Requirement Analysis of Pharmacy Module of HIS In Takshasila Hospital

A dissertation submitted in partial fulfilment of the requirements for the award of

Post-Graduate Diploma in Health and Hospital Management

by

Himanshu Jagat

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New Delhi -110075

May, 2013

Certificate of Internship Completion

Date: 10/5/2013

TO WHOM IT MAY CONCERN

This is to certify that **Himanshu Jagat** has successfully completed her 3 months internship in our organization from February 04, 2013 to May 03, 2013. During this intern he has worked on **Functional Requirement Analysis for Pharmacy Module of HIS to be Implemented in Takshasila Hospital** under the guidance of me and my team.

We wish him/her good luck for his/her future assignments

Sunil S Bhase 10/5/2013
(Signature)

Takshasila Hospitals Operating Pvt. Ltd. Bangalore

Certificate of Approval

The following dissertation titled "**Functional Requirement Analysis for Pharmacy Module of HIS to be Implemented in Takshasila Hospital**" is hereby approved as a certified study in management carried out and presented in a manner satisfactory to warrant its acceptance as a prerequisite for the award of **Post- Graduate Diploma in Health and Hospital 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.

Dissertation Examination Committee for evaluation of dissertation

Name Signature

DR. R. BHALLA

Prof. I. Bhattacharya

Dr. Anandhi Ramachandran KA

Certificate from Dissertation Advisory Committee

This is to certify that **Himanshu Jagat,** a graduate student of the **Post- Graduate Diploma in Health and Hospital Management**, has worked under our guidance and supervision. He is submitting this dissertation titled "**Functional Requirement Analysis for Pharmacy Module of HIS to be Implemented in Takshasila Hospital**" in partial fulfilment of the requirements for the award of the **Post- Graduate Diploma in Health and Hospital 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.

Takshasila Hospitals Operating Pvt. Ltd. Bangalore

17/05/13

Faculty Mentor – Minakshi Gautam

Designation- Professor

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Date

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FEEDBACK FORM

Name of the Student: Himanshu Jagat

Dissertation Organisation: Takshasila Hospitals Operating Private Limited

Area of Dissertation: Purchase and Supply Chain

Attendance: 100%

Objectives achieved:
- HIS implementation
- Understanding of HIS system.
- Understanding of MIS for PSM

Deliverables:
- Coordination for conflict resolution
- Finalisation and evaluation - end to end procurement of specialised items.

Strengths:
- Intradepartmental coordination
- Conflict resolution - Focused approach

Suggestions for Improvement:
- Micro detailed working
- Time management.

Sunil Bhasin

Signature of the Officer-in-Charge/ Organisation Mentor (Dissertation)

Date: 10/5/2013

Place: Bangalore.

Takshasila Hospitals Operating Pvt Ltd Bangalore

Abstract

Requirement Analysis of Pharmacy Module of HIS In Takshasila Hospital

Hospital pharmacy is the health care service, which comprises the art, practice, and profession of choosing, preparing, storing, compounding, and dispensing medicines and medical devices, advising healthcare professionals and patients on their safe, effective and efficient use.To ensure the 7 “rights” are respected: right patient, right dose, right route, right time, right drug with the right information and right documentation. Hospital pharmacy to enhance the safety and quality of all medicine related processes affecting patients of the hospital. According to a paper by Infosys, the key benefits of pharmacy management systems- automating processes, streamlining workflow and enhancing the customer base- are attractive enough to draw retail pharmacy chains competing in a world of growing challenges.

To enable operational efficiency across the chain, management need to deploy the right-fit pharmacy management system

Rationale of Study

The business requirements are very essential for the smooth flow of the business activities of hospital in order to streamline, consolidate and provide a strong platform:

- To Enable the Pharma related Activities in Pharmacy Module
- To Enable Business growth

General Objective

To study and analyze the workflow and gather requirements for Pharmacy module of HIS in Takshasila Hospital, Bangalore.

Specific Objectives

- To gather functional requirements and to identify the various Stakeholders for pharmacy module of HIS.
- To observe the flow of information from various departments to pharmacy and vice versa.
- To identify the flow of input and output data for Pharmacy module of HIS

Methods and Tools

Study Design- Analytical Study

Data Collection- The data was collected from various stakeholders which are related to the workflow of pharmacy department through in-depth interviews and focus group discussions.

Data Analysis- The data collected was qualitative and was analyzed for identifying workflows and various process related pharmacy department

Results and findings

Item	Definition
Input Point & Input Criteria	Prescription from the physician to issue the medication order from the outstanding order queue, Drugs formulary decided by THOPL, Inventory Policy, Pharmacy Module, THOPL Pharmacy Policy, Indent from Nursing station and departments, Material Receipts(GRN)
Output Point & Output Criteria	**IP Pharmacy**: 1. Medication and consumables issued to the nurse department for the patient, billing 2. Medication and consumables issued to various nursing station and stores as stock transfer 3. Vendor Return of near expiry drugs and damaged stock 4. Patient returns as per THOPL Pharmacy Policy 5. Various MIS reports **OP Pharmacy**: 1. Medication issued and billing, Procurement process, material receipts(GRN) and Indenting 2. Patient Returns as per THOPL Pharmacy Policy 3. Vendor Returns of near expiry drugs and damaged stock 4. Various MIS reports

The design of good organizational workflow is not simply about improving efficiency. Workflow processes are maps that direct the care team how to accomplish a goal in timely manner.

The output points plays a vital role in any system which provides very critical and useful data and information related to transactions , generations of reports and performance the department.

Acknowledgement

I would like to extend my heartfelt gratitude towards all the personnel at **Takshasila Hospitals Operating Pvt. Ltd. who** helped me get through this project. This project would never have been possible without those who went out of their way to help me

I start by expressing my sincere gratitude to **Mr. Sunil Sommnath Bhase (General Manager – Purchase & Supply Chain)** who gave me the opportunity to work in this renowned organization. I also extend my heartfelt gratitude to **Mr. Rajavel Ponniah (Manager)** who extended timely guidance and support at every crucial juncture of this project and gave it the shape you see today.

I would also extend my sincere gratitude to **Mr. S.V. Kiran (VP – HR & Operations)** who gave me the opportunity to work in this renowned organization.

Sincere thanks to all the staff at all levels, especially IT staff, for helping me at each and every step of my work. Heartiest gratitude to them for making my stay and work at this place a memorable one.

In addition I would also like to thank my mentor at IIHMR; New Delhi respected **Ms. Pragya Tiwari Gupta** and **Ms. Minakshi Gautam** for her valuable efforts in shaping this study to a meaningful effort.

Himanshu Jagat

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Abbreviations

Legend	Abbreviations
THOPL	Takshasila Hospitals Operating Pvt. Ltd.
IP	In Patient
OP	Out Patient
OTC	Over The Counter
MRN	Medical Record Number
TPA	Third Party Administrator
FEFO	First Expiry First Out
TPA	Third Party Administrator

PART I

Internship Report

1. ORGANISATION PROFILE

FOR THE FIRST TIME IN INDIA

FOR THE FIRST TIME FROM JAPAN

KIRLOSKAR + TOYOTA TSUSHO + SECOM HOSPITALS
Japan come together to set up a WORLD CLASS HOSPITAL

Throughout history, Japan and India maintain strong cultural connections. The cultural exchanges between the two countries created many parallels in their folklore. Modern popular culture based upon this folklore, such as works of fantasy fiction in manga and anime, sometimes bear references to common deities (devas), demons (asuras) and philosophical concepts. Going ahead in the business foray, the relationship between two nations are much stronger and buoyant.

Making an aggressive foray into Healthcare in India - Kirloskar, Toyota Tsusho, Secom hospitals, Japan come together to set up their first World Class Hospital in Bangalore. It would be the first hospital that Secom Hospitals of Japan or any Hospital brand from Japan is investing in the Indian Healthcare sector. It is also the first time that an International Joint Venture Hospital chain is launched in India. All three partners have planned to make it a National chain, with large multi-speciality Hospital across the country.

The first Kirloskar Hospital along with the Japanese partnership will be commissioned with the brand name " TAKSHASILA HOSPITAL" in Bangalore on July 1st. It would be a 300 plus bed facility with its core centres of excellence will be in Cardiac, Neurosurgery & Orthopaedics and would also have a strong Urology, Nephrology and Gastroenterology department. This Hospital along with the Japanese partnership will also have a very strong Trauma Centre to provide International standard of Emergency Care.

In order to integrate best of Japanese practices, processes and medical protocols, and to get the full benefit of domain knowledge from Secom Hospital Japan, upon the specific request of the Kirloskars, Secom Hospital Japan have sent their member of Top Management from Japan as Managing Director for this new chain of Hospitals in India.

The Takshasila Hospital will have all other specialities like ENT, Ophthalmology, Endocrinology / Paediatrics etc.

The partners have worked hard to ensure that this Hospital chain will try to differentiate by offering higher quality of patient convenience, hygiene, infection control, and improved outcome of Surgery, thereby ensuring that care and treatment extend beyond surgery into complete rehabilitation. Secom Hospital Japan is providing extensive training and exposure to the staff in Rehabilitation for this proposed Hospital, thereby committing itself to complete After-care to patients.

Nurses play a central role in delivering health care. Nurses advocate for health promotion, educate patients and the public on the prevention of illness and injury, provide care and assist in cure, participate in rehabilitation, and provide support. No other health care professional has such a broad and far-reaching role. In India, this seems to be a weak link. Secom Hospital Japan has positioned their Nurse Director from Japan at Bangalore, to work on the Nursing processes, ensuring the delivery of quality services through extensive training to the team members.

The first Hospital will not only have well experienced & trained staff members but will ensure the highest quality and technology of Medical Equipment and consumables, without compromise.

Kirloskars Engineering and project experience has ensured that the Hospital construction and Project Management uses their valuable insights in engineering thereby creating a niche in Engineering Infrastructure & Planning. This ensures that the Hospital has a high quality construction and is completed within the deadlines with no compromise ever on quality, Ethics & Transparency in operations.

The Hospital positions itself in offering cutting edge surgeries in specialized horizons, continuously challenging the Surgeon improved outcome through stronger Clinical process, state-of-the-art Medical Technologies, high quality OTs and strong Administrative Machinery. Together with commitment to research and contributions to society.

The brand and logo of Takshasila Hospital has derived from the word *Sacrum* which is the tail bone of the vertebral column & *Sakura*, flowering Cherry, National flower of Japan.

The logo is in the shape of cross which is a symbol of many facets. It is a positive, sign of hope and recovery. It indicates that disparate paths and avenues can converge for the

purpose of harmonious function. The Logo has 4 petals conjoined at the stem; the flower metaphor lends certain softness to the brand.

A hospital brand also has essential qualities of care, nurturing and empathy. Hence the logo represents a coming together of strength and energies.

The colours of the logo are coral, mauve, orchid blue & teal which symbolifies the amalgamation of Healing, calming and relaxing process. Each of the color has a meaning to it.

Coral - Restores youthfulness, Brings you in contact with your feelings.

Mauve-Brings sleep, Soothes mental and emotional stress, decreases sensitivity to pain.

Orchid Blue -Represents Elemental water and elemental air.

Teal - Increases intuition and sensitivity while dissipating any sensation of stress.

2. TASKS PERFORMED

Working in the department of purchase and supply chain management is a very challenging well very interesting job especially when the hospital is in a project stage.

1. Working on development of pharmacy management information system.
2. Formulating hospital drug formulary.
3. Comparison of quotation and negotiation with vendors related to medical equipment.
4. Finalisation and procurement of nursing hostel equipment.
5. Specification of ambulance and procurement and finalising of ambulance services and fabrication.

3. REFLECTIVE LEARNING DURING INTERNSHIP

During internship, most important learning activity was the building up of inter-department coordination to achieve the end result.

While working on various assignments I learned various aspects of procurement from defining the specification of the material, calling for quotations, arranging of demonstration for end users and holding negotiations.

During working on the procurement of ambulance, I learned about team work and bringing together various stakeholders for finalization of the fabrication specifications and equipment. I also learnt various types of medical equipment used in the hospital and their role in treatment of patient.

I also learnt about preparation of comparative statement of various equipment and vendors and the role of proper documentations in accountability.

PART II

Dissertation on

Requirement Analysis of Pharmacy Module of HIS In Takshasila Hospital

1. INTRODUCTION

- Hospital pharmacy is the health care service, which comprises the art, practice, and profession of choosing, preparing, storing, compounding, and dispensing medicines and medical devices, advising healthcare professionals and patients on their safe, effective and efficient use.
- Hospital pharmacy is a specialised field of pharmacy which forms an integrated part of patient health care in a health facility.
- Hospital pharmacy is the profession that strives to continuously maintain and improve the medication management and pharmaceutical care of patients to the highest standards in a hospital setting.
- Hospital pharmacists provide services to patients and health care professionals in hospitals

The mission of the hospital pharmacist

- To be part of the medication management in hospitals, which encompasses the entire way in which medicines are selected, procured, delivered, prescribed, administered and reviewed to optimise the contribution that medicines make to producing informed and desired outcomes
- To enhance the safety and quality of all medicine related processes affecting patients of the hospital
- To ensure the 7 “rights” are respected: right patient, right dose, right route, right time, right drug with the right information and right documentation

1.1 SCOPE OF THE PROCESS

- Pharmacy is the health profession that links the health sciences with the chemical sciences and it is charged with ensuring the safe and effective use of pharmaceutical drugs.
- The scope of pharmacy practice includes more traditional roles such as compounding and dispensing medications, and it also includes more modern services related to health care. Pharmacists, therefore, are the experts on drug therapy and are the primary health professionals who optimize medication use to provide patients with positive health outcomes.

The business requirements are very essential for the smooth flow of the business activities of TAKSHASILA HOSPITAL in order to streamline, consolidate and provide a strong platform:

• To Enable the Pharma related Activities in Pharmacy Module
• To Enable Business growth

1.2 REVIEW OF LITERATURE

The Right Pharmacy Management System

According to a paper by Infosys, the key benefits of pharmacy management systems- automating processes, streamlining workflow and thereby enhancing the customer base- are attractive enough to draw retail pharmacy chains competing in a world of growing challenges. However, the choices are tough with a handful of products and the high cost of customized solutions.

To enable operational efficiency across the chain, management need to deploy the right-fit pharmacy management system. With right implementation approach, these systems can help with

- Addressing the shortage of pharmacists by streamlining and automating the workflow process
- Streamlining operations through data sharing across store locations
- Segmentation of work process for efficient division of labour
- Systemic data checks to scan impact of drug combinations or drug allergies to ensure patient wellness and provide counselling to improve relationships with patient.
- Enhancing customer satisfaction levels and repeat business through timely and consistent customer service.

Pharmacy management systems must work unfailingly, flawlessly and seamlessly in complex multi-store, cross – geography environments to enable drugstore chains to operate efficiently and profitably.

Realization for the need of Pharmacy Management System

Healthcare literature is rich with evidence indicating the United States has a history of struggling with post-acute care transitions that lead to increased hospital readmissions and healthcare costs. A significant contributing factor in the complexity of these transitions is the presence of medication discrepancies or drug therapy problems. According to Forster, an adverse event occurs in nearly 20% of patients discharged from the hospital to home setting. Sixty-six percent of these adverse events are drug-related, making it the most common type of adverse event experienced across the continuum of care. Other studies show the prevalence of

drug therapy problems in patients being discharged from the hospital ranges from 14 - 60%.The literature also shows that when pharmacists are involved in care transitions and take measures to decrease the prevalence of drug therapy problems, the quality of the discharge process is improved and rehospitalization rates and preventable adverse drug events are lowered. This provides compelling evidence to support the need to identify and eliminate gaps in the care transitions process, especially drug therapy problems, in order to improve care transitions. While these studies show that incorporating pharmacists into the care transitions process has the potential to improve medication use and patient outcomes, it is often difficult to develop a care transitions program that would meet an institution's and patient population's specific needs and fit within the institution's operating structure. Several organizations have created guidelines to assist institutions in the creation of care transitions programs which aim to decrease unnecessary healthcare utilization and improve quality of care. Two examples of such programs include Project BOOST and Project RED sponsored by the Society of Hospital Medicine and the Agency for Healthcare Research and Quality, respectively. Each of these projects includes medication management as an essential intervention component of the discharge process. While these programs provide robust outlines on which types of services should be included in the hospital discharge process, they do not encompass institution-specific details on how to implement sustainable processes or discuss the outpatient interventions that are needed to ensure a complete transition.

Integrated Care

The new pharmacy is the hub of UCSF's integrated medication management system which combines state-of the-art technology with personalized care.

"The automated pharmacy streamlines medication delivery from prescription to patient," said Lynn Paulsen, PharmD, director of pharmaceutical services at UCSF Medical Center. "It was important to develop a system that is integrated from end to end. Each step in safe, effective medication therapy – from determining the most appropriate drug for an individual patient to administering it–is contingent on the other."

The new pharmacy currently serves UCSF hospitals at Parnassus and Mount Zion and has the capacity to dispense medications for the new UCSF Medical Center at Mission Bay, scheduled to open in 2014. As the phase-in continues, additional steps in the process will be eliminated as doctors begin inputting prescriptions directly into computers in 2012.

"We are intent on finding new ways to improve the quality and safety of our care, while increasing patient satisfaction," said Mark Laret, CEO, UCSF Medical Center and UCSF Benioff Children's Hospital. "The automated pharmacy helps us achieve that and at the same time, advance our mission as a leading teaching hospital and research institution.

1.3 OBJECTIVES

General Objective

To study and analyze the workflow and gather requirements for Pharmacy module of HIS in Takshasila Hospital, Bangalore.

Specific Objectives

- To gather functional requirements and to identify the various Stakeholders for pharmacy module of HIS.
- To observe the flow of information from various departments to pharmacy and vice versa.
- To identify the flow of input and output data for Pharmacy module of HIS

2 DATA AND METHODS

- **Study Design-** Analytical Study

- **Data Collection-** The data was collected from various stakeholders which are related to the workflow of pharmacy department through in-depth interviews and focus group discussions.

- **Data Analysis-**

  The data collected was qualitative and was analysed for identifying workflows and for developing user cases.

3 RESULTS AND FINDINGS

Workflow is defined as the set of tasks—grouped chronologically into processes—and the set of people or resources needed for those tasks, that are necessary to accomplish a given goal. An organization's workflow is comprised of the set of processes it needs to accomplish, the set of people or other resources available to perform those processes, and the interactions among them.

3.1 USER PROFILES

The following table provides a description of the system key user profiles and their role description.

USER	ROLE DESCRIPTION
Pharmacists	Pharmacists are healthcare professionals with specialized education and training who perform various roles to ensure optimal health outcomes for their patients through proper medication use
Attender	Attender supports the pharmacist by delivering the medicated items and pharmacy related deliverables.

3.2 ITEM DESCRIPTION

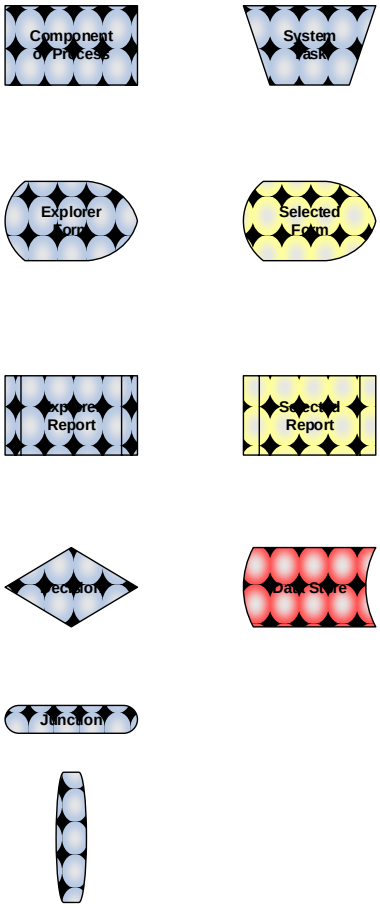
Item	Definition
Input Point &Input Criteria	Prescription from the physician to issue the medication order from the outstanding order queue, Drugs formulary decided by THOPL, Inventory Policy, Pharmacy Module, THOPL Pharmacy Policy, Indent from Nursing station and departments, Material Receipts(GRN)
Output Point & Output Criteria	**IP Pharmacy**: 1. Medication and consumables issued to the nurse department for the patient, billing 2. Medication and consumables issued to various nursing station and stores as stock transfer 3. Vendor Return of near expiry drugs and damaged stock 4. Patient returns as per THOPL Pharmacy Policy 5. Various MIS reports **OP Pharmacy**: 1. Medication issued and billing, Procurement process, material receipts(GRN) and Indenting 2. Patient Returns as per THOPL Pharmacy Policy 3. Vendor Returns of near expiry drugs and damaged stock 4. Various MIS reports

3.3 Interconnected Departments

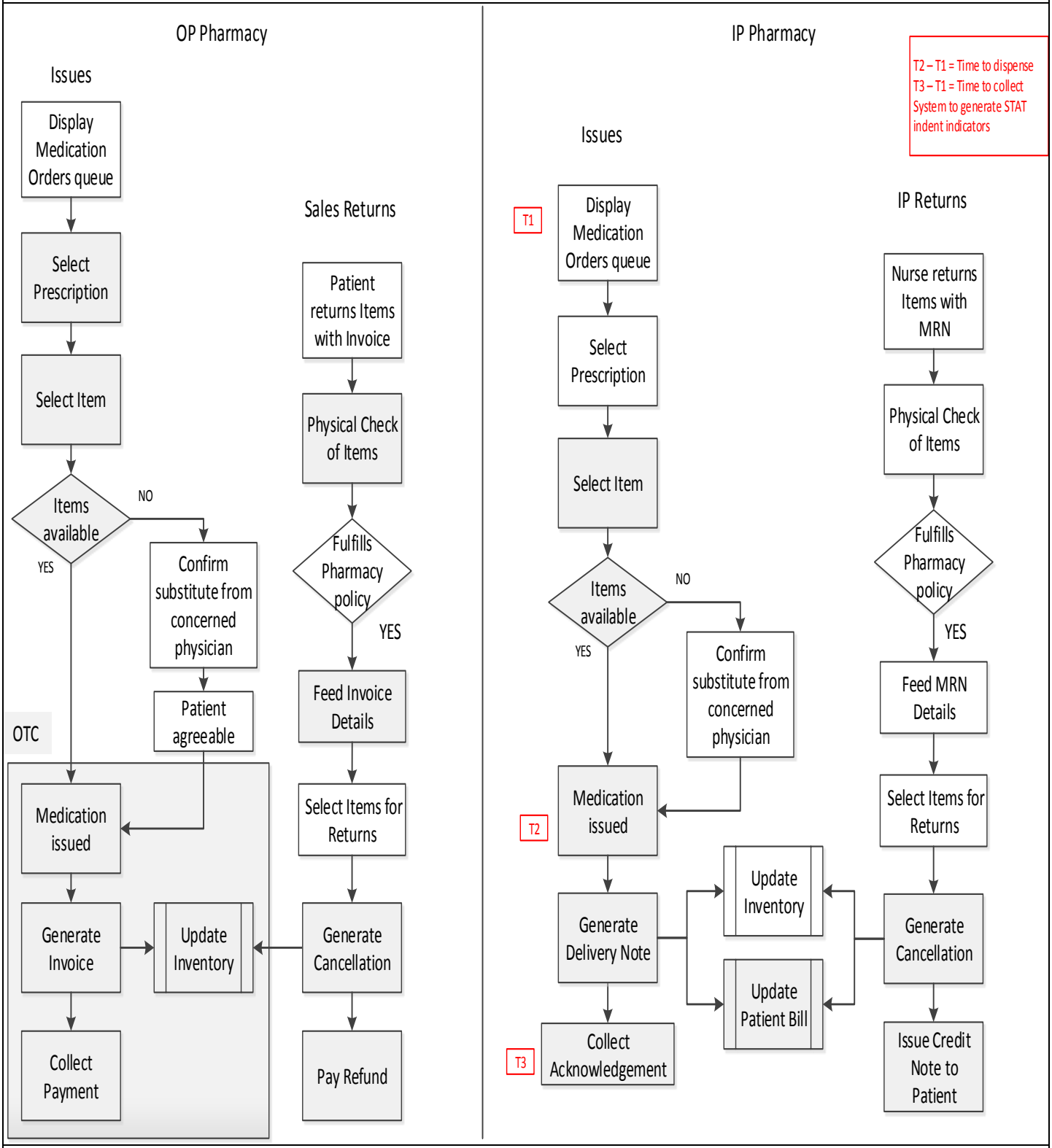
#	Department	Purpose of interactions
1	Purchase Department	Procurement
2	Store management	Material requests for issue
3	Departments	Nursing station, Various stores (like cathlab), finance, customer care
4	Pharmacy committee	Approved pharmacy items and their maintenance

FLOW CHART SYMBOLS

Symbols

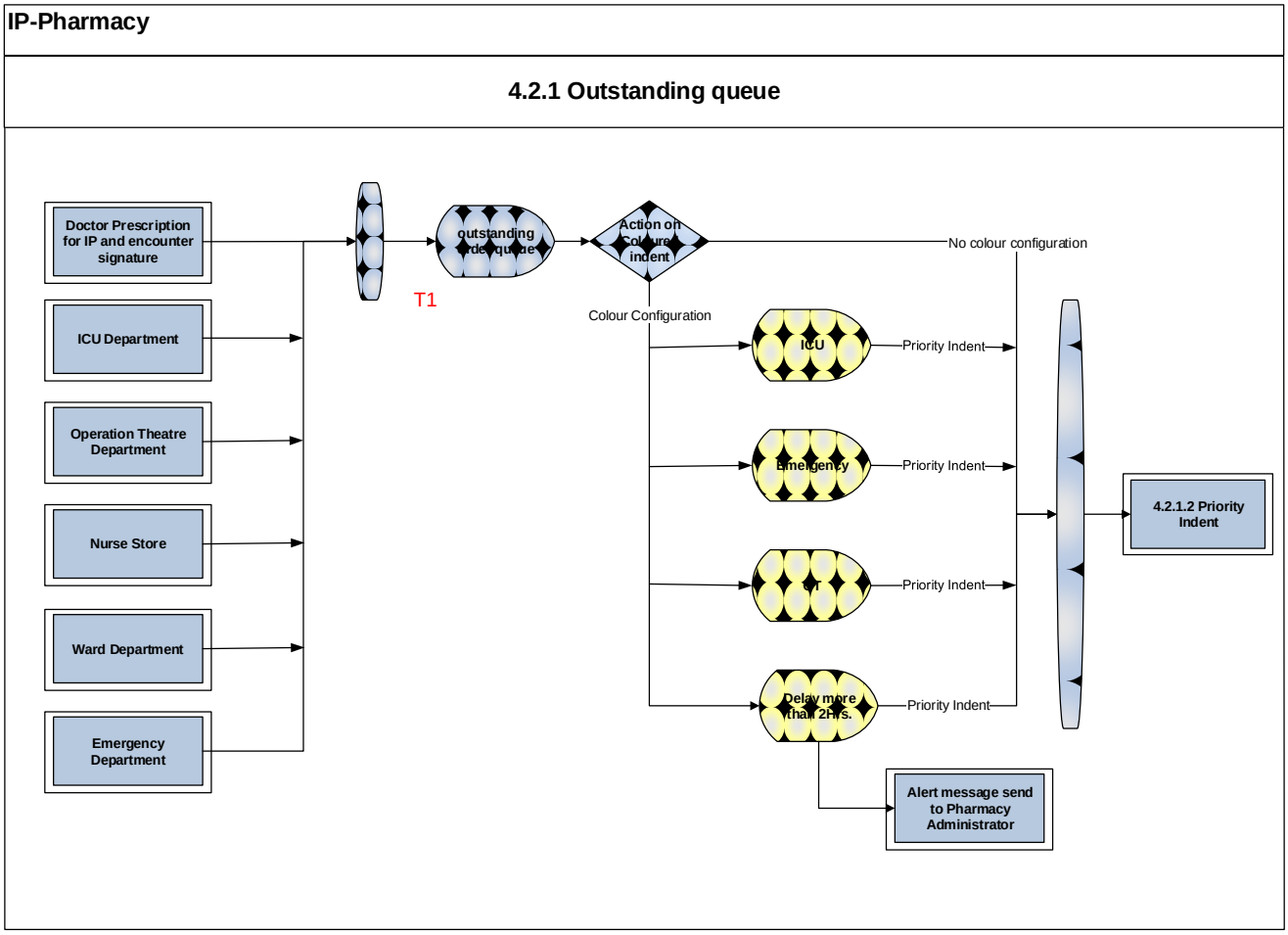
System	Manual	Other
		

3.3 OVERVIEW BUSINESS PROCESS:



3.3.1 Process – IP Pharmacy

3.3.1.1 Outstanding queue

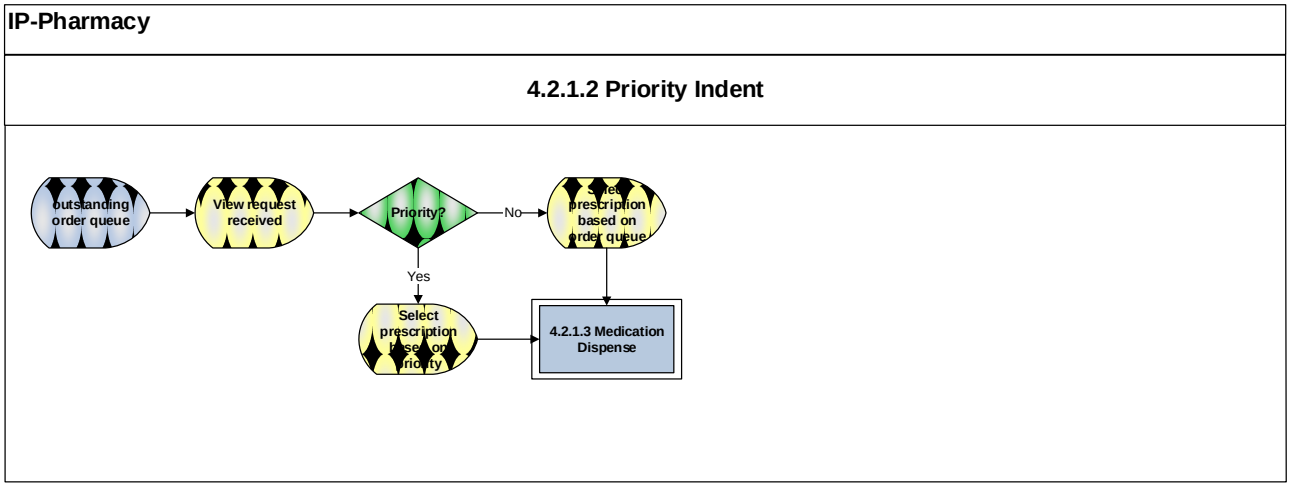


REQ. ID	REQ. GROUP	BUSINESS RULES / EXAMPLES
IP-001	Drug dispensing	1. Drugs will be dispensed only on HIS order from a registered medical practitioner/ authorized personnel 2. Only brands listed in formulary will be dispensed. 3. Drugs will be procured In Unit packs and stored, dispensed in Pack size as defined in Material masters. The MRP is calculated based on Pack size by the system and billing will be done on MRP

REQ. ID	REQ. GROUP	BUSINESS RULES / EXAMPLES
IP-002	Functioning of Formulary	1. The hospital shall have a drug formulary approved by the hospital (Pharmacy committee). 2. In case of non-formulary request, the items can be procured only after receiving approval from head of Pharmacy committee
IP-003	Addition and Deletion of Drugs in the Formulary	1. Formulary addition/deletion will be done as per THOPL policy. 2. If there is requirement raised by any doctor for a particular medicine to be procured on urgent basis which is not mentioned in hospital formulary, the drug is procured as per the emergency procurement protocol.(defined in procurement SOP'S)
IP-004	IP Pharmacy outstanding orders	1. The indents prescribed from the physician is updated in the outstanding order queue as soon as the physician prescribes the medication items and signs the encounter with the patient. The indents are received in the pharmacy from different wards, ICU, OT, ER, Recovery room, etc. 2. Requested medicated items from Wards, ICU, OT, and Recovery room are issued as per prescriptions raised by physician/ Nursing incharge in the system. The System shall facilitate filtering of the medication order queue based on the following. The filtration will be on any combination. Required fields: 1. Patient MRN 2. Patient name 3. Gender 4. Date 5. Time 6. Doctor name 7. Ward 8. Room No 9. Patient type

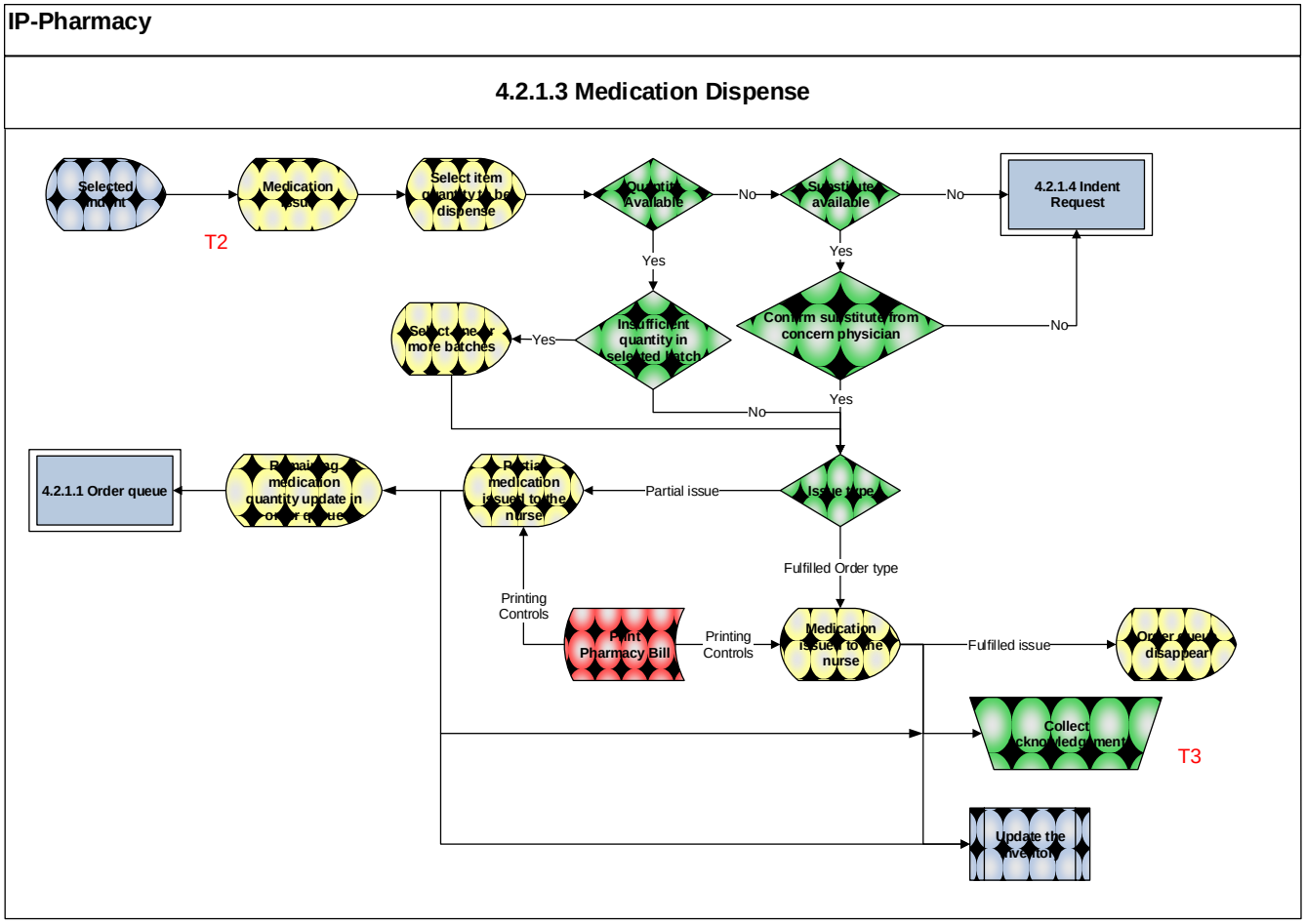
REQ. ID	REQ. GROUP	BUSINESS RULES / EXAMPLES
IP-005	Color configuration	1. Indents requested for ICU, OT, ER, Ward are indicated with a specific colour. 2. Delay in dispensing for more than 2 hours, the colour should change to RED automatically 3. Alert to the pharmacy administrator for immediate dispensing (STAT Indent) in case of emergency indicated by specific colour for ICU, OT, ER (escalation).

3.3.1.2 Priority Indent



REQ. ID	REQ. GROUP	BUSINESS RULES / EXAMPLES
IP-006	Outstanding orders	Outstanding order details queue displays the indents received from the physician.
IP-007	Priority issue	1. Outstanding order queue displays the priority indents in specific colours for ICU, OT, ER wards 2. ICU indent is displayed in green colour, OT indent in orange colour, ER indent in yellow colour.(THOPL will decide the colour code) 3. The indents displayed in specific colour based on department are issued first i.e. the indents in specific colour alerts will display the urgency or priority of dispense. 4. Delay in dispense for more than 2hrsfrom time of prescription for the priority indents, the colour changes to red automatically.
IP-008	Regular issue	If there are no priority indents, the prescribed medication is dispensed based on order queue.

3.3.1.3 Medication Dispense



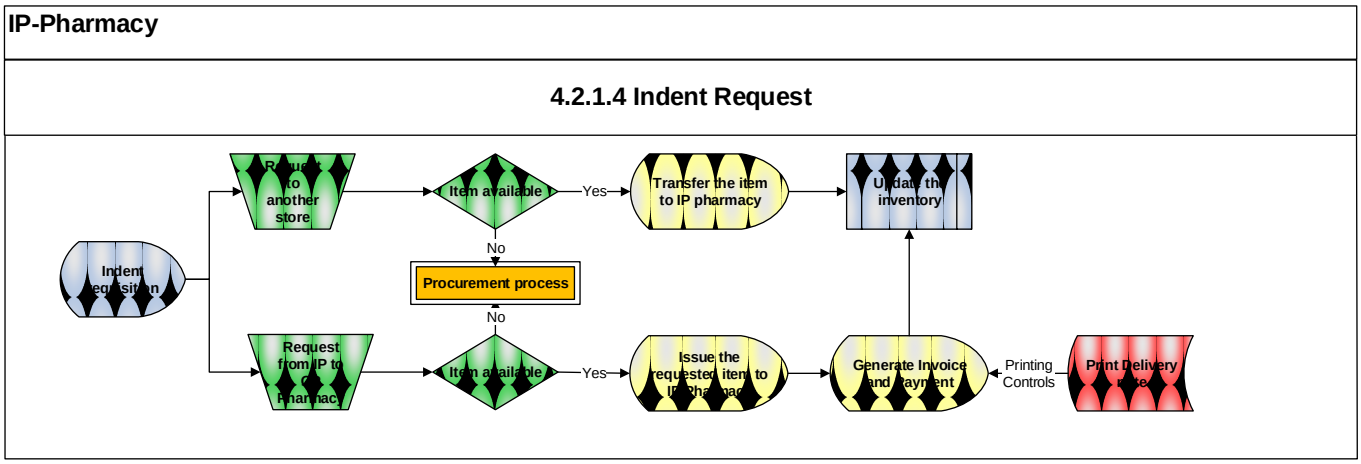
REQ. ID	REQ. GROUP	BUSINESS RULES / EXAMPLES
IP-009	IP Issue details	1. IP pharmacist views all the requests received from the physician in the outstanding order queue. To fulfil the specific indent, pharmacist selects the prescribed record based on the patient MRN. 2. After selecting the medication order in the outstanding order queue, the pharmacist opens the record to view the details of the medication order. It will be directed to the items issue form. Form contains : 1. Item number

		2. Brand name 3. Generic name 4. Batch number 5. Expiry date 6. Quantity 7. Unit 8. MRP per unit 9. Discount 10. Net amount
IP-010	Multiple batches	1. If the items are insufficient in the defaulted batch, the line is split into two with same item but different batches automatically 2. On selection of an item, there should be provision to display the stocks of the item from multiple batches. 3. This facilitates pharmacist to fulfil medication request if the quantity is not sufficient in a single batch. 4. Drugs shall be dispensed batch wise to enable traceability in case of recall 5. The batch number should automatically default based on FEFO
IP-011	Issue of Substitute (Alternative) drugs	1. Substitute item details must be available through facility of maintaining generic name of drugs. 2. The doctor should have a an option to view the substitute items as well as the main item during prescribing as this will help in writing a prescription based on stock availability. 3. The pharmacist should also have an option to issue the substitute drug in case of non-availability of the prescribed drug. 4. In case the prescribed items are not available in the IP store, the pharmacist shall confirm in writing or over the phone about the substitute from the concerned physician.

IP-012	Confirmation	1. Each prescription or indent will be reviewed by pharmacist before dispensing (manual process) 2. Once the items to be dispensed are confirmed, the runner from pharmacy deliversthe same to the nursing station in the ward and takes physical acknowledgement from the nurse on the bill.
IP-013	Partial Issue	1. Items can be issued partially based on the prescription. 2. The status of the prescription record remains open when items are issued partially. 3. Once the partially issued order is fulfilled totally, the outstanding order is removed from the queue
IP-014	Medication issue and charge slip / bill	1. The items are issued from the IP store based on FEFO. 2. Charge slip/bill is generated against the MRN/Patient once items are selected for issuance. 3. Once the items are issued, it will be updated in the inventory automatically i.e. the items are reduced from the store.
IP-015	Acknowledgement	Once the items to be dispensed are confirmed, the runner from pharmacy deliversthe same to the nursing station in the ward and takes acknowledgement from the nurse on the delivery slip/bill. There should be an option in the system to keep track of the nurse acknowledgement on receipt of the goods.
IP-016	Issue from Nurse store	1. Nurse will issue the items from the nurse store/ Crash Cart in case of emergency. 2. The delivered items from the nurse store are billed against the patient by the respective nursing station.
IP-017	Discount	1. Discounts are not given while issuing the medicated items to IP patients.If given, it will be approved by proper authorization 2. Items are issued based on MRP

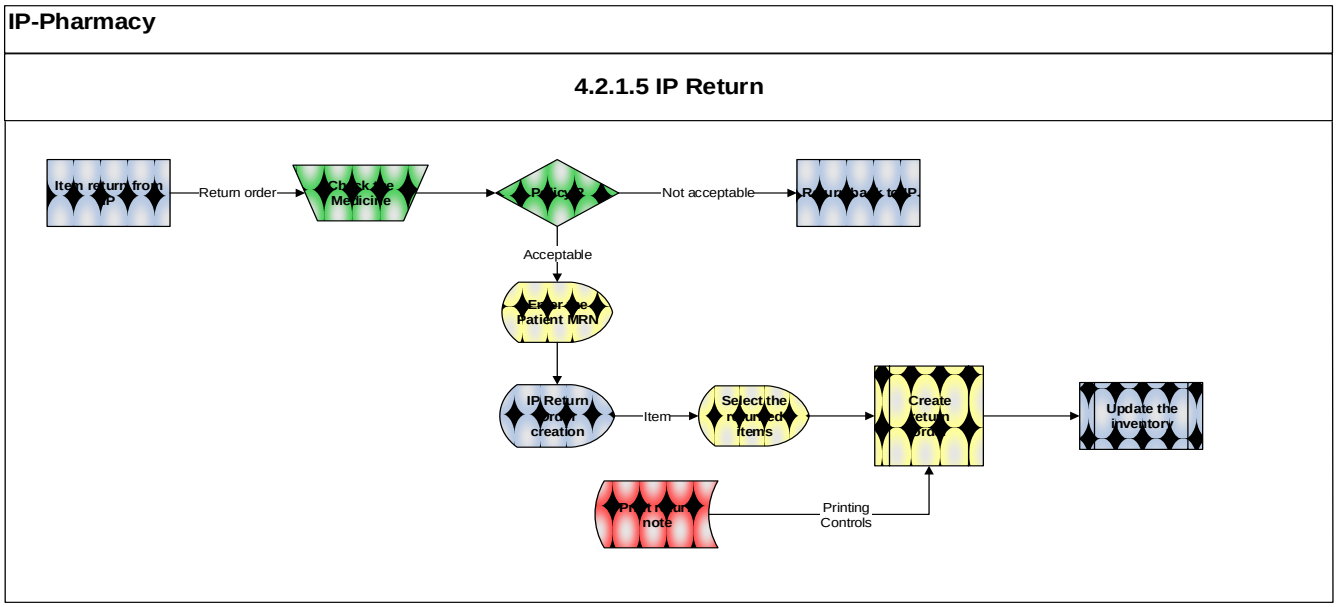
IP-018	Sales markup value for non MRP items.	1. Mark-up value should be specified for non MRP items based on the THOPL policy. 2. The selling price in case of non MRP items is calculated by adding profit percentage to the cost of the item. 3. Mark-up for non MRP items should be categorized based on the patients i.e. VIP and General patient
IP-019	Licensing and pricing	1. License should be different for IP and OP pharmacy 2. MRP should not be less than the purchase price. There should be a validation in the System and it should not allow to enter the MRP below purchase price.

3.3.1.4 Indent Request



REQ. ID	REQ. GROUP	BUSINESS RULES / EXAMPLES
IP-020	IP Item transfer	1. Items can be issued from one store to other store on request except to OP store 2. If the items prescribed are not available in IP store, items being transferred from OP to IP will be purchased from OP in case of emergency. There is no stock transfer in system 3. The OP pharmacist should bill for the items issued to the IP store

3.3.1.5 IP Return



REQ. ID	REQ. GROUP	BUSINESS RULES / EXAMPLES
IP-021	IP Item Return	1. The unused dispensed items will be returned to IP pharmacy by the nurse/attender against the patient to whom the items have been dispensed. The items are taken back into the IP store based on the policies of the pharmacy, example: a. The bottle is sealed and unused b. The tablet strip is unused and is in saleable condition etc. 2. Reason codes must be specified against each item while returning the items. The reason code is not mandatory. 3. Once the return slip/Bill (Credit into patient Bill) is made, return note is issued and items are stored in the IP pharmacy. This will update the inventory with addition of items in the IP store

3.3.1.6 Short closed

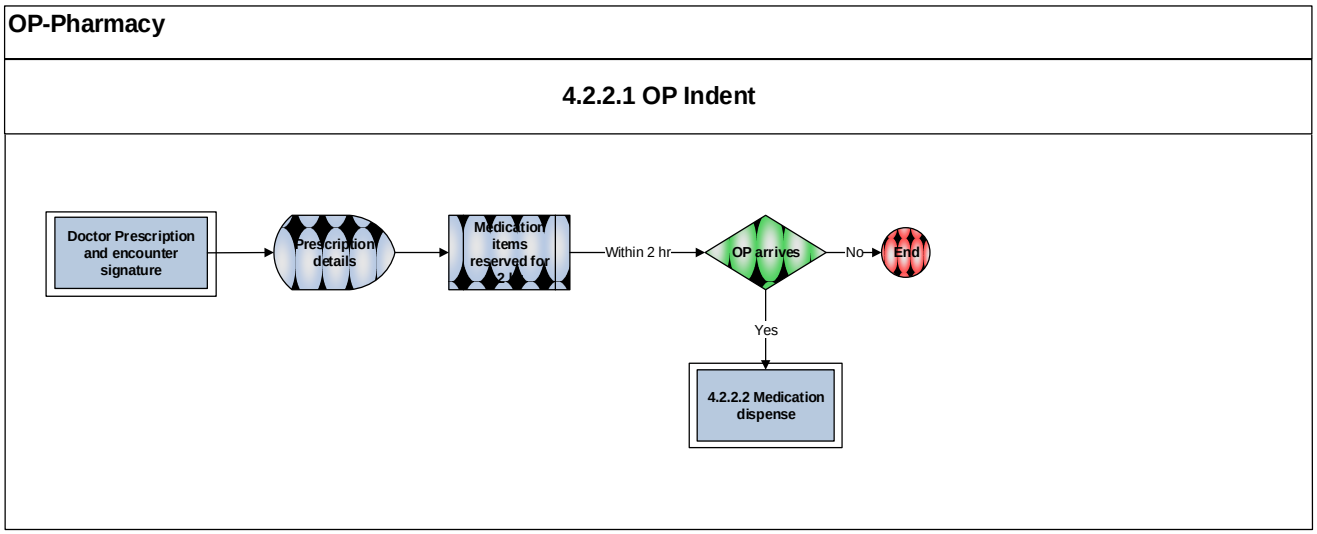
REQ. ID	REQ. GROUP	BUSINESS RULES / EXAMPLES
IP-022	Stop Dispensing	In case the patient expires, the indent raised by the physician for that particular patient will automatically disappear from the outstanding order queue.
IP-023	Short closing of indent	1. Indents will be closed by the physician (reactions/ Allergies). 2. If the prescription has to be stopped for a particular patient, the indent can be short closed either totally or partially. a. If the medication items are delivered and un-used, they are returned back to IP Pharmacy based on the return policies. b. If the medication items are not delivered, the indent is short closed automatically.

3.3.1.7 Adjustment

REQ. ID	REQ. GROUP	BUSINESS RULES / EXAMPLES
IP-024	Stock variance Analysis	Analysis of stock variance in IP store against the items present in the IP store batch wise will be taken care within pharmacy. Required fields: 1. Item code 2. Item description 3. Generic 4. Brand name 5. Batch number 6. Expiry date 7. Cost 8. MRP 9. On hand quantity 10. Physical stock quantity (Enter Manual) 11. Stock Variance quantity (Calculate as Physical stock quantity – on hand quantity) 12. Margin
IP-025	Stock adjustment	1. Store Manager will validate the stock variance details. Stock variance observed can be approved by authorized person. Approved Stock variance will be processed for stock adjustment in the system. 2. Reason code must be specified against each item that is being adjusted 3. Information on audit trail is maintained(like who created and when)

3.3.2 Process – OP Pharmacy

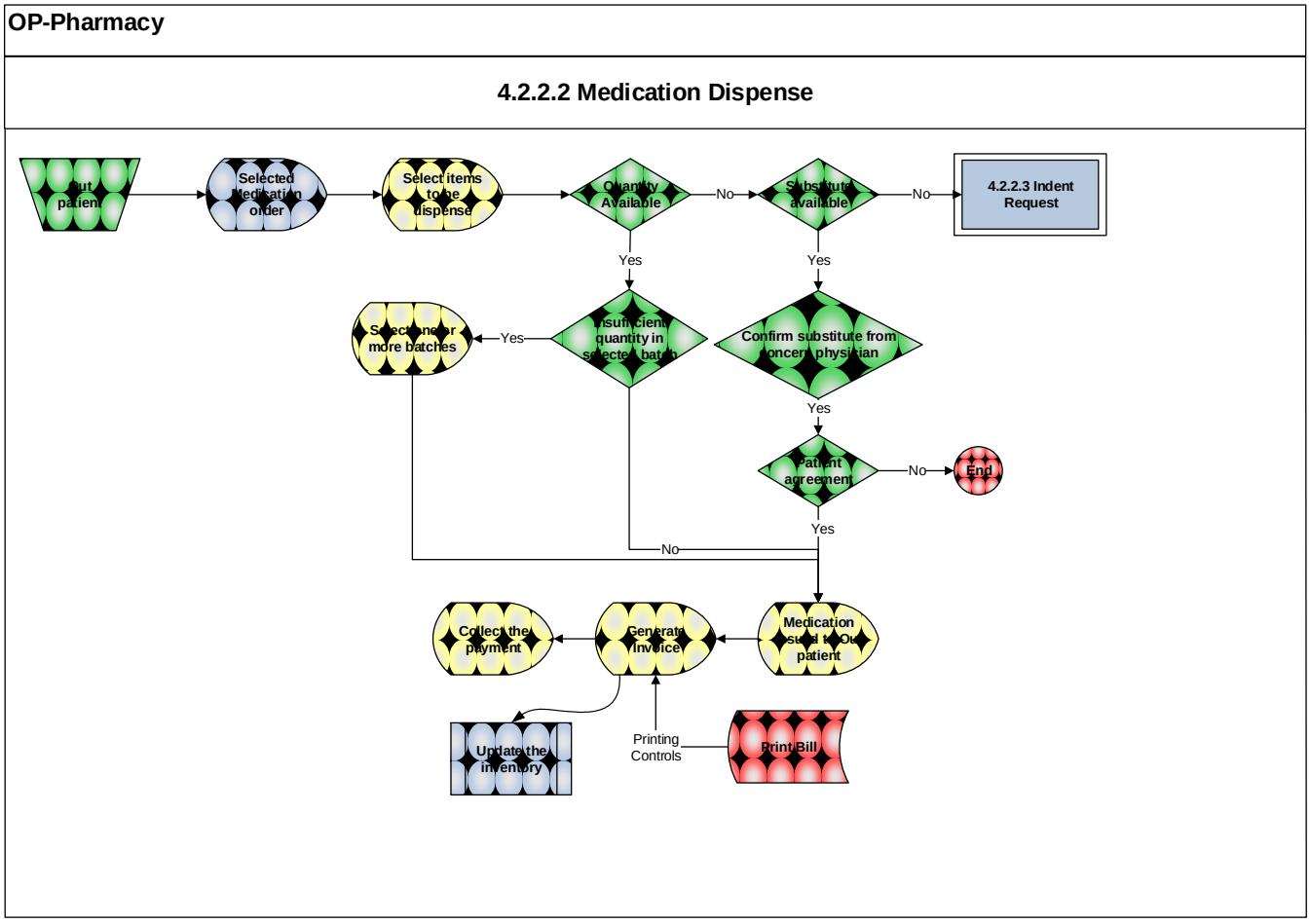
3.3.2.1 OP Medication Order



REQ. ID	REQ. GROUP	BUSINESS RULES / EXAMPLES
OP-001	OP Indent	1. The indents prescribed from the physician is updated in the OP Indent queue as soon as the physician prescribes the medication items and signs the encounter with the patient. 2. The System shall facilitate filtering of the OP Indent queue based on the following. The filtration will be on any combination. Required fields: 1. Patient MRN 2. Patient name 3. Gender 4. Date 5. Time 6. Doctor name 7. Patient type
OP-002	Reserve	Once the medication items are prescribed by the physician, the

REQ. ID	REQ. GROUP	BUSINESS RULES / EXAMPLES
	items	system has to reverse it for the OP for two (2) hours. If the OPD patient does not turn up to the OP pharmacy counter for receiving the medicated items in two hours, the pharmacist will un-reserve the items that have been reserved for the patient.

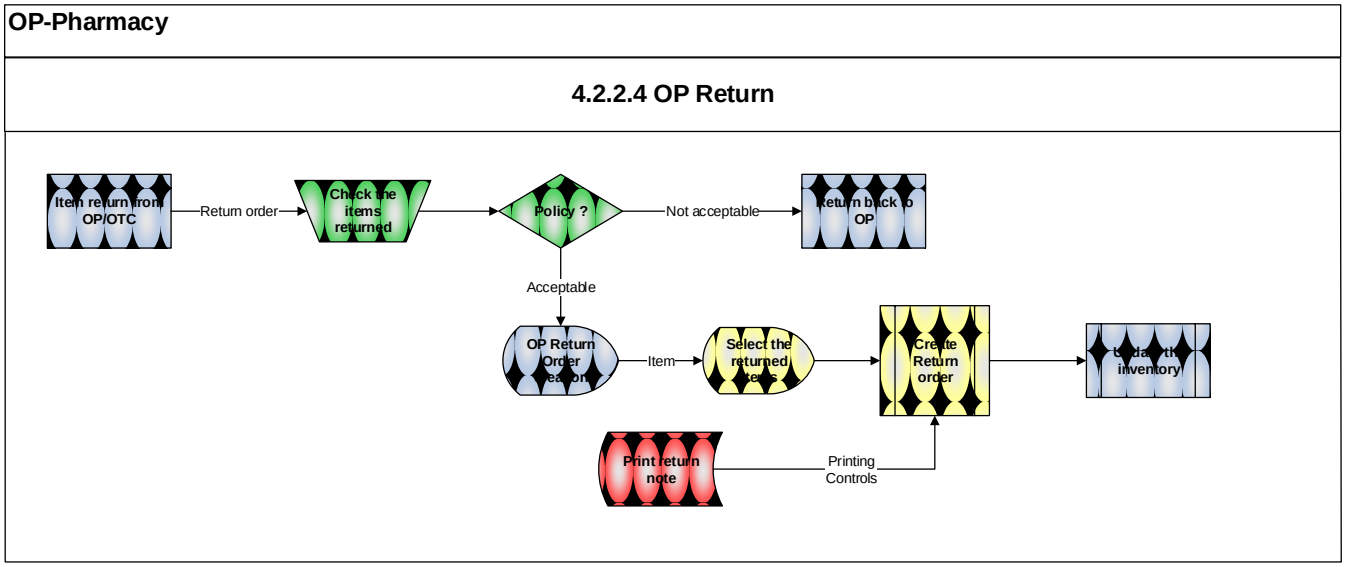
3.3.2.2 Medication Dispense



REQ. ID	REQ. GROUP	BUSINESS RULES / EXAMPLES
OP-003	OP Issue details	The pharmacist filters the medication record based on the MRN of the patient in OP sales screen. Once the patient MRN is specified in the OP sales screen, the details of the prescription will be displayed in the display screen: 1. Item number 2. Generic name 3. Drug name 4. Batch number 5. Expiry date 6. Quantity 7. Unit 8. MRP per unit 9. Discount 10. Net amount
OP-004	Multiple batches	1. On selection of an item, there should be provision to display the stocks of the item from multiple batches. 2. This facilitates pharmacist to fulfil medication request if the quantity is not sufficient in a single batch. 3. Drugs shall be dispensed batch wise to enable traceability in case of recall 4. The batch number should automatically default based on FEFO 5. If the items are insufficient in the defaulted batch, the line is split into two with same item but different batches automatically
OP-005	Issue of Substitute (Alternative) drugs	1. In case the prescribed items are not available in the OP store, the pharmacist shall confirm about the substitute from the concerned physician for issuing the medicine. 2. The physician shall be given a provision to view all the stocks available in the OP pharmacy, So that he can prescribe the medicines also considering the stock availability.Once the items

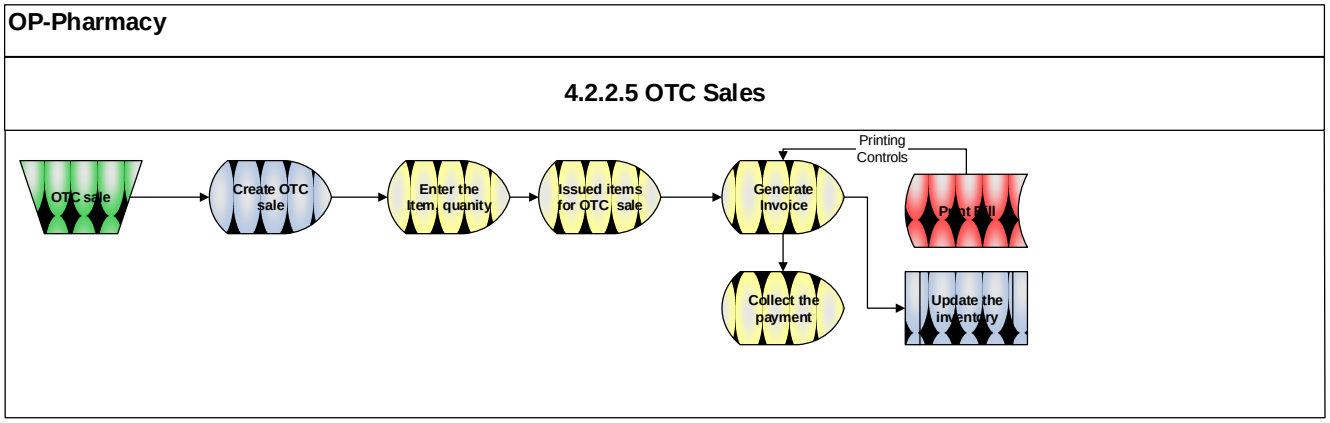
REQ. ID	REQ. GROUP	BUSINESS RULES / EXAMPLES
		to be dispensed are confirmed, they are issued to the OPD patient or his/her relative. 3. Pharmacist should confirm if the patient/attendant is interested in taking the substitute item. i. If yes, then select the substitute item against the generic item ii. If no, the patient/attendant needs to procure the same from outside.
OP-006	Confirmation	Once the items to be dispensed are confirmed, they are delivered to the OPD patient or his/her relative
OP-007	Medication issue and billing	1. The items are issued from the OP store based on FEFO. 2. Once the items are issued, it will be updated in the inventory automatically i.e. the items are reduced from the store. 3. After issuing the items, bill is generated. The bill contains the summary of the items being delivered.
OP-008	Billing	1. Payment of issued items is done once the indents are issued. 2. Payment can be done through Cash, Debit or credit card, or multiple combinations.

3.3.2.3 OP Return



REQ. ID	REQ. GROUP	BUSINESS RULES / EXAMPLES
OP-009	OP sales return	1. The issued medicated items can be returned to the OP pharmacy. The items are taken back into the OP store only based on the policies of the THOPL pharmacy 2. Reason codes must be specified against each item while returning the items. The reason codes are mandatory. Reason codes will be pre-defined and there should be a select from the reason code master

3.3.2.4 OTC Sales



REQ. ID	REQ. GROUP	BUSINESS RULES / EXAMPLES
OP-010	Advanced search	THOPL would like to have advanced search option for filtering the items. Ex: If the word "PARA" is keyed in, it should list out all the items that contains the "PARA".
OP-011	Issue of OTC items	1. OTC drugs are issued with and without prescription. 2. Payment of issued items is made by credit/debit card or by cash.

3.3.2.5 Adjustment

REQ. ID	REQ. GROUP	BUSINESS RULES / EXAMPLES
OP-012	Stock variance Analysis	Analysis of stock variance in IP store against the items present in the IP store batch wise will be taken care within pharmacy. Required fields: 1. Item code 2. Item description 3. Generic 4. Brand name 5. Batch number 6. Expiry date 7. Cost 8. MRP 9. On hand quantity 10. Physical stock quantity (Enter Manual) 11. Stock Variance quantity (Calculate as Physical stock quantity – on hand quantity) 12. Margin
OP-013	Stock adjustment	1. Store Manager will validate the stock variance details. Stock variance observed can be approved by authorized person. Approved Stock variance will be processed for stock adjustment in the system. 2. Reason code must be specified against each item that is being adjusted 3. Audit trail has to be maintained on the stock adjustments.

3.3.3 Reporting Requirements

3.3.3.1 IP Pharmacy Reports

#	Category	Report Name
IP-026	Transaction	Profit margin report
IP-027	Transaction	Daily transaction report
IP-028	Transaction	Stock Variance report
IP-029	Transaction	Stock Adjustment report
IP-030	Transaction	Stock Return report
IP-031	Transaction	Stock transfer report
IP-032	MIS	List of Drugs
IP-033	MIS	Drugs issue report
IP-034	MIS	Expiry report
IP-035	MIS	Near Expiry report
IP-036	MIS	Indent Pending report
IP-037	Quality / KPI	STAT reports: 1. Report required viewing the percentage of indents delivered within 30 minutes. 2. Report required to view the percentage of routine indents delayed beyond 2 hour.

3.3.3.2 OP Pharmacy Reports

#	Category	Report Name
OP-014	Transaction	Profit margin report
OP-015	Transaction	Daily transaction report
OP-016	Transaction	Stock Variance report
OP-017	Transaction	Stock Adjustment report
OP-018	Transaction	Cash collection report
OP-019	Transaction	Stock Return report
OP-020	MIS	List of Drugs
OP-021	MIS	Drugs issue report
OP-022	MIS	Expiry report
OP-023	MIS	Near Expiry report
OP-024	MIS	Indent Pending report
OP-025	Print Forms / Slips	Pharmacy bill slip
OP-026	Print Forms / Slips	Return Slip

3.3.4 TAT Points - IP Pharmacy

#	Process Stage	Type	Ref	TAT Point Description
1	Indent queue	Direct	T1	Medication Queue
2	Indent dispense	Direct	T2	Medication issue
3	Indent dispense	Direct	T3	Collect Acknowledgement
4	Indent dispense	Calc.	T2-T1	Time to dispense
5	Indent dispense	Calc.	T3-T2	Time to collect Acknowledgement

3.3.5 TAT Points - OP Pharmacy

#	Process Stage	Type	Ref	TAT Point Description
1.	Generate Token	Direct	T1	Token issued to patient on OP pharmacy counter
2.	Indent issue	Direct	T2	Issuing the prescribed medication
3.	Billing	Direct	T3	Generating and issuing bill
4.	Indent dispense time	Calc.	T2-T1	Time to dispense the prescribed medication
5.	Billing time	Calc.	T3-T2	Time to collect payment after issuing the bill

4 DISCUSSION

The data collected from various stakeholders or users involved in the pharmacy department (directly or indirectly) of the Takshasila Hospital through in-depth personal interview and focus group discussion which were conducted and organized during the designing and development stage of the pharmacy module of HIS was analyzed and grouped under different processes and findings and workflow generated as shown in the form of flowcharts and tables in the previous chapter. Although largely based on Requirements for Pharmacy module of HIS to be implemented in the Takshasila Hospital, the models for action functional requirements focused on the system-level (policy, management, and technology) strategies that create records rather than on the record-level. The definition of a record used in the development of the Functional Requirements is the following: "any information received in the normal course of business and retained as evidence of organization, function, policies, decisions, procedures, operations, or other activities, or because of the information contained there in."

The initial models for Functional Requirements contained mainly two categories of the pharmacy module i.e. OP pharmacy and IP pharmacy, which were further expanded into each comprised of a number of sub-requirements, and each containing a brief justification statement. The sub- requirements for OP Pharmacy and IP pharmacy were grouped under required ID, required group, business rules / process, workflow or transactions and reports. All the workflow process will have input point and output point and each step will be denoted through an individual and specific colour coding which will reflect a certain action command.

Manual inpatient pharmacy processes often delay order fulfillment and may even cause pharmacy order errors. Slow, lost or mishandled prescriptions can jeopardize patient medication safety, exposing patients and healthcare organizations to unnecessary risk.

The IP pharmacy will receive request in form of indents differently from various departments i.e. ICU department, Operation Theatre, nurse store, ward department and emergency department on the available drugs in the drug formulary approved by hospital's drug and therapeutic committee which will get processed on the basis of either priority indent or order queue.

The IP pharmacy workflow starts with prescription order by doctor which is enter into the system by the consultant himself or nurse enters it into the system. The pharmacist selects the particular indent and selects the prescribed drugs and quantity required and sends to the nursing station for dispensing and collects the acknowledgement from nursing station and update the inventory.

While efficiency is the foundation of our workflow solutions, patient safety and near accuracy are the key benefits to the pharmacy operation. The ability to virtually eliminate the chance of picking or dispensing errors leaving the pharmacy combined smarter implementation and more efficient workflow.

The OP pharmacy workflow starts with the same system of prescription order but here only consultant selects or enters the drugs into the system and generates the prescription in the system. Once the prescription order is generated in the system it is directly viewed by the pharmacist and is ultimately issued to the patient with proper information of dosage and precautions to be taken.

The output points plays a vital role and importance in any system which provides with very critical and useful data and information related to transactions , generations of reports and performance the department and the processes involved in the providing services to the patient.

The design of good organizational workflow is not simply about improving efficiency. Workflow processes are maps that direct the care team how to accomplish a goal. A good workflow will help accomplish those goals in a timely manner, leading to care that is delivered more consistently, reliably, safely, and in compliance with standards of practice.

The limitations of the study are-

- As hospital is in project stage and the process of recruitment is undergoing, so the participation of end users was constraint.
- Many times all the stakeholders were not present together at same time for discussion.

5 CONCUSION AND RECOMMENDATIONS

Health care is a service industry that relies heavily on good information. This valuable information can be lost when poor workflows impede communication and coordination or increase interruptions. Characteristics of a poorly functioning work process include unnecessary pauses and rework, delays, established workarounds, gaps where steps are often omitted, and a process that participants feel is illogical.

The data collected from various stakeholders or users involved in the pharmacy department (directly or indirectly) of the Takshasila Hospital was analyzed and grouped under different processes and findings and workflow generated as shown in the form of flowcharts and tables.

For successful development and implementation of HIS,

- The system's development and successful use has been dependent on the constant active involvement and participation of the internal pharmacy team who would eventually become its end users.
- The internal team should be knowledge in providing correct information.
- The system should adhere to the issues related to privacy and regularities.
- Proper training should be provided to the end users by software development team.
- The internal team should have a good software design personnel for software designing and development of the system.
- The user involvement proved essential for system roll-out as the users were equipped with not only technical training and support, but also the ability to shape the system to their specific and at times evolving needs.

Annexure 1

S.No	List Of People Interviewed
1.	General Manager – Purchase And Supply Chain
2.	Assistant General Manager - Stores
3.	Senior Manager - Pharmacy
4.	Manager – Purchase
5.	Senior Implementation Specialist IT

Annexure 2

S.No	List Of People Participated In Focus Group Discussion
1.	General Manager – Purchase And Supply Chain
2.	Assistant General Manager – Stores
3.	Senior Manager – Pharmacy
4.	Manager – Purchase
5.	Senior Implementation Specialist It
6	Chief Of Medical Services
7	Nursing Director

Annexure 3

Input Compliance Sheet

S.No	Questions
1.	What are the main start and end points of pharmacy workflow ?
2.	What should be the initial requirement for pharmacy HIS ?
3.	What are the various touch points in the workflow ?
4.	What should be dispensing process of IP and OP pharmacy ?
5.	How should be the process of indenting and stock management ?
6	What should be the reports to be generated by the system ?
7	What details should be entered in system for drugs ?

Annexure 4

Output Compliance Sheet

Description	Reviewed/ Understood
System will automatically update the Drug request Queue for Inpatient and Outpatient once prescription is raised by Doctor. The Queue can be filtered based on **- Date** **- Pharmacy Name** **- Patient ID** **- Patient Name** **- Patient Type [OP/IP]** **- Emergency Tag** **- Ward etc.**	YES
System should have the facility for **- Point of Sales [POS] screen for OPD & Over the Counter sales** **- Dispensing screen for Inpatients** **- Auto dispensing of drugs (shall be configurable)**	YES
The Patient Drug Request queue will be displayed on Plasma TV with current and next patient highlighted in the queue.	YES
System should allow to view Doctor Prescription online from Pharmacy	YES
System shall have the facility to create the prescription for formulary drugs (multi drug combination)	YES
System shall be able to automatically bill the formulary creation charges based on the number of drugs composition.	YES
Facility to inform patients the cost involved for each drug and the price involved for the medicines need to be purchased. This will help to address patient queries for medicine price.	YES
Should allow the dispensing of drugs against the drug indents and prescriptions for patients for both one time and repeating prescriptions	YES

Description	Reviewed/ Understood
Pharmacy user can view the prescription and should have the facility to copy the medicines in Pharmacy Sales Order screen to minimize time to enter data	YES
System should have the facility to find drug based on **- Drug Name** **- Generic Name** **- Manufacture Name** **- Therapeutic Code etc.**	YES
System should allow to scan the Barcode on Drug pack and update Sales line with	YES
Drug Name, Batch and Expiry date information	
System should allow to view the Batch wise medicine information with **- Batch No** **- Expiry Date** **- Available Quantity information**	YES
The information will be displayed in such a way so that the Batch which is expiring first will be displayed on top of the Batch List.	YES
If a specific batch is expired, the information for the batch should not be displayed **at all while selecting medicine**	YES
System should have the facility to list down all the substitute Drugs with their Generic name and Quantity information. This will help the Pharmacy users to dispense substitute medicines during non-availability of original drug prescribed by doctor.	YES
Facility of selecting same drug from multiple batches. This facility will help Pharmacy staff to sell/dispense medicines while quantity is not sufficient in a single batch to address the prescribed drug quantity.	YES
System should have the facility to track multiple UOM information and automatic calculation of quantity based on conversion factor	YES
The system should support partial issues of stock for both Normal and Repeat order. The repeat order should specify the start date and the	YES

Description	Reviewed/ Understood
duration of the prescription and also the frequency at which the order for the prescribed dosage should be automatic.	
System should display the Price information for the selected drug during Pharmacy sales and also the total amount for the medicines to be sold/ dispensed	YES
System should be integrated with Inventory module. Once medicine is sold / dispensed, system will automatically reduce inventory for the specific batch.	YES
Facility to collect amount and generate Receipt for OPD and OTC sales	YES
Facility to collect in different Payment Mode like: **- Cash** **- Check** **- Debit/ Credit Card**	YES
Facility to collect in different currency and converting into base currency.	
System should have the Drug return functionality and automatic update of inventory.	YES
Stock Audit and adjustment of inventory	YES
Maintain complete drug formulary with information on the generic name, the **trade name, standard dosages, contra-indications, interactions, physical and chemical characteristics etc.**	YES
System shall have facility to configure the purchase and sale UOM as different.	
Pharmacy Request Queue	YES
Pharmacy Return Order Queue	YES
Pharmacy Billing Queue	YES
Stock Adjustment Queue	YES
Stock Transfer Queue	YES
Stock Issue Queue	YES
Pharmacy Order No.	YES
Pharmacy Return Order No.	YES
Pharmacy Bill No.	YES

Description	Reviewed/ Understood
Pharmacy Receipt No.	YES
Pharmacy Purchase Order No.	YES
Stock Adjustment No.	YES
Stock Transfer No.	YES
Stock Issue No.	YES
Batch wise Tracking	YES
List of Near expiry Drug	YES
List of Expired Drug - By period	YES
Stock Transactions List - Item wise, Date/Period wise	YES
Daily transactions details	YES
Pharmacy Revenue	YES
Fax	YES
Plasma TV	NO

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