

Dissertation Training

at

Eye Q Hospital Pvt. Ltd., Udhna Branch, Surat, Gujarat

**Assessing Real-Time Stock Replenishment and Delivery Turnaround Time
(TAT) for Intraocular Lenses (IOLs), Operation Theatre (OT) Consumables,
and Medicines in a Tertiary Eye Care Setting.**

By

Ms. KRATI GUPTA

PG/23/052

Under the guidance of

Dr. Ratika Samtani

PGDM (Hospital & Health Management)

2023-25



International Institute of Health Management Research New Delhi

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International Institute of Health Management Research New Delhi

(Completion of Dissertation from respective organization)

The certificate is awarded to

Ms. KRATI GUPTA

in recognition of having successfully completed her Dissertation in the department of

Operations

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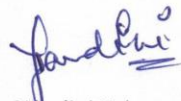
**ASSESSING REAL-TIME STOCK REPLENISHMENT AND DELIVERY TURNAROUND TIME (TAT) FOR
INTRAOCULAR LENSES (IOLS), OPERATION THEATRE (OT) CONSUMABLES, AND MEDICINES IN
A TERTIARY EYE CARE SETTING**

Date: March to June, 2025

Eye Q Vision Pvt. Ltd. Udhna Branch, Surat, Gujarat

She comes across as a committed, sincere & diligent person who has a strong drive & zeal for learning.

We wish him/her all the best for future endeavors.



Ms. Nandini Kalme

(Operations Manager)

Head – Human Resources



TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. KRATI GUPTA** student of PGDM (Hospital & Health Management) from International Institute of Health Management Research, New Delhi has undergone internship training at **Eye Q Vision Pvt. Ltd.** from **17th March to 24th June, 2025.**

The Candidate has successfully carried out the study designated to him during internship training and his/her approach to the study has been sincere, scientific and analytical. The Internship is in fulfillment of the course requirements. I wish him all success in all his/her future endeavors.



Dr. Sumesh Kumar

Associate Dean, Academic and Student Affairs

IIHMR, New Delhi



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Assistant Professor

IIHMR, New Delhi

Certificate of Approval

The following dissertation titled **ASSESSING REAL-TIME STOCK REPLENISHMENT AND DELIVERY TURNAROUND TIME (TAT) FOR INTRAOCULAR LENSES (IOLS), OPERATION THEATRE (OT) CONSUMABLES, AND MEDICINES IN A TERTIARY EYE CARE SETTING..** is hereby approved as a certified study in management carried out and presented in a manner satisfactorily to warrant its acceptance as a prerequisite for the award of **PGDM (Hospital & Health Management)** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

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Certificate from Dissertation Advisory Committee

This is to certify that **Ms. KRATI GUPTA**, a graduate student of the **PGDM (Hospital & Health Management)** has worked under our guidance and supervision. He/ She is submitting this dissertation titled **“ASSESSING REAL-TIME STOCK REPLENISHMENT AND DELIVERY TURNAROUND TIME (TAT) FOR INTRAOCULAR LENSES (IOLS), OPERATION THEATRE (OT) CONSUMABLES, AND MEDICINES IN A TERTIARY EYE CARE SETTING”** at **“EYE Q VISION PVT. LTD.”** in partial fulfillment of the requirements for the award of the **PGDM (Hospital & Health Management)**.

This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report or book.



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CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled **ASSESSING REAL-TIME STOCK REPLENISHMENT AND DELIVERY TURNAROUND TIME (TAT) FOR INTRAOCULAR LENSES (IOLS), OPERATION THEATRE (OT) CONSUMABLES, AND MEDICINES IN A TERTIARY EYE CARE SETTING** and submitted by KRATI GUPTA Enrollment No. PG/23/052 under the supervision of Dr. RATIKA SAMTANI for award of PGDM (Hospital & Health Management) of the Institute carried out during the period from 17TH March to 24th June, 2025 embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.



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FEEDBACK FORM

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Name of the Organisation in Which Dissertation Has Been Completed: EYE Q VISION PVT. LTD. UDHNA BRANCH, SURAT, GUJARAT

Area of Dissertation: ASSESSING REAL-TIME STOCK REPLENISHMENT AND DELIVERY TURNAROUND TIME (TAT) FOR INTRAOCULAR LENSES (IOLS), OPERATION THEATRE (OT) CONSUMABLES, AND MEDICINES IN A TERTIARY EYE CARE SETTING.

Attendance: Adherence as per dissertation 100%

Objectives achieved: Yes

Deliverables: Submitted a well documented dissertation & training report with insightful analysis. Actively contributed to departmental tasks/targets and process improvements.

Strengths: Proactive, dependable, observant and adaptable

Suggestions for Improvement: Improve assertiveness during cross-departmental functional coordination.

Suggestions for Institute (course curriculum, industry interaction, placement, alumni): Encourage more hands-on exposure to real-time hospital system.

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Date: 1st July, 2025
Place: Surat, Gujarat





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I extend my gratitude to the **entire Eye-Q team**, especially the dedicated staff at the **Udhna branch**, for their cooperation, support, and for making my training period smooth and insightful. Working with such a committed team helped me understand hospital operations in depth.

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TABLE OF CONTENTS

S. No.	Particulars	Page No.
1.	Completion Of Dissertation From Respective Organization	3
2.	To Whomsoever It May Concern	4
3.	Certificate Of Approval	5
4.	Certificate From Dissertation Advisory Committee	6
5.	Certificate By Scholar	7
6.	Feedback From	8
7.	Plagiarism Certificate	9
8.	Acknowledgement	10
9.	Table Of Contents	11
10.	List Of Abbreviations	12
11.	List Of Tables And Figures	13
12.	Organizational Learning	14
13.	Organizaton Overview	15-19
14.	Key Competency Summary and Conclusion	20
15.	Supply Chain Eye Q	21
16.	Project Report	22
17.	Abstract	23
18.	Introduction	24
19.	Literature Review	25
20.	Research Methodology	26-27
21.	Results - Quantitative	28-36
22.	Qualitative Results Summary Table	37-38
23.	Discussion	39-40
24.	Conclusion And Recommendations	41
25.	References	42

LIST OF ABBREVIATIONS

Abbreviation	Full Form
CMD	Chairman and Managing Director
CEO	Chief Executive Officer
OT	Operation Theatre
IOL	Intraocular Lens
TAT	Turnaround Time
HMS	Hospital Management System
OP/IP	Outpatient/Inpatient
OPD	Outpatient Department
AR	Auto Refractometer
NCT	Non-Contact Tonometer
PD	Pupillary Distance
PO	Purchase Order
GRN	Goods Receipt Note
MRD	Medical Records Department
CSR	Corporate Social Responsibility
NABH	National Accreditation Board for Hospitals and Healthcare Providers
CRM	Customer Relationship Management
TPA	Third Party Administrator
JIT	Just-In-Time
VMI	Vendor Managed Inventory
AI	Artificial Intelligence
SRB	Scientific Review Board

LIST OF TABLES AND FIGURES

S.No.	Table or Figure	Page No.
1.	<i>Figure 1: TAT Distribution for IOLs</i>	28
2.	<i>Figure 2: Delay Reasons for IOLs</i>	29
3.	<i>Figure 3: Operational Impacts Levels from IOLs Delays</i>	30
4.	<i>Figure 4: TAT Distribution for OT Consumables</i>	31
5.	<i>Figure 5: Delay Reasons for OT Consumables</i>	32
6.	<i>Figure 6: Operational Impact from OT Consumable Delays</i>	33
7.	<i>Figure 7: TAT Distribution for Medicines</i>	34
8.	<i>Figure 8: Delay Reasons for Medicines</i>	35
9.	<i>Figure 9: Operational Impact of Medicine Delays</i>	36
10.	<i>Table 1: Summary Turnaround Time by Category</i>	36
11.	<i>Table 2: Qualitative Results Summary Table for IOLs</i>	37
12.	<i>Table 3: Qualitative Results Summary Table for OT Consumables</i>	37
13.	<i>Table 4: Qualitative Results Summary Table for Medicines</i>	38

ORGANIZATIONAL LEARNING

ORGANIZATON OVERVIEW

The Eye-Q hospital chain, led by the renowned eye surgeon **Dr. Ajay Sharma (CMO) and Mr. Rajat Goyal (CEO)**, is dedicated to delivering the highest quality eye care services at affordable prices throughout India. As an ISO 9001-2015 registered organization, Eye-Q operates a network of 30 domestic Super-Speciality Eye Hospitals across Delhi-NCR, Haryana, Uttar Pradesh, Uttarakhand, and Gujarat, along with two hospitals in Nigeria, Africa.

Vision: To be India's foremost chain of eye Hospital in terms of both Quality of eye care and the Number of patients handled.

Mission: To make every patient an Ambassador for Eye-Q through a combination of: -

- Highest level of quality and technology in eye care.
- Exceptional personal care.
- Complete integrity to the patient and his/her needs

VALUES

Be honest and open in my communication and do what I say I will do

- I accept our individual & team responsibility and meet my commitments each & every time ■
- Our clinical & non clinical team is supportive of each other's efforts and care for each other ■
- Give care, compassion & respect to patients and colleagues as I expect for myself
- Will make conscious effort to contribute in creating a social impact
- Will embrace and drive positive change
- I will feel Proud of Eye Q

360° Organizational Learning Experience

Position: Management Trainee

Organization: Eye Q Super Speciality Eye Hospital, Udhna Center

Duration: 17th March –24th July, 2025 (3 Months)

Training Timeline & Departmental Rotation:

Month	Departmental Focus	Duration
Month 1	Patient Relations (PRE), Registration, Optometry	Week 1–4
Month 2	Pharmacy, Optical, OT Training, Product Knowledge	Week 5–8
Month 3	Counselling, Operations, Quality, CSR, Research Work	Week 9–12

Introduction

As a Management Trainee at Eye Q Super Speciality Eye Hospital, Udhna Branch, I underwent a comprehensive 360-degree training experience designed to provide holistic exposure to the operations, patient services, quality standards, and administrative frameworks that drive a super-speciality healthcare facility. This rotational training was spread over three months and strategically divided across key departments to ensure practical learning, systems understanding, and skill development at both clinical and operational levels.

Month 1: Patient Interface and Clinical Foundations

During the first month, my training focused primarily on patient-facing departments, including the Patient Relations Executive (PRE) module, the registration desk, and the optometry room. I was trained extensively in the EyeTech HMS software where I learned to generate OP/IP slots, manage appointments and billing, update patient demographics, and assist with surgery scheduling. I performed around 15–20 patient data entries under the supervision of senior PREs, which helped me build foundational administrative competence.

At the registration desk, I learned the art of greeting patients, encouraging them for free screening, and facilitating smooth registration experiences. I collected over 20 Google reviews and familiarized myself with various visit types (new, old, review, corporate), consultation charges, and the hospital's fee structure. I also worked as an OPD assistant and became acquainted with the maintenance of manual records such as emergency, medico-legal, and visitor suggestion registers.

In the optometry room, I observed the functioning of ophthalmic diagnostic tools including AR, NCT, vision refraction setups, and slit lamp microscopes. I took readings for 5–10 patients under supervision, learning basic diagnostic protocols and deepening my understanding of how preliminary assessments contribute to a patient's care journey.

Month 2: Intermediate Technical & Sales Training

The second month emphasized pharmacy operations, optical sales, operation theater processes, and product knowledge. My pharmacy training involved an in-depth understanding of ophthalmic medicines, including high-risk and LASA drugs. I assisted with outpatient medicine issues, explained dosage instructions to patients, supported early-May pharmacy audits, and engaged in PO/GRN management. These tasks enhanced my appreciation for pharmaceutical protocols, inventory controls, and patient safety mechanisms.

My time in the optical department involved learning about various lens types and coatings, PD marking, and the counseling process for frame and lens selection. I became familiar with key lens brands (Essilor, Vision Rx) and frame brands (Ray-Ban, Eye Q, Nova, etc.). I was involved in PO generation, GRN entry, and billing, and I also helped perform frame audits. Observing the Optical Sales Executive, I learned how sales and patient satisfaction are balanced through proper product counseling and service.

Operation Theater (OT) training was an enriching experience. I observed over 10 surgeries and understood preoperative and postoperative protocols such as autoclaving, fogging, and ethical conduct within a sterile field. I was trained to fill MRD case sheets, raise IOL indents, and manage consumable stock entries in the EyeTech HMS system. I reviewed multiple OT registers, learning how infection control, biomedical waste management, and equipment monitoring are documented rigorously.

Additionally, I started gaining product knowledge related to superspecialty ophthalmic care, including LASIK (various types), ICL, PRK, and retina surgeries. I understood the categorization and differences in products used for glaucoma, squint correction, and pterygium. This phase highlighted the need for deeper clinical-product knowledge to aid in patient counseling and surgical planning.

Month 3: Strategic Operations, Counselling & Research

The final month focused on operations management, patient counselling, quality assurance, and exposure to community and CSR activities. In the counselling module, I observed and participated in patient interactions related to cataract, LASIK, and retina treatments. I understood the distinctions between monofocal, EDOF, and trifocal IOLs and their pricing packages. I successfully conducted two counselling sessions and converted one patient. Additionally, I handled CRM form filling and supported the pre-authorization documentation process for TPA-insured patients.

My operations management training included daily preparation of OM sheet reports and gaining familiarity with essential business levers like culture reports, biomedical waste data, incident tracking, and departmental self-audits. I organized a team-building activity after a patient offered free mela passes, which allowed me to explore employee engagement in a hospital setting.

I worked alongside the Quality Officer during internal audits and attended formal quality training. I learned about NABH-aligned parameters and compliance indicators that are critical for maintaining hospital standards. These experiences gave me a strong foundation in the governance side of healthcare operations.

In addition to hospital operations, I participated in the NTPC CSR Cataract Camp organized by Eye Q's Rander Center. Here, I helped in patient registration, screening coordination, and gained firsthand experience in delivering community-based eye care services through public-private partnership models.

My academic work involved preparing a research proposal titled *“Assessing Real-Time Stock Replenishment and Delivery Turnaround Time (TAT) for Intraocular Lenses (IOLs), Operation Theatre (OT) Consumables, and Medicines in a Tertiary Eye Care Setting.”* This research was submitted for SRB approval as part of my college dissertation and aligned closely with my operational observations.

Key Competency Summary

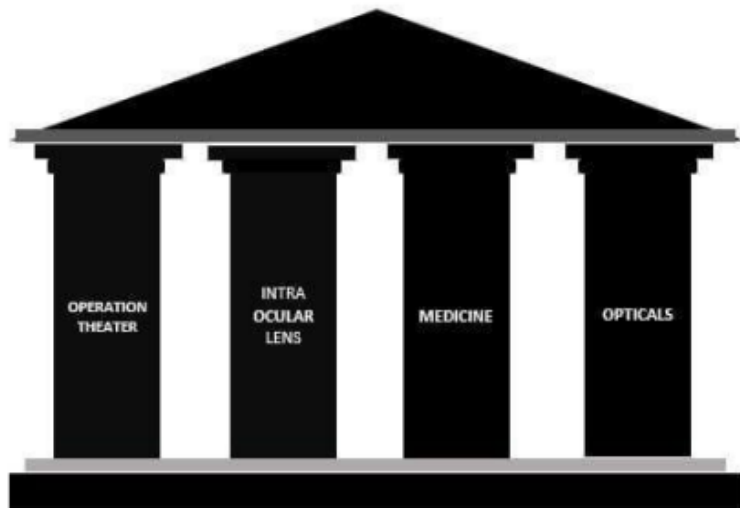
Over the course of my 3-month training, I developed a robust set of skills across patient interaction, diagnostic procedures, pharmaceutical management, optical sales, operation theater processes, and strategic operations. My competencies include effective communication, software proficiency in HMS, supply chain documentation, clinical product knowledge, quality standards, and counselling practices. I also demonstrated initiative through participation in CSR and research work.

Conclusion

This 360-degree training experience at Eye Q Hospital Udhna has been instrumental in shaping my understanding of hospital operations in both clinical and administrative dimensions. The structured departmental exposure over three months has equipped me with practical, strategic, and interpersonal competencies that are critical for a future role in healthcare management. Continued learning in counselling conversion, advanced product detailing, and quality systems will further strengthen my preparedness for leadership roles in healthcare.

SUPPLY CHAIN EYEQ

Supply Chain Management is a systematic approach encompassing the strategic coordination and oversight of procurement, transportation, storage, and distribution activities, ensuring efficient and effective flow of materials and products from suppliers to customers.



PROJECT REPORT

**“Assessing Real-Time Stock Replenishment and Delivery
Turnaround Time (TAT) for Intraocular Lenses (IOLs), Operation
Theatre (OT) Consumables, and Medicines in a Tertiary Eye Care
Setting”**

ABSTRACT

Background: Effective inventory management in healthcare is critical for uninterrupted services (1). Delays in replenishing essential medical items can disrupt operations and patient care (2). This study evaluated real-time stock replenishment processes and delivery turnaround time (TAT) for intraocular lenses (IOLs), operation theatre (OT) consumables, and medicines at Eye Q Vision Pvt. Ltd., Udhna Center (Surat), using the Eyetech inventory system.

Objectives: The study aimed to measure average TAT for each category, identify bottlenecks in the replenishment cycle, gather staff perspectives on coordination and delays, and recommend improvements.

Methods: A cross-sectional retrospective design was used. Quantitative data (January–June 2024) were extracted from the Eyetech logs, TAT records, and depot delivery reports. Descriptive statistics (mean, median, range) and frequency analyses were performed in Excel. Qualitative data were collected via semi-structured interviews with 4–5 key staff (inventory, pharmacy, depot logistics, management) and observations of workflows. Thematic analysis identified recurrent issues. Ethical approval was secured and informed consent obtained from participants.

Results: The average TAT for IOLs was ~1.4 days (range 0–4 days), within the ideal 0–1 day benchmark. OT consumables had a higher mean TAT (~8.7 days; range 1–60 days; ideal 5 days), and medicines had a mean TAT of ~7.8 days (range 2–36 days; ideal 2 days). Common delay reasons included vendor backlogs, depot coordination lapses, and data-entry mismatches. Operational impact analysis showed that medicines had the highest proportion of major delays, followed by IOLs and OT consumables. Interviews revealed challenges in approval processes, inadequate system updates, and communication gaps with the central depot.

Conclusion: While IOL replenishment was largely timely, consumables and medicines suffered significant delays. Bottlenecks were linked to manual approval lags and supply-chain issues. Recommendations include improving Eyetech data accuracy, streamlining approval workflows, maintaining buffer stock for critical items, and strengthening depot communication. Adopting lean inventory practices and enhancing JIT (just-in-time) coordination with suppliers could reduce holding costs and minimize stockouts. The findings offer actionable insights to optimize inventory management and turnaround times in specialized hospital settings.

Keywords: Inventory management, Turnaround time, Intraocular lenses, OT consumables, Medicines, Justin-Time (JIT), Healthcare supply chain.

INTRODUCTION:

Efficient inventory management is vital in healthcare to ensure the availability of critical supplies, such as intraocular lenses (IOLs), surgical consumables, and medicines (3,4). Delays or stockouts in these items can disrupt patient care, postpone surgeries, and degrade quality of service (1). The Eye Q Vision Pvt. Ltd., Udhna Center in Surat has implemented a real-time inventory system (“Eyetechn”) to monitor stock levels and automate replenishment. However, despite this technology, the center faces recurring supply delays. Preliminary discussions with staff revealed that approval bottlenecks, data entry issues, and coordination gaps with the central depot may be contributing to high turnaround times. With a growing surgical caseload, timely restocking is increasingly critical. Inadequate inventory leads to either overstocking (wasted capital) or understocking (service disruptions) (5). In India and globally, hospitals often struggle with coordinating between central warehouses and individual units, resulting in elongated replenishment TATs (6). This research aims to systematically assess the real-time replenishment process at Eye Q Udhna, quantify average TATs for IOLs, OT consumables, and medicines, and identify where delays occur. By pinpointing these bottlenecks, the study seeks to propose data-driven recommendations to optimize the supply chain in this specialized tertiary eye-care setting.

Problem Statement: Despite automation, stock replenishment at the Eye Q Udhna Center experiences delays that impact operations. This study will analyze the end-to-end replenishment cycle, measure TAT for key categories, and explore the causes and effects of any delays.

Significance: Ensuring timely availability of surgical supplies is critical in eye care. Findings can improve patient scheduling, reduce canceled procedures, and enhance overall efficiency. Given the high cost and perishability of ophthalmic supplies, optimizing inventory is both a financial and clinical imperative.

LITERATURE REVIEW

Healthcare inventory represents a significant portion of hospital operating budgets (7). Poor inventory practices can lead to wastage of resources and compromised patient care (2). Overstocks tie up capital and risk expiration of goods, while understocks cause delays and interruptions in service (8). Inadequate inventory management is a major source of inefficiency in healthcare supply chains . Many studies show that efficient supply chain management (including timely replenishment) correlates with reduced costs and improved outcomes (2,3,4).

Real-Time Systems and Just-In-Time (JIT) Practices: Advances in information systems have enabled realtime tracking of stock. Such systems can automatically trigger orders when levels fall below thresholds, improving responsiveness (9). For instance, JIT inventory approaches help hospitals match supply with demand, minimizing excess inventory without jeopardizing service quality (10). JIT requires close collaboration with suppliers, accurate forecasting, and visibility across the supply chain (10). When well-implemented, JIT can yield cost savings (e.g. millions per hospital annually in the US) and reduce waste . However, during disruptions (e.g., pandemics), even robust JIT systems can falter, highlighting the need for contingency planning (10).

Turnaround Time (TAT) and Clinical Impact: Several studies underline the criticality of rapid replenishment in surgical settings. Delayed availability of an IOL or critical consumable may force surgery rescheduling or use of suboptimal alternatives (3). The impact of such delays can range from minor (short work-day delays) to major (cancellation of procedures or clinical compromise). In ophthalmology, where patient throughput and visual outcomes are paramount, even small delays can significantly affect service efficiency and patient satisfaction . Therefore, measuring and improving TAT is a recognized priority in hospital logistics.

Supply Chain Challenges in Healthcare: Indian tertiary care centers often contend with limited storage space and variable demand. Literature suggests common bottlenecks: manual approval processes, outdated inventory records, unpredictable supplier performance, and transportation delays (11). Solutions proposed include lean inventory techniques and automation. For example, process audits and lean workflows have been shown to reduce non-value activities in hospital logistics . Integration of demand forecasting, along with clearer communication channels with central warehouses, is recommended to minimize stockouts(12). This study builds on existing evidence by specifically quantifying TAT for high-value ophthalmic items and identifying local causes of delays. While global studies have examined JIT and inventory metrics, there is a gap in focused research on ophthalmology settings in India. By aligning with IIHMR's guidelines, the study will use a structured approach to compare actual versus ideal replenishment timelines and to contextualize findings within the broader supply chain literature.

RESEARCH METHODOLOGY

Study Design and Setting: A retrospective cross-sectional design was employed. The study was conducted at Eye Q Vision Pvt. Ltd., Udhna Center (a tertiary eye-care facility in Surat, Gujarat) . Data were collected for a continuous 6-month period (January–June 2024) to capture sufficient variation in order frequency and TAT.

Data Sources: Multiple data sources were used to triangulate findings:

- **Eyeteck Inventory System Logs:** Automated records of stock movements, requisitions, and order timestamps.
- **Depot Delivery Records:** Shipment logs from the central depot to the Udhna Center.
- **Local Inventory Records:** Manual and digital stock cards and order sheets maintained at Udhna Center.

Additionally, **qualitative data** were gathered via:

- **Semi-Structured Interviews:** Conducted with 4–5 key personnel involved in stock management, including inventory/pharmacy staff, a depot logistics coordinator, a software (Eyeteck) operator, and an operations manager . An interview guide (see Supplement) ensured consistency.
- **Observations:** Direct observation of replenishment workflows, focusing on data entry, approval procedures, and communication with depot. Field notes were recorded to capture process nuances.

Sampling and Participants: A purposive sampling strategy was used for interviews, selecting staff based on role relevance (inventory, procurement, pharmacy, logistics, management) . For quantitative data, all stock requests made for IOLs, OT consumables, and medicines during the study period were included (approximately 30–50 orders per category) to ensure adequate representation.

Variables: Key variables included:

- **Turnaround Time (TAT):** Defined as days between stock request (order) and stock receipt (delivery).
- **Delay Reasons:** Coded from logs/interviews (e.g. vendor delay, transport hold-up, data-entry error).
- **Impact on Operations:** Categorical measure (No/Minor/Moderate/Major impact) of how delays affected surgeries or pharmacy operations (see Supplement for definitions).

Data Analysis:

- **Quantitative:** All numeric data were entered into Microsoft Excel. Descriptive statistics for TAT were computed by category. The frequency of delays and their causes were tabulated. Comparative charts (average vs ideal TAT, impact distribution) were generated (see Figures).

- **Qualitative:** Interview recordings were transcribed. **Thematic analysis** was performed to identify recurring issues in stock handling, approval workflows, and system use. The themes were triangulated with observation notes to validate findings.

Ethical Considerations: Institutional approval was obtained from IIHMR Delhi. All interview participants provided informed consent after being briefed on the study's purpose. Personal identifiers were anonymized. Data were stored securely and used solely for academic purposes.

RESULTS

1. Intraocular Lenses (IOLs)

Turnaround Time: Among 37 IOL requisitions (Jan–June 2024), the mean TAT was approximately 1.43 days (range 0–4 days). An ideal TAT of 0–1 day was expected for immediate use items. Notably, 13 requests had no delay (TAT 0–1), but 24 experienced delays (TAT >1 day). Overall, the average was within an acceptable range for IOLs.

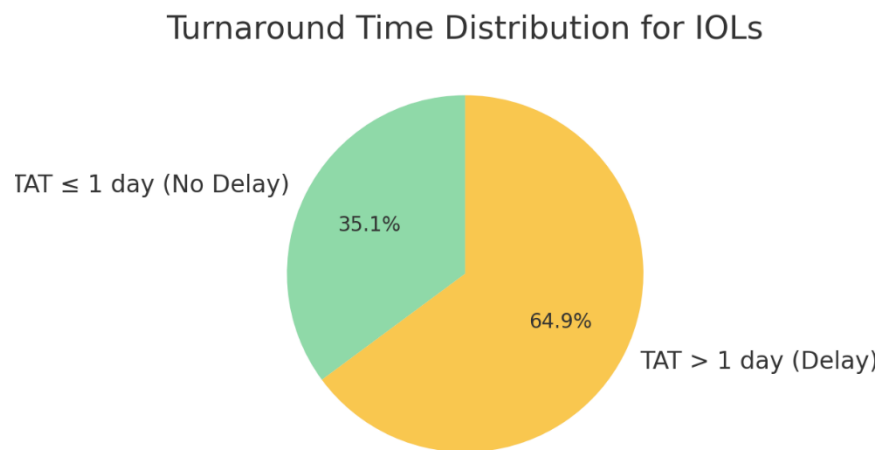


Figure 1: TAT Distribution for IOLs

Delay Reasons: Key causes of delay included:

- *Vendor/Supplier Delays:* 6 orders (e.g. IOL unavailable or late shipment).
- *Depot Coordination Delays:* 7 orders (e.g. slow transfer from warehouse).
- *Data Entry Errors:* 6 orders (incorrect stock update in Eyetech).
- *Approval Delays:* 5 orders (internal paperwork lag).

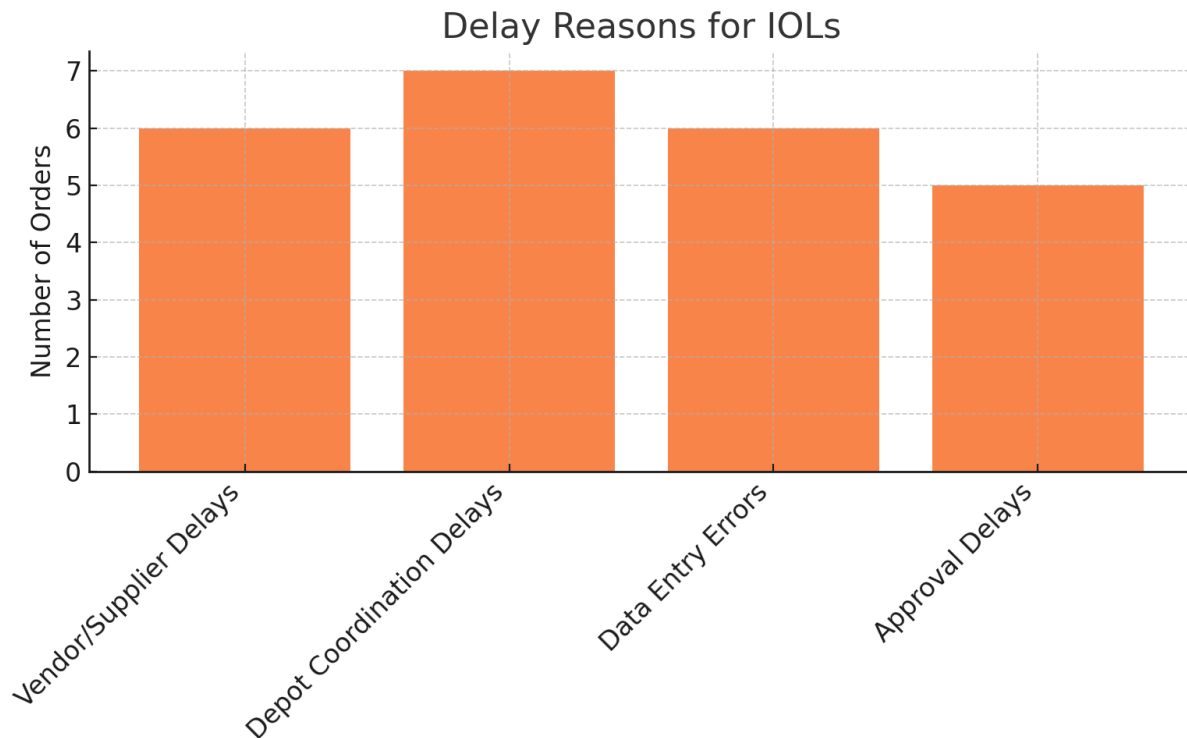


Figure 2: Delay Reasons for IOLs

Operational Impact: Of the 37 IOL orders, 24 had an “**Impact on OT scheduling: Yes**”. According to staff feedback, minor impacts (e.g. 30-60 min procedure delays) were most common, but 3 orders caused a major impact (surgery rescheduled). No IOL delays resulted in surgery cancellations, but some required brief workarounds (e.g. switching to an alternative lens).

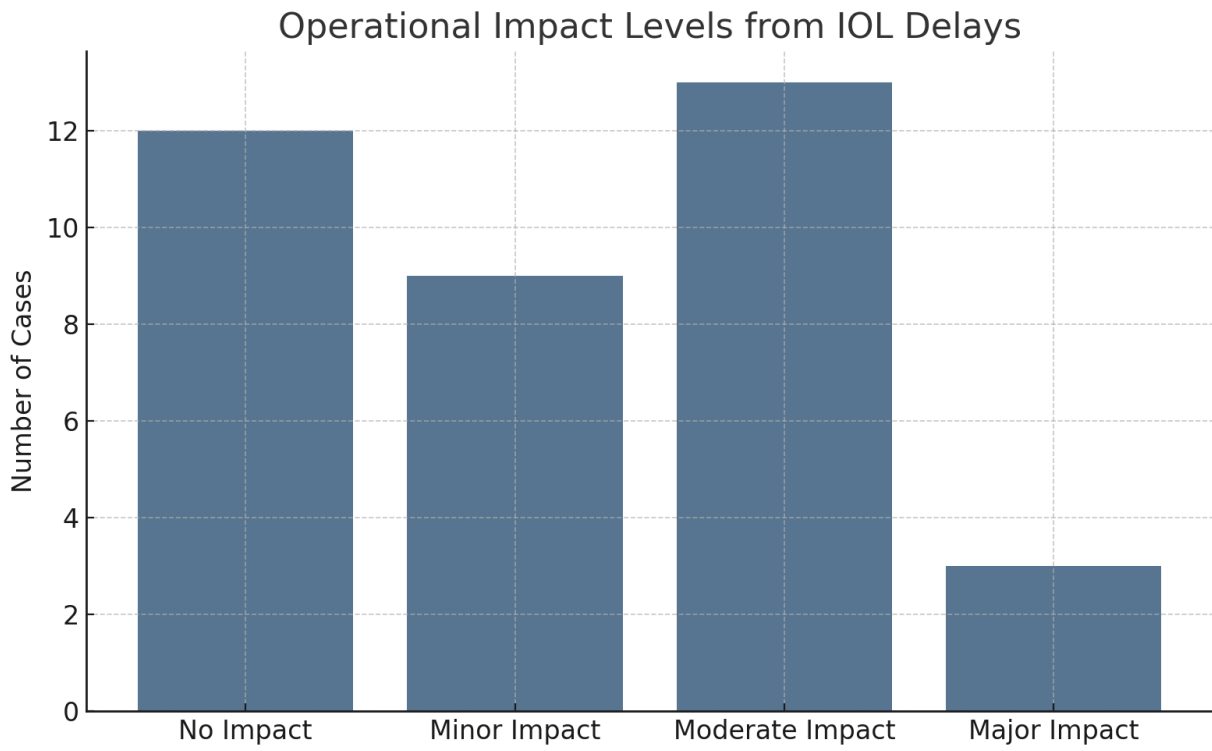


Figure 3: Operational Impacts Levels from IOLs Delays

2. OT Consumables

Turnaround Time: For 35 OT consumable orders, the mean TAT was ~8.7 days (range 1–60 days). The ideal benchmark was set at 5 days . Only 15 of 35 orders met the ideal; many far exceeded it.

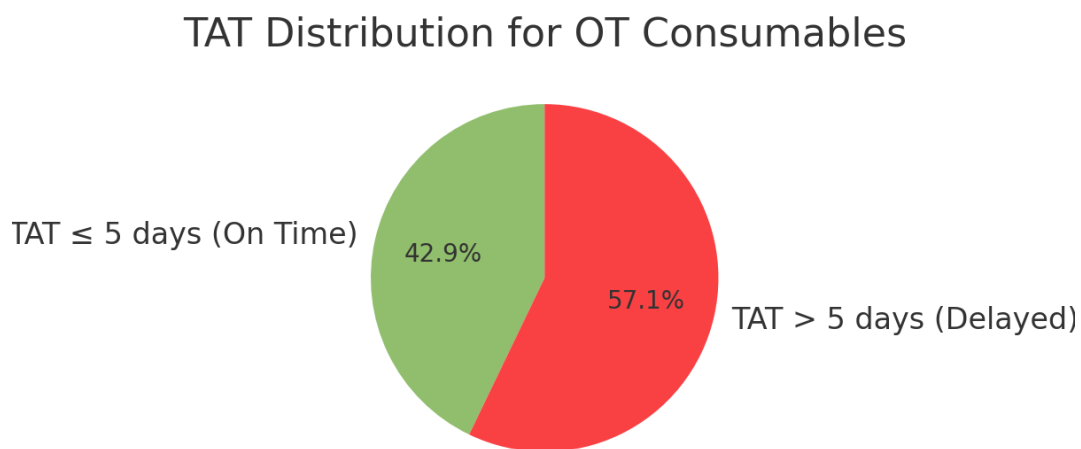


Figure 4: TAT Distribution for OT Consumables

Delay Reasons: Multiple factors contributed to delays:

- *Inventory Mismatch:* 5 orders (system showed stock, but actual count was short).
- *Forecasting Error:* 4 orders (unanticipated demand spike).
- *Vendor Backlog:* 3 orders (suppliers had backlog orders).

- *Depot/Transport Delay*: 3 orders (logistics slow or vehicle issues).
- *Approval Delay*: 3 orders (internal sign-off lag).
- *Batch Expiry Concern*: 2 orders

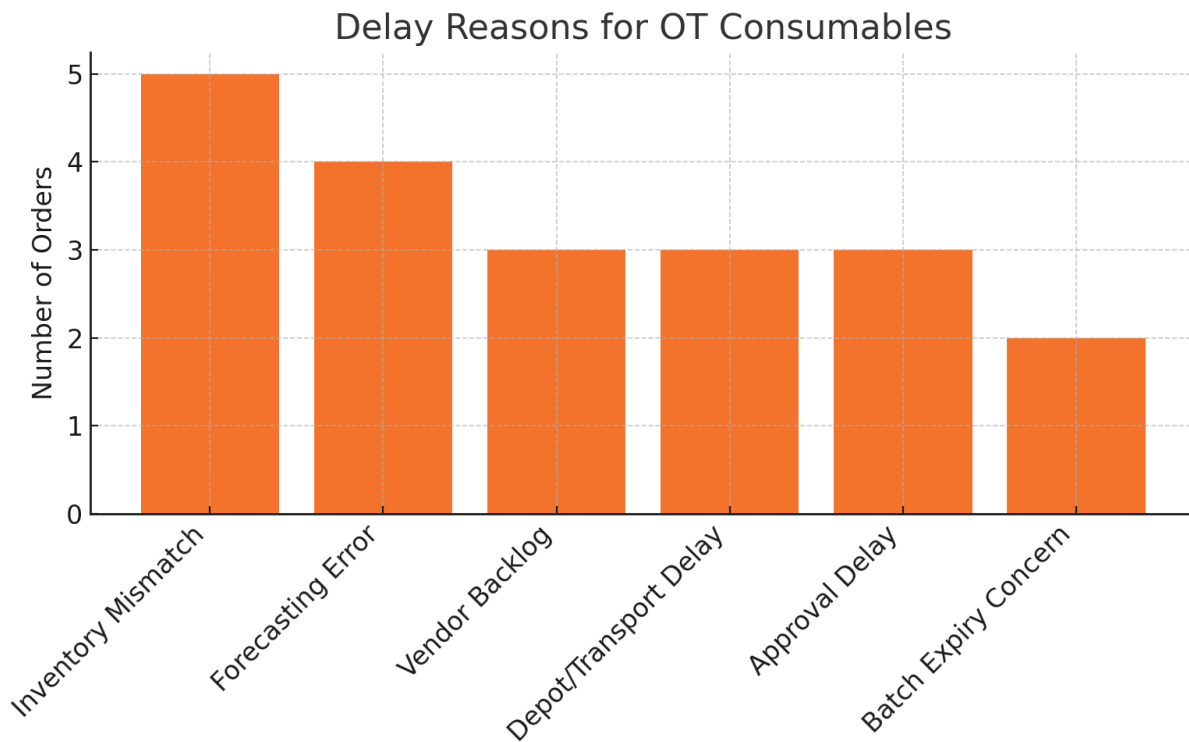


Figure 5: Delay Reasons for OT Consumables

Operational Impact: 19 of 35 orders impacted OT functioning. Minor impacts (temporary substitutions, brief schedule adjustments) occurred in 9 cases, moderate impacts (delay of entire OT list) in 7, and major impacts (emergency cases affected) in 2. For example, a delay in suture delivery led to postponed surgery.

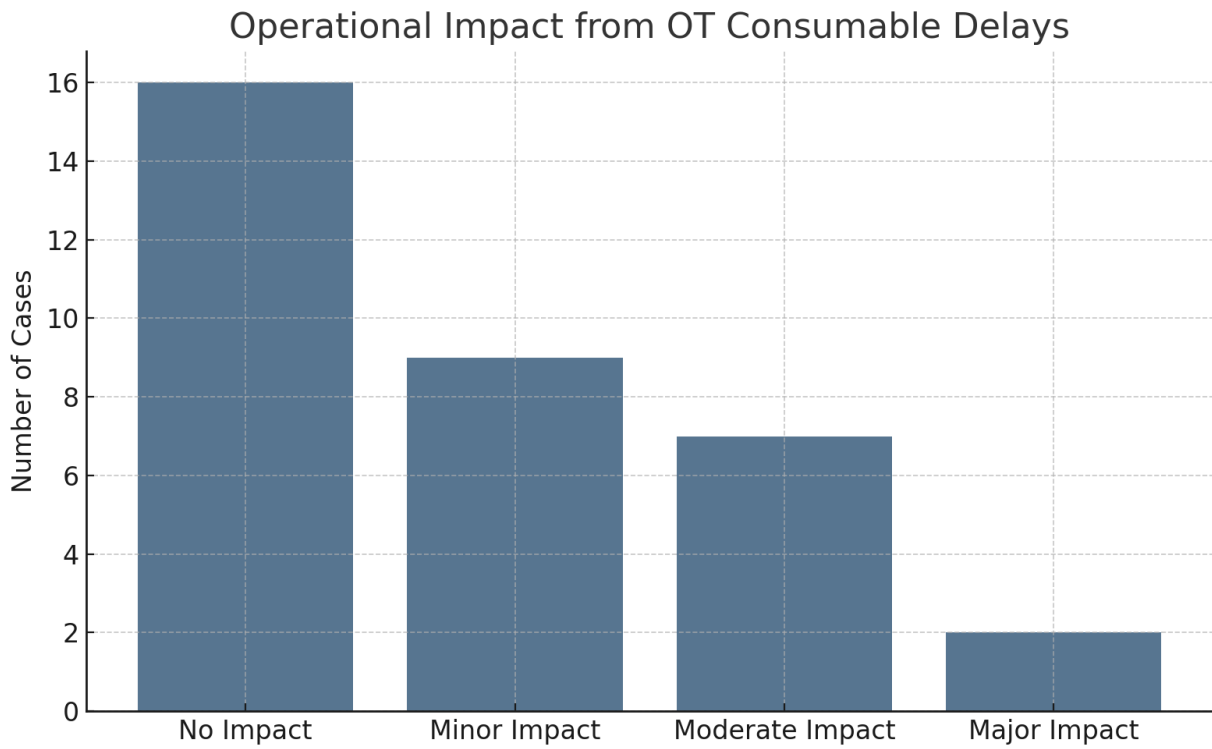


Figure 6: Operational Impact from OT Consumable Delays

3. Medicines

Turnaround Time: Of 44 medicine replenishment events, mean TAT was ~7.82 days (range 2–36 days); ideal TAT was 2 days . Only 5 orders met the ideal. Several outliers skewed the mean upward (long waits due to complex order processing).

Medicine Replenishment Turnaround Time (TAT) Compliance
Met Ideal TAT (≤ 2 days)

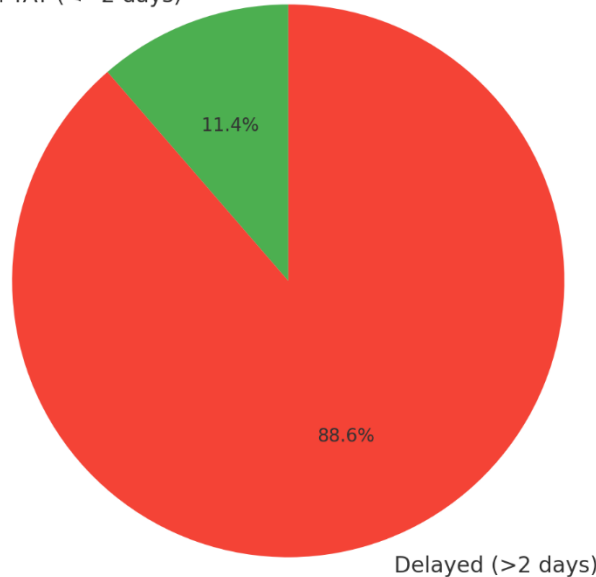


Figure 7: TAT Distribution for Medicines

Delay Reasons: The most common causes were:

- *Supplier Stockout:* 11 orders (vendor out of stock).
- *Late Goods-Received Note (GRN) Entry:* 10 orders (unlogged delivery delays detection).
- *Regulatory Hold:* 6 orders (awaiting compliance clearance).
- *Purchase Order Approval Delays:* 6 orders.
- *Cold Chain Breakage:* 4 orders (required re-dispatch).
- *Emergency Reallocation Elsewhere:* 2 orders (stock diverted for emergencies).

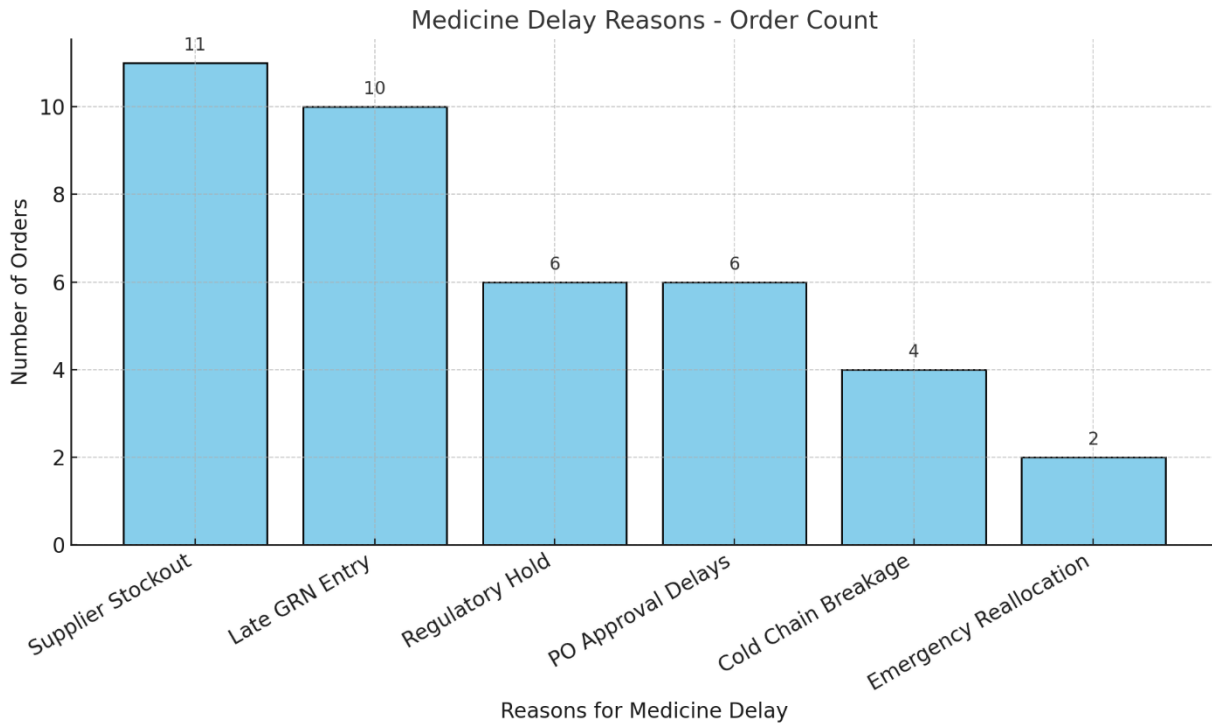


Figure 8: Delay Reasons for Medicines

Operational Impact: 22 of 44 medicine orders had reported impacts. Most were minor 7 caes (slight delays in administration with alternative dosing) or moderate 4 cases (delaying initiation of therapy). Notably, 7 instances were classified as major impacts, such as switching to second-line drugs or transferring patients due to critical medicine unavailability

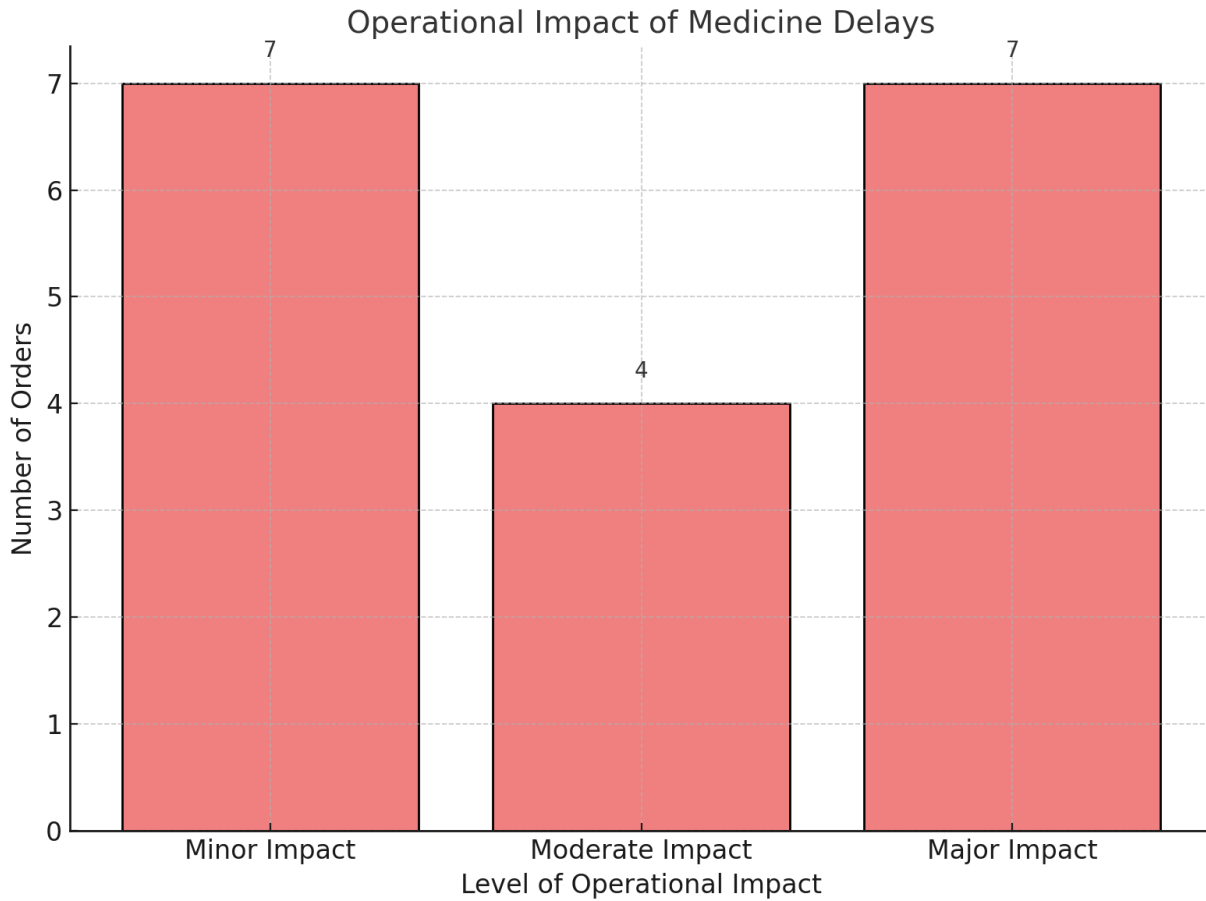


Figure 9: Operational Impact of Medicine Delays

Summary Table 1: Turnaround Time by Category

Category	Mean TAT (Days)	Min	Max	Ideal TAT (Days)	#Requests	#Delayed (>Ideal)
IOLs	1.43	0	4	0-1	37	24
OT Consumables	8.71	1	60	5	35	20
Medicines	7.82	2	36	2	44	39

(All results based on compiled logs; "Delayed" defined as TAT exceeding ideal.)

QUALITATIVE RESULTS SUMMARY TABLE

□ 1. Intraocular Lenses (IOLs) – Table 2:

Theme	Summary of Key Insights	Supporting Quotes
Administrative Delays	Approval and vendor communication delays affect surgery scheduling.	“Approvals take 2–3 days minimum.” “Sometimes the vendor confirmation is late.”
Eyeteck System Gaps	System doesn’t give real-time alerts on IOL stockouts; manual checks are required.	“There’s no alert when lens power is missing.” “We check manually before PO.”
Emergency Responses & Workarounds	Staff coordinate with nearby Eye Q centers to borrow lenses.	“We borrow from Randher or Parle Point if needed urgently.”
Impact on Revenue & Patient Satisfaction	Delays lead to rescheduling surgeries, loss of patients, and reduced revenue.	“If the IOL isn’t there, we postpone surgery.” “Sometimes patients get angry and don’t return.”
Suggestions for Improvement	Predictive alerts and lens-wise forecasting should be built into the system.	“The system should alert us if any power is low.” “Auto-requisition based on consumption would help.”

□ 2. OT Consumables- Table 3:

Theme	Summary of Key Insights	Supporting Quotes
Inventory Tracking Challenges	Consumables are difficult to track; mismatch between software and physical stock is common.	“The stock shows in software but isn’t physically there.” “Consumables don’t sync in real time.”
Eyeteck System Limitations	No alerts for low stock or expiry of consumables.	“No expiry alerts—sometimes we only find out at the OT table.”
Administrative Gaps	Purchase orders are based on manual stock counts; forecasting is absent.	“We don’t forecast—we raise PO when stock is very low.”
Emergency Workarounds	Staff borrow consumables from other centers or manage with substitutes.	“We got suture packs from another center when we ran out.” “Sometimes we use what’s available if there’s no time.”
Suggestions for Improvement	System should show real-time consumable expiry alerts and reorder triggers.	“If expiry alerts pop up, it’ll help avoid waste.” “A daily use trend report will help in planning.”

□ 3. Medicines – Table 4:

Theme	Summary of Key Insights	Supporting Quotes
Stockout Consequences	Out-of-stock medicines result in local purchases or revenue loss when patients don't return.	"If glaucoma meds aren't in stock, we lose the sale." "We do local purchase in urgent cases."
No Forecasting/Manual PO	System lacks forecasting for medicine usage; staff raise orders manually.	"We manually check stock, no pop-ups." "The system doesn't help with forecasting."
Coordination via Ticket System	Coordination happens via EYE Quick, but follow-up is often delayed.	"We raise tickets but they're not resolved quickly."
High-demand Medicines	Long-term patients (e.g., glaucoma) expect availability; stockouts affect trust and revenue.	"Patients buy glaucoma drops in bulk—if it's not there, they don't come back."
Suggestions for Improvement	Demand trend-based ordering, alert systems, and expiry tracking needed.	"Add alerts for short expiry medicines." "Trend-based suggestions for PO would help."

DISCUSSION

This study reveals significant disparities in stock replenishment performance across product categories. IOL orders were mostly timely (mean ~1.4 days) and within acceptable norms. This likely reflects the high priority given to surgical implants and perhaps a smaller number of suppliers with reliable schedules. In contrast, OT consumables and medicines experienced much longer delays (mean ~8–9 days) than their targets. These findings align with studies noting that non-sterile consumables often suffer from forecasting and supplier issues in hospital supply chains.

The qualitative findings shed light on root causes. Many delays stemmed from procedural bottlenecks. For example, manual approval processes at the center often took 1–2 days, pushing the baseline TAT higher. Some staff also reported gaps in how frequently inventory levels are updated in Eyetechn (e.g., low stocks not reflected, leading to last-minute orders). This echoes prior literature that notes inaccurate usage data and delayed entries are common impediments. Vendor-side issues (stockouts or backlogs) were prominent for medicines, as these often come from multiple suppliers with variable lead times.

The impact analysis highlights risk: medicine delays showed the greatest severity, with the highest share of major disruptions. This is concerning given the potential patient harm. It suggests that the pharmacy may lack sufficient buffer stock or alternatives for critical medications. The interview data confirmed that emergency protocols exist but are reactive (arranging special deliveries only after detecting a shortage). In contrast, IOL delays had mostly minor impacts, perhaps due to on-site storage of a few backup lenses and substitution possibilities.

Compared to literature, the center's situation exemplifies typical healthcare inventory challenges. Just-in-time principles have been partially adopted through Eyetechn triggers but work best when combined with lean internal processes. For instance, automated alerts could have prevented some manual lag in approvals. The study underscores that technological tools alone are insufficient; workflow redesign and staff training are needed to realize their benefits.

Based on the data and staff suggestions, key recommendations emerge:

- **Streamline Approval Workflows:** Empower on-site pharmacists or inventory managers with authority to expedite urgent orders. Reducing paperwork can shave days off TAT.
- **Improve Data Accuracy:** Conduct regular physical counts and ensure Eyetechn is updated daily. Automated low-stock notifications should be monitored promptly.
- **Buffer Critical Items:** Maintain a small reserve of the most commonly used IOLs and consumables to cover short delays. Likewise, keep emergency stocks of lifesaving medicines.
- **Enhance Depot Coordination:** Establish a direct communication line (e.g., WhatsApp group or weekly calls) with the central depot to flag urgent requisitions. Possibly negotiate priority shipping for high demand items.

- **Vendor Management:** Work with suppliers to understand lead times and improve forecast sharing. For multiple-source products (like sutures), consider alternate suppliers to avoid single points of failure.

- **Lean Practices:** Apply lean inventory techniques such as “Two-Bin” systems for certain consumables and analyze consumption trends to order closer to actual demand. Periodic audits could identify recurrent excesses or shortages.

These measures align with evidence that proactive coordination and just-in-time alignment can reduce both overstock and out-of-stock situations. By addressing the human and organizational factors alongside the software system, Eye Q Udhna can minimize disruptions.

CONCLUSION AND RECOMMENDATIONS

This investigation quantified the stock replenishment TAT for key surgical items at Eye Q Udhna and identified systemic delays. **Key conclusions:** (1) IOL supplies largely met demands quickly (mean TAT ~1.4 days), but consumables and medicines lagged significantly behind their targets. (2) Primary bottlenecks were manual approval delays, data-entry errors, and external supply chain issues. (3) Prolonged delays, especially for medicines, have tangible operational impacts, potentially affecting patient care.

Recommendations: Improve the integration and use of the Eyetech system by ensuring real-time data updates. Shorten bureaucratic steps in the ordering process, possibly through digital approval workflows. Enhance inventory planning by analyzing consumption trends and maintaining safety stock for critical items. Strengthen collaboration with suppliers and the central depot through clearer communication protocols and performance tracking. Finally, periodic review of inventory KPIs (e.g. average TAT) should be institutionalized to monitor progress.

By adopting these measures, Eye Q Udhna can shift from reactive to proactive inventory management. The goal is to approach an ideal state where replenishment is timely (akin to a JIT model) without unnecessary buffer costs, thereby improving patient throughput and reducing operational risks. These findings may also inform similar efforts in other specialty healthcare settings.

REFERENCES

1. Saha E, Ray PK. Inventory management and analysis of pharmaceuticals in a healthcare system. In *Healthcare Systems Management: Methodologies and Applications: 21st Century Perspectives of Asia* 2017 Sep 7 (pp. 71-95). Singapore: Springer Singapore.
2. Thomsen PB. Delays in Care Due to Inaccessibility of Essential Medical Items in Surgical Unit.
3. Sharma N. Implementation of vendor managed inventory (VMI) in managing intraocular lenses (IOL) in eye care organization. *International Research Journal of Management, IT and Social Sciences*. 2015;2(9):1-9.
4. Mandara RS. INVENTORY CONTROL OF DISPOSABLE MEDICAL MATERIALS AT THE BALI MANDARA EYE HOSPITAL.
5. Thomsen PB. Delays in Care Due to Inaccessibility of Essential Medical Items in Surgical Unit.
6. Landry S, Beaulieu M. The challenges of hospital supply chain management, from central stores to nursing units. In *Handbook of healthcare operations management: Methods and applications* 2013 Jan 10 (pp. 465-482). New York, NY: Springer New York.
7. Ahmadi E, Masel DT, Metcalf AY, Schuller K. Inventory management of surgical supplies and sterile instruments in hospitals: a literature review. *Health Systems*. 2019 May 4;8(2):134-51.
8. Kelka H. Supply Chain Resilience: Navigating Disruptions Through Strategic Inventory Management.
9. Pal S. Advancements in AI-enhanced Just-in-Time inventory: elevating demand forecasting accuracy. *International Journal for Research in Applied Science and Engineering Technology*. 2023;11(11):282-9.
10. Coslett BG. Just-In-Time/Just-In-Case Inventory Management as an Influence on Supply Chain Disruption in Medical Systems Based in the Southeastern United States During the COVID-19 Pandemic.
11. Chandran V. *CHALLENGES OF LOGISTICS IN INDIAN PHARMACEUTICAL INDUSTRY* (Doctoral dissertation, Griffith College.).
12. Nabelsi V, Gagnon S. Information technology strategy for a patient-oriented, lean, and agile integration of hospital pharmacy and medical equipment supply chains. *International Journal of Production Research*. 2017 Jul 18;55(14):3929-45.

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