacking off work. Additionally the hospital administrators can efficiently plan staff for peak hours and days of the week.

Monitoring and evaluation: Monitoring and evaluation needs to be done on a constant basis to identify areas for further improvement and optimization. By tracking delay in medication deliveries, and performance metrics such time taken for delivery, number of trips made, and medication errors caused in the entire process specifically attributing towards the delivery process. Hospital management may be able to identify and pin point at the areas which require additional adaptations or any type of interventions that may be necessary.

CHAPTER 6: CONCLUSION

The study was set out to investigate the importance of medication management and associated problems, as well as explore the challenges related to porter management in a healthcare facility. The research examined various aspects such as medication dispensing, delivery of medicine packets, staff performance, and patient care areas.

Medication management has proven itself to be a critical aspect of the healthcare delivery system, envisaging patient safety and appropriate medications usage. It is essential for ensuring the best therapeutic outcomes for the patients. Strengthened medication management aids in controlling the onset of disease, reducing symptoms such as pain, and collectively improving the overall health of the patients by administering the appropriate medications at the appropriate time and amount. Additionally, by lowering the possibility of prescription errors, adverse drug interactions, leads to preventing ill fated consequences. Effective drug management depends on precise prescription of durg, cautious and timely dispensing, and appropriate administration methods.

Another crucial area that affects the efficiency and effectiveness of hospital operations more specifically pharmacy operations is porter management. Continuous patient care depends on prompt and effective medication delivery. The observational study evaluated how many trips the clinical pharmacy GDA team made and how many medicine packets did they deliver to the various patient care areas throughout the hospital. It also showcased that there were differences in how well each employee performed during their shift, highlighting the necessity for the hospital management to efficiently plan their porters.

The data analysis offered insights about the patterns and trends in porter performance and medicine movement. The number of trips and medication packets delivered across the hospital, the mean, median, mode, standard deviation, efficiency percentage, and correlation were all computed. The results revealed variations and inefficiency in the GDA team's performance while delivering the medication to all the patient care areas. Increasing patient criticality, need for increased medication for care, higher patient volumes, also indicated that certain areas continuously required more attention than others. The research also emphasised on the significance of effective resource planning and staffing allocation for streamlining the delivery process.

The study's findings have a number of ramifications for the hospital management. In order to guarantee patient safety and the best possible therapeutic results, it first needs to emphasise the significance of sound drug management procedures. To encourage adherence to treatment plans, this also includes precise prescribing, cautious and timely dispensing, and patient education. This report also emphasises on the necessity for effective porter management tactics to improve medicine packet delivery as it was clearly seen that the efficiency of the team was lower than 50%. This could entail streamlining the procedures of medication delivery by integrating technological solutions such as barcoding, porter management system, beacon systems, and optimising staffing levels.

Numerous recommendations can be made in light of the study’s findings. The hospital management should create personnel education and training programs for the clinical pharmacy GDA especially. Part of this program needs to focus on how to use the pneumatic chute system properly as a top priority, as the hospital has invested a lot in the technology. It is recommended that it may be more accurate and efficient to use automated methods for tracking and medication distribution to decrease medication errors and human errors. Additionally, continuous monitoring and evaluation of the medication management process helps spot opportunities for enhancement and guarantee best practices are being followed.

The multi-specialty, tertiary care hospital can think about optimising staffing schedules based on patient care demands for porter management, especially in high-volume regions. The location and travel time should also be considered in the re-planning of the staff. Real-time updates and delivery process streamlining can both be made possible through effective communication technologies, such as mobile applications or electronic tracking systems like a beacon system. Regular performance reviews and feedback protocols can also aid in pinpointing areas which require a certain specific staff member to improve.

The importance of medicine management and porter management for hospitals is highlighted by this research study. Patient safety, treatment effectiveness, and adherence to treatment goals are all guaranteed by on time drug delivery.

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