

DEP302  
**Systems Design Project**

*Guided by:*

Prof. Ravi Poovaiah, Prof. Pramod Khambete, Dr. Ajanta Sen

**FINAL REPORT**

*Team:*

C Jeremiah Iype

Ishaan Nejeeb

Mohak Gulati

Prafulla Chandra G S

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# Project Synopsis

This project is a deep dive into the Indian Healthcare system, specifically the Indian Medicine System, in an attempt to understand and map all the various perspectives in play and the clogs that interact to bring about these perspectives. Our team of 4, with specializations ranging from User Research to Interaction Techniques and Visual Design, was able to come together to identify the inner workings of this system and through secondary research and stakeholder interviews we were allowed to witness what works, what needs improvement and how innovatively people adapt to accommodate the system's lapses.

Having understood the unique challenges Indians face in this space, we identified Patient Education as one of the key aspects to empower through a series of interventions spread across the system. Disseminating the interventions allows for a more holistic approach to the problem rather than trying to push through from one angle. We mapped out how each of these interventions positively impacts the larger system and this system design proposal was then presented forth to valuable stakeholder insights. Their response was a healthy of approval and some improvement suggestions, further grounding our work into reality. We are proud to have had the opportunity to work on a solution for the semi-urban middle-class population, a demographic that is often underrepresented when it comes to design solutions. We hope that the progress we have made here inspires and creates a real positive impact in the near future.

By *Team Malayaliano*,

ഇഷാൻ, मोहक, അരമ്യോൻ, പ്രഫുല്ല

(Ishaan, Mohak, Jeremy and Prafulla)

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# Project Overview

The aim of this Systems Design Project is to research, understand, visualize, synthesize and design for problems from socio-economic, cultural, political, technology, sustainability perspectives that are complex, uncertain, interconnected and form a system with often unclear boundaries. With that intention in mind we started looking at different areas based on our collective interests, knowledge and possibilities of interventions.

## Problem Area Exploration

We shortlisted several possible ideas ranging from visual design and communication systems to interactive information dispensation systems. Of these the one that interested us the most was the consumer-side of the Indian Pharmaceutical system or the **Indian Medicine system**, that is, how patients and healthcare professionals interact with medicines.

We received feedback to look at the system from a broader lens and thus proceeded to detail out its place within much larger Indian Healthcare system, within which we will be looking at:

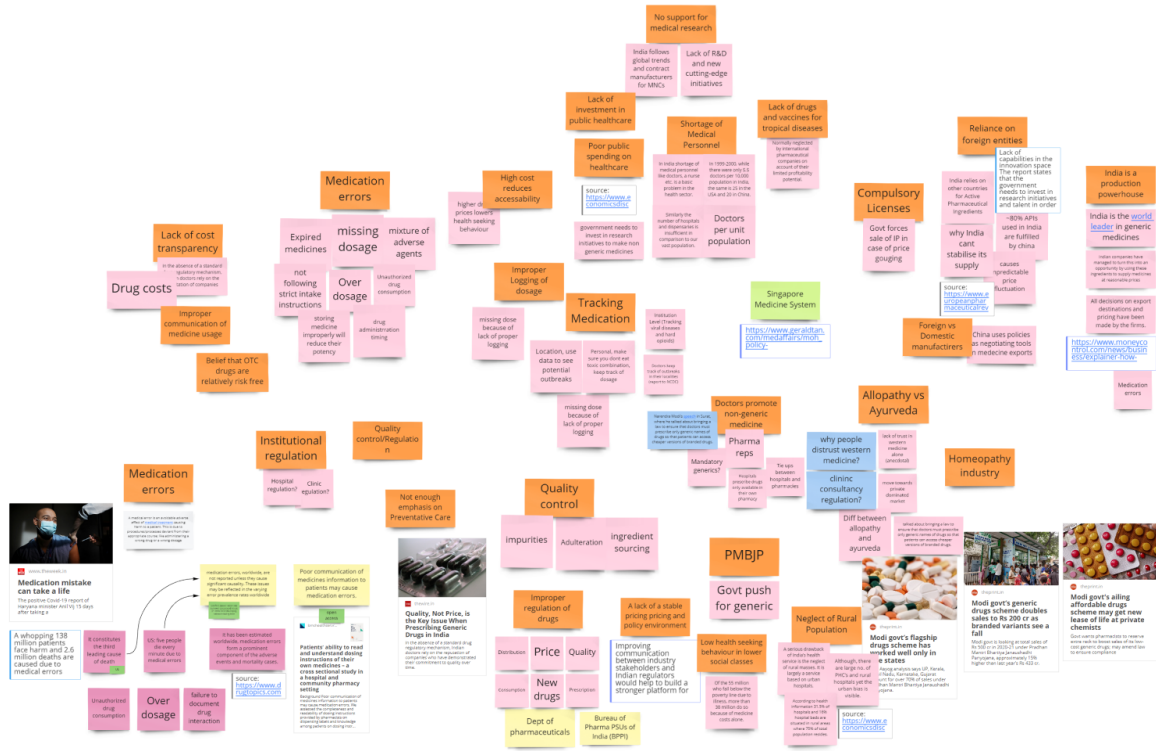
- Production
- Prescription
- Access
- Usage

In order to put these 4 aspects of this system into perspective we must look at the broader relationship between the *Indian Healthcare system*, the *Pharmaceutical industry* and the *institutional policies* that drive and regulate them both.



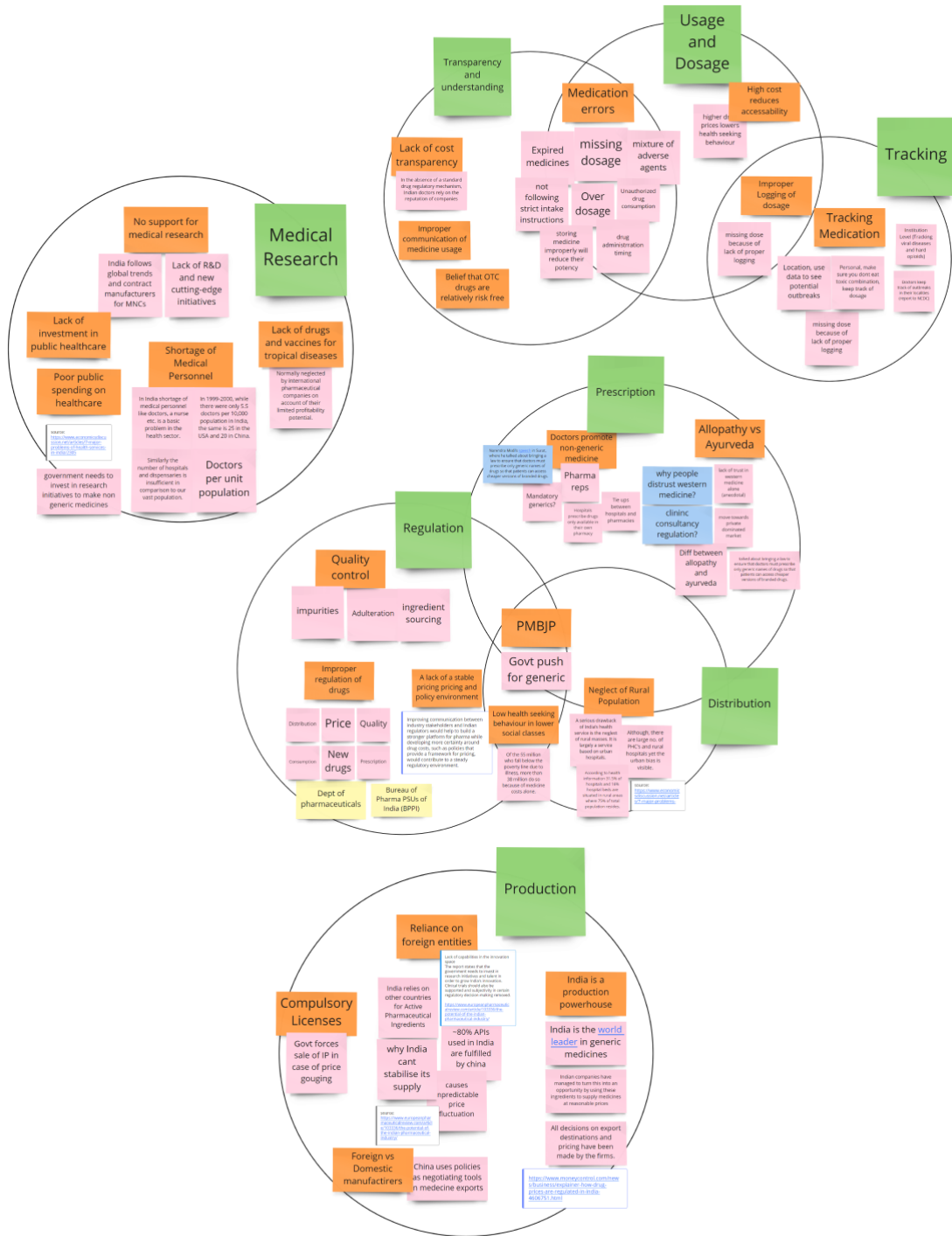


# Brainstorming



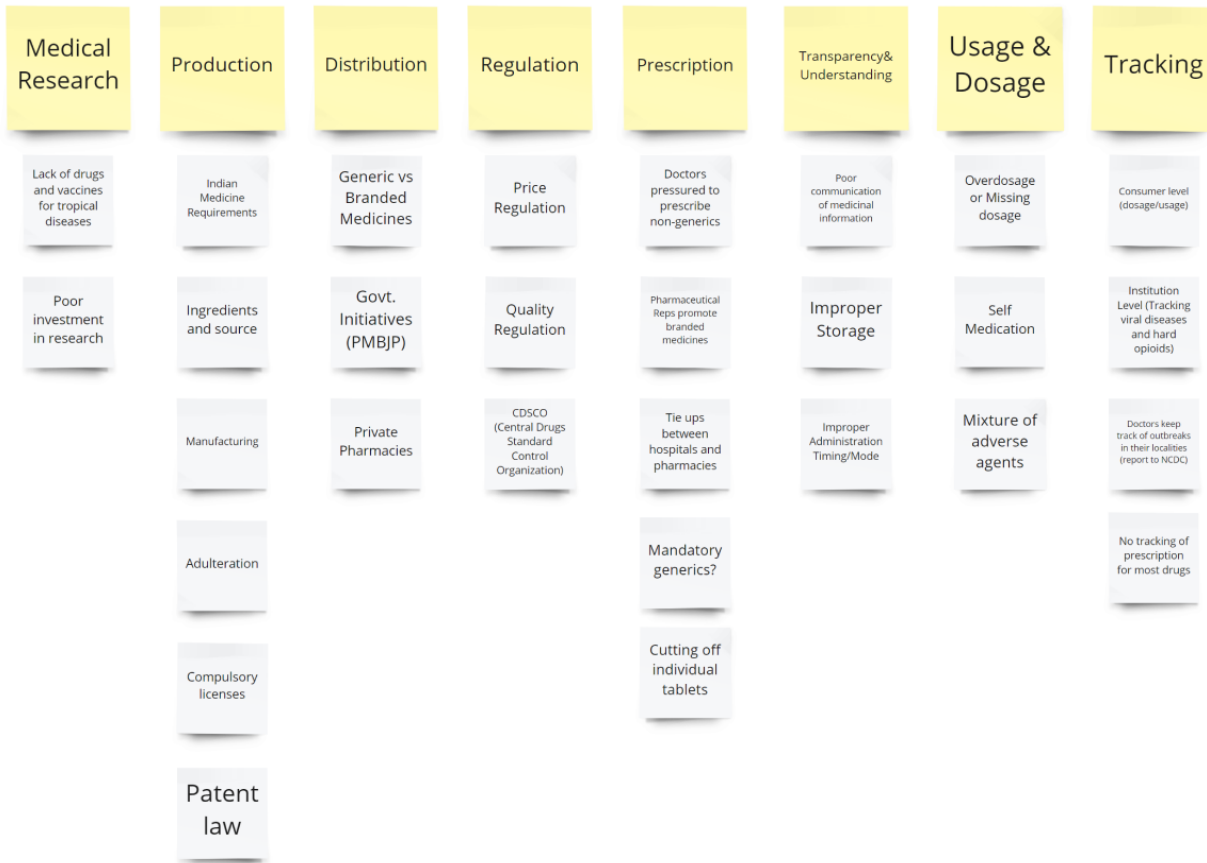
To understand the big picture and map all parts of the system which were influencing medicine usage, we identified some of the major entities and forces in play in the existing systems. During our initial secondary research we covered the following topics:

- Generic Medicines & Branded Medicines
- Our large imports of medicinal ingredients
- India's massive exports of staple medicines and vaccines
- Government regulations regarding medicines
- Medicinal errors caused due to improper information dispensation
- And more...



Those factors/aspects were further clustered together and mapped onto venn diagrams to better understand their relationship with each other. These connections will be explored further in our mappings, with causality-loop and feedback-loop diagrams.

# Identifying System Boundaries



We consolidated all our ideas into groups we were able to better identify some of the main aspects of the system:

## 1. Medical Research



There is a dearth of Medical Research in India, despite our extensive manufacturing capabilities. This is caused by many factors including a lack of govt funding into the research sector.

## 2. Production



Production refers to the manufacturing and sourcing of medicines along with policies regarding them like licensing, indian medical requirements, patent laws etc

## 3. Distribution



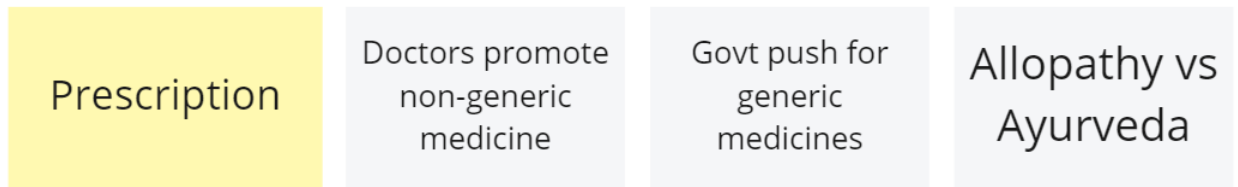
Systems of distribution include entities like major pharmacy chains. This also includes govt dispensaries and generic medicine dispensaries. Today the growth of emedicine means that there are also online players in the space.

## 4. Regulation



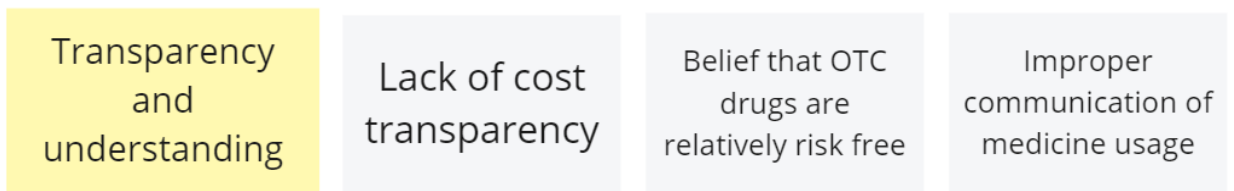
The Govt imposes many regulations which control various aspects of the pharmaceutical industry including quality control, price control, IP law, manufacturing licenses and much more.

## 5. Prescription



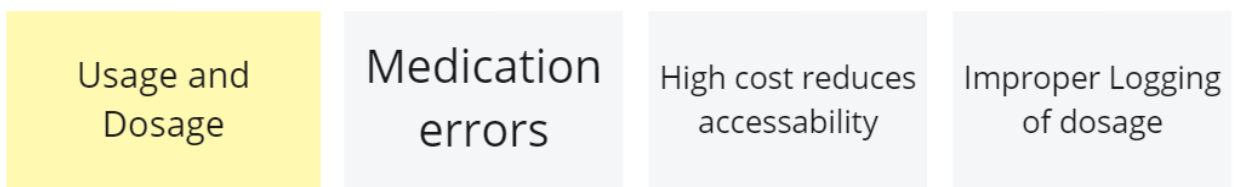
The particular brand of a medicine prescribed by doctors depends on a variety of factors. Pharmaceutical sales reps aggressively promote branded medicines to doctors, there could be tie ups between the hospitals and pharmacies which only sell a specific brand of medicines. Doctors tend to prescribe more non-generics due to the brand trustworthiness and quality control as well as a commitment to a particular brand.

## 6. Transparency and Understanding



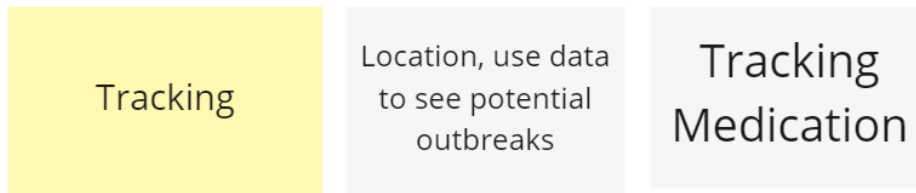
People might not be aware of all relevant medical information due to poor communication between doctors and patients. This problem is only exacerbated by illiteracy and many other factors.

## 7. Usage and Dosage



This entails how medicines are consumed and the many risks of medication errors. Self medication by people could lead to over/underdosing. People can forget to take their medicines on time. People might even accidentally take the wrong medicine entirely.

## 8. Tracking



Keeping a record of the flow of medicines to identify potential disease outbreaks in certain regions. This is especially important for decentralised and local healthcare policy makers.

## Setting Project Scope



From the 8 aspects identified, we plan to further focus on the consumer side of this system, into things like Prescription, Distribution, Transparency, Usage and Tracking. These can be further generalized into 3 categories:

- **Prescription**
- **Procurement**
- **Usage**

Using these three broad categories we will identify and map all the entities that make up the system and map them to understand all the interconnections between them.

# Identifying System Components

Within these 3 areas, we identified some important components to focus on and represent properly in our system mappings:

## 1. Prescription

- Pharmaceutical Influence on Medical Prof.
- Patient Education
- Medical Malpractice
- Generic medicines
- Brand substitution

## 2. Procurement

- Medicine Production in India
- Urban and Rural Accessibility
- Health Expenditure
- Investments and Exports
- Medical Research and Innovation
- AYUSH Medicine

## 3. Usage

- Consumer Awareness
- Over-the-counter Medicines in India
- Self-Medication
- Medication Errors
- Medicine dispensation

Additionally we had to look at the overarching institutional policies and regulations that govern these 3 areas as well:

## 4. Policies, regulations & Initiatives

- Medicine Tracking
- Drug Pricing
- Drug Schedule
- Pharma Rep Behaviour
- Drug Authenticity
- Essential Medicines

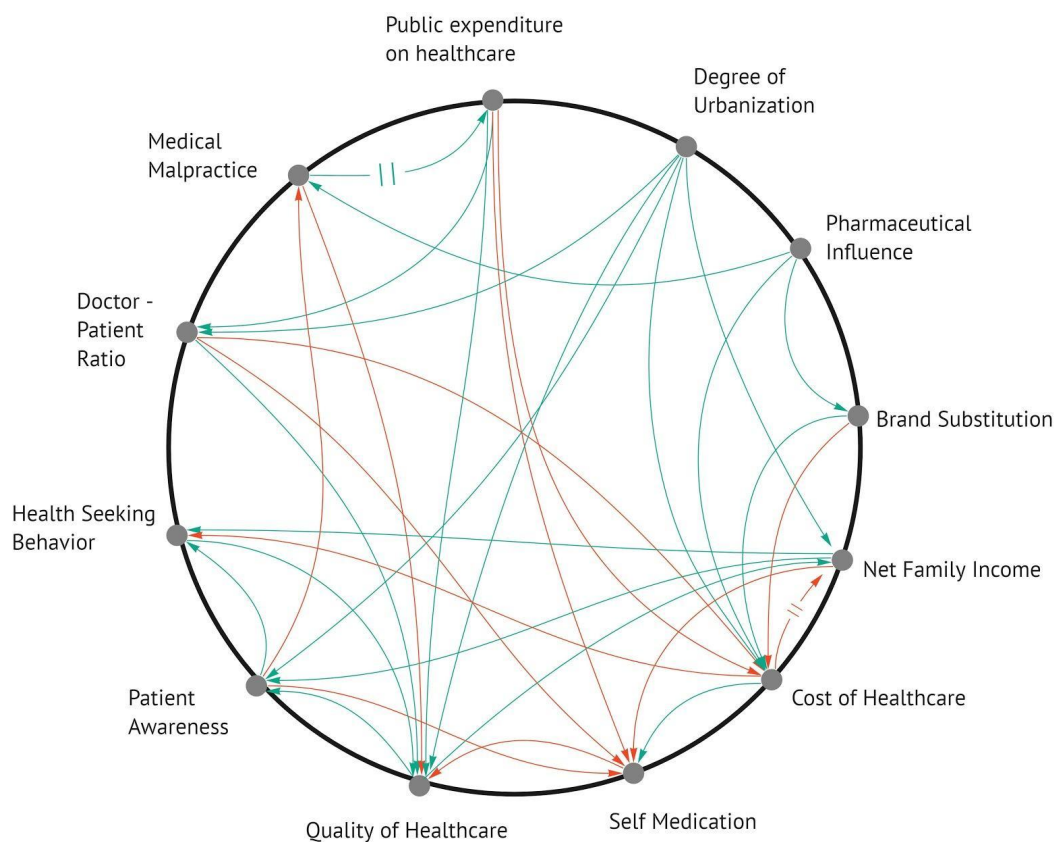
# Identifying Subsystems

To get a better understanding of these 3 focus areas or subsystems (Policies, Regulations and Initiatives are present in all 3), they were mapped onto Connection Circles.

All the quantitative variables of the system are placed on the boundary and connected with lines pointing from causes to effects. The green lines show a direct relationship while the red lines show an inverse relationship. System delays were also accounted for in the connections.

## The Prescription Subsystem

*Diagnosis, Treatment and Prescription*

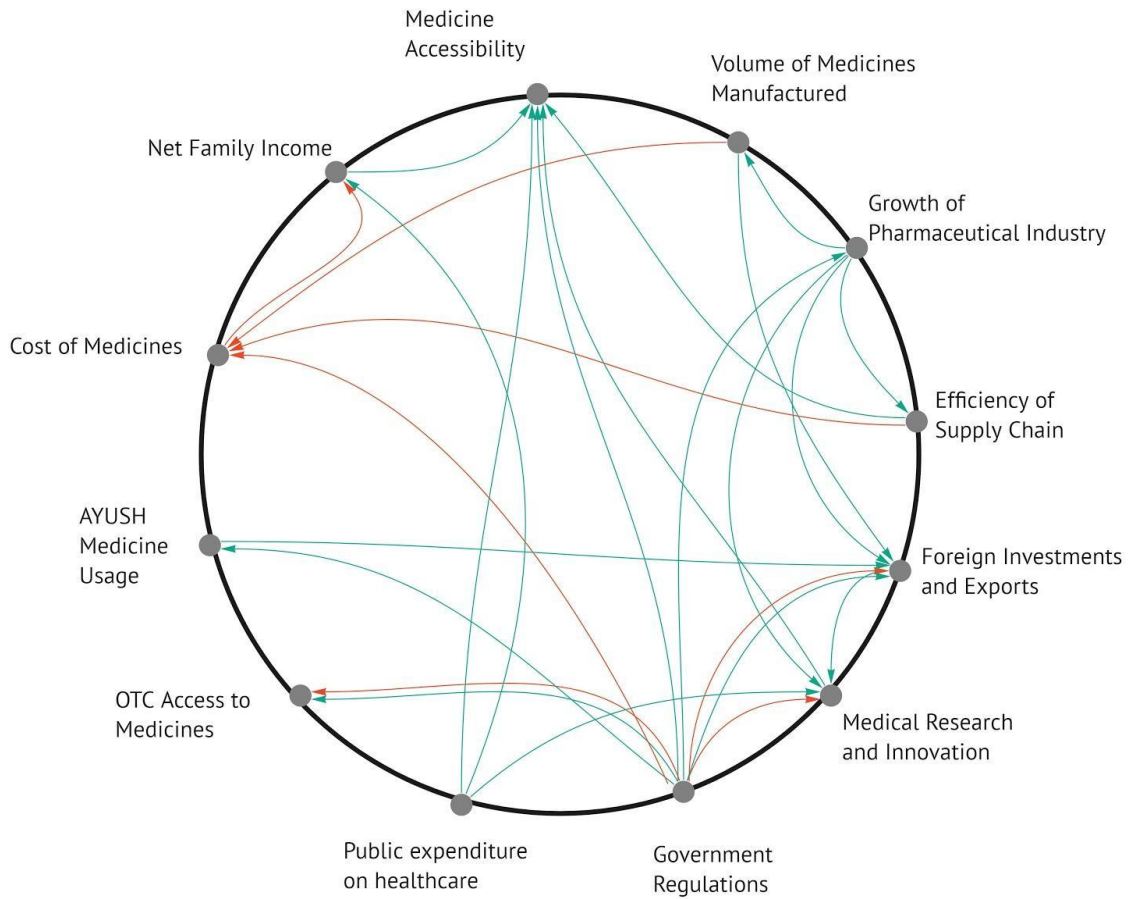


*Diagnosis, treatment and prescription*



# The Procurement Subsystem

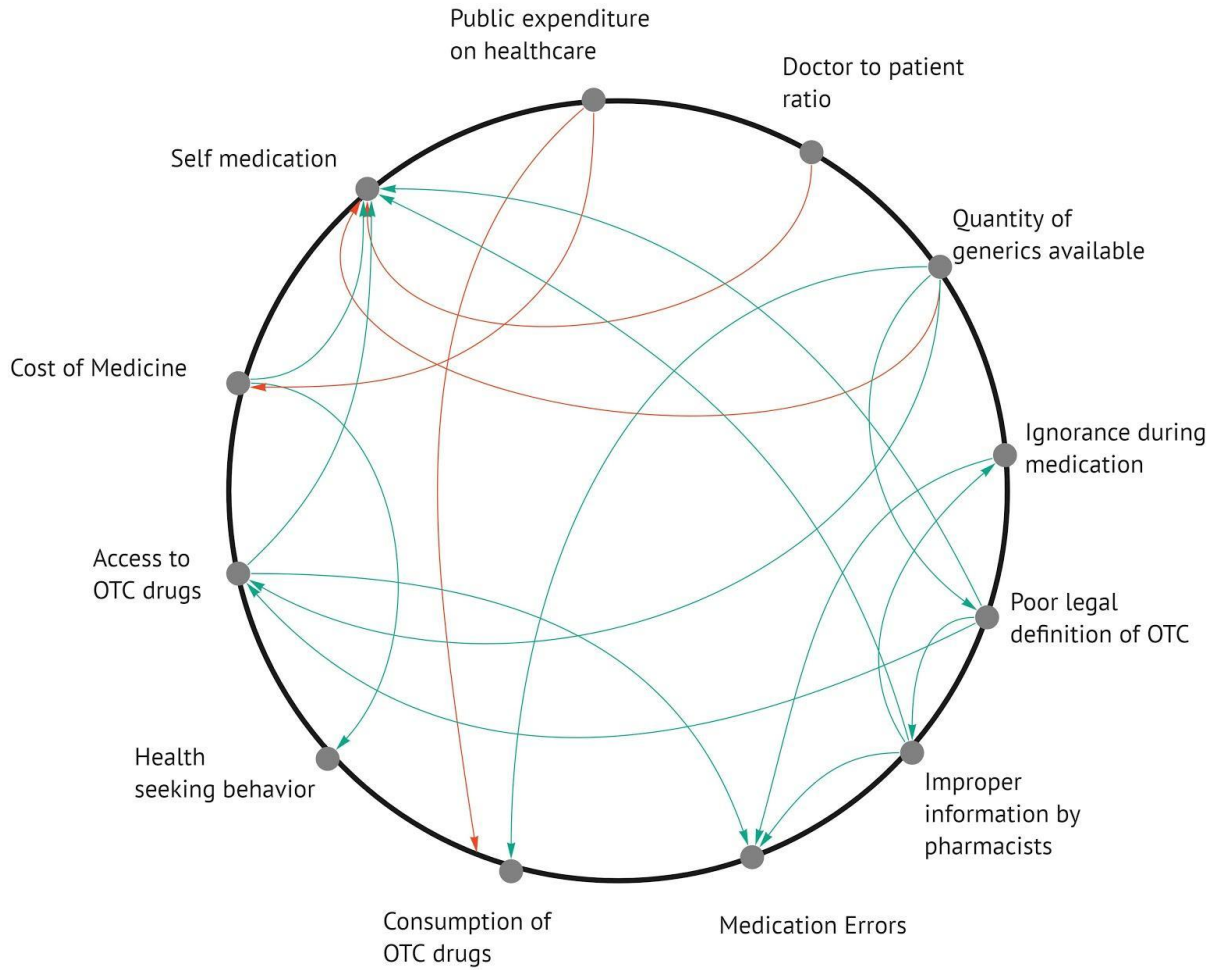
## Medicine Production, Accessibility and Availability



*Medicine production, Accessibility and availability*

## The Usage Subsystem

### *Patient Consumption, Awareness and Medication Errors*



### *Medicine consumption, awareness and medication errors*

These Connection Circles helped identify the various entities within each subsystem and visualize the relationships between each of them.

# Affinity

Research and observations from the prior mappings were summarized into useful insights.



We further clustered those insights to mitigate redundancy and create slightly broader and quantifiable variables.



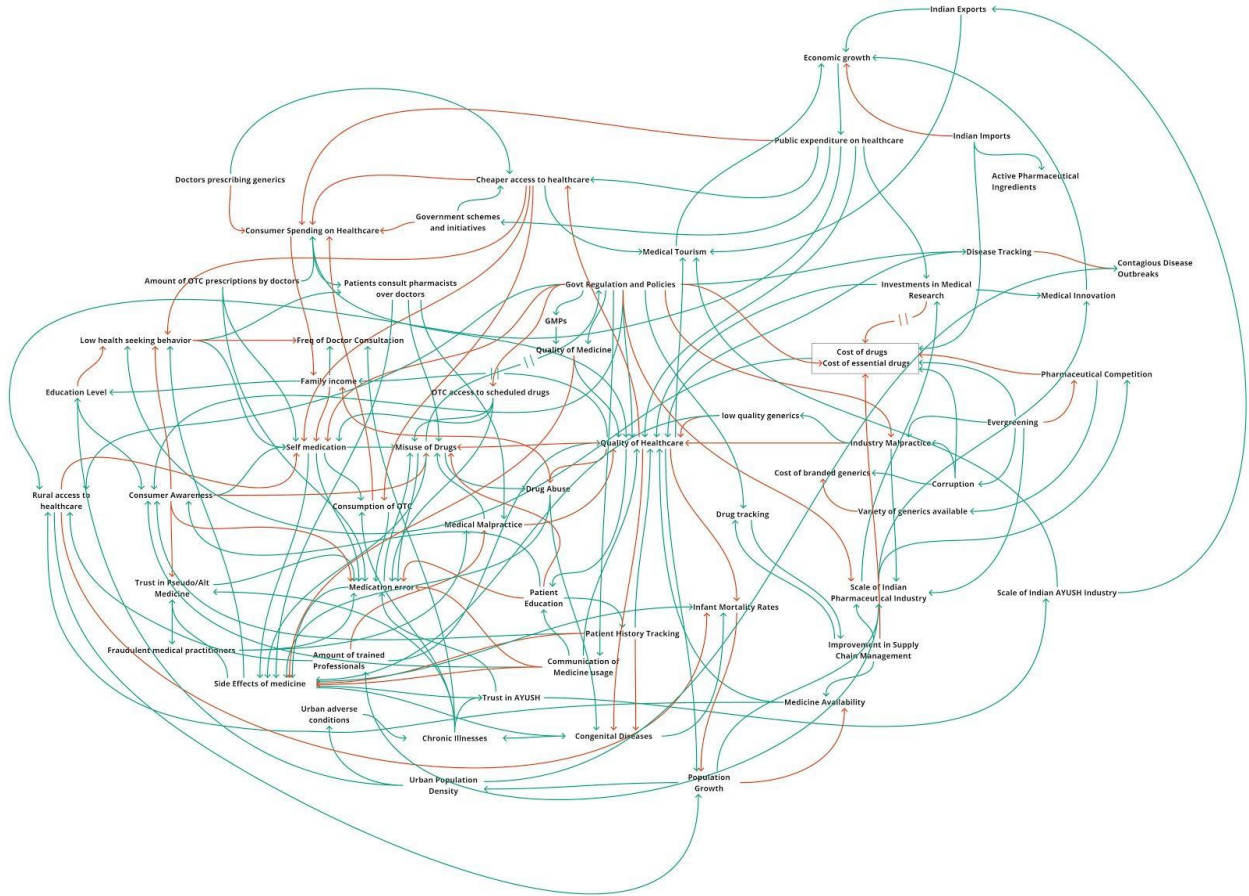
We were careful not to delete the granular insights which gave us our broader variables in order to be able to track back to these in the future and include them in subsequent sub-systems.

Comm. of Medicine usage	Medical Malpractice	Amount of trained Professionals	Corruption	Government schemes and initiatives	Misuse of Drugs	infant mortality rates	Consumer Spending on Healthcare
Indian Imports	Medication error	Trust in AYUSH	Industry malpractice	low quality generics	Govt Regulation and Policies	cheaper access to healthcare	Freq of Doctor Consultation
Fraudulent medical practitioners	Consumer Awareness	Medicine Availability	Rural access	low health seeking behaviour	Economic growth	Indian Exports	Quality of Medicine
Quality of Healthcare	Self medication	Variety of generics available	Doctors prescribing generics	Investments on Medical Research	Patients consulting pharmacists instead of doctors	Improvement in Supply Chain Management	Amount of OTC prescriptions by doctors
Net Family Income	Public expenditure on healthcare	Adverse urban conditions	Pharmaceutical Competition	Patient history Tracking	Disease Tracking	Drug Tracking	

These consolidated insights were used further to map the holistic system.

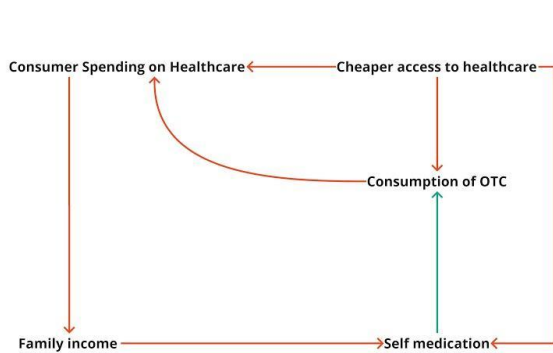
## Mapping the Holistic System

The variables were placed with 'Quality of Healthcare' in the centre. They were then connected with other variables using direct and inverse signifier lines. Possible delays in the connections were also taken into consideration.

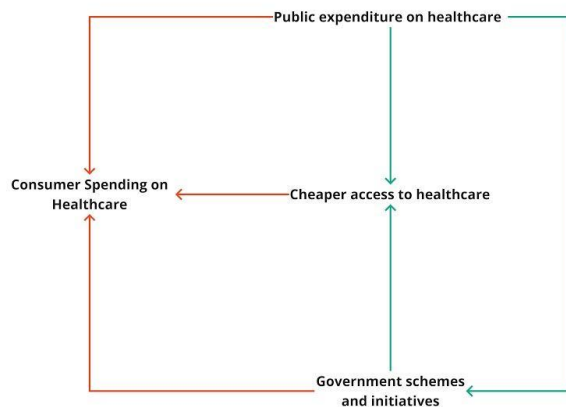


## Insights from the System Mapping

Doing a holistic system map helped identify insights that were not easily visible before:



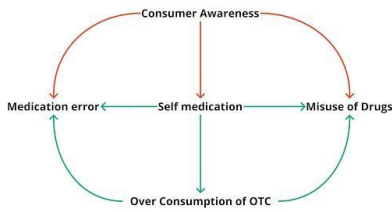
Low income households tend to self-medicate using OTC drugs



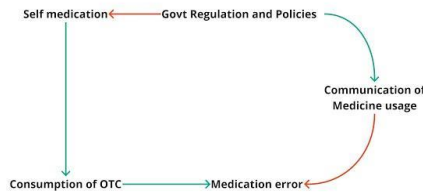
Factors that can help reduce Out of Pocket expenditure



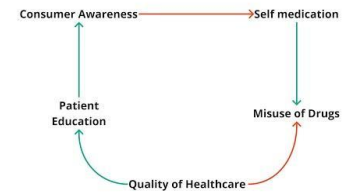
1. Low-income households are more likely to **self-medicate** using drugs available over the counter. Public spending and government schemes play in facilitating access to healthcare for working-class people.



Over consumption of OTC drugs occurs due to lack of consumer awareness and prominence of self medication

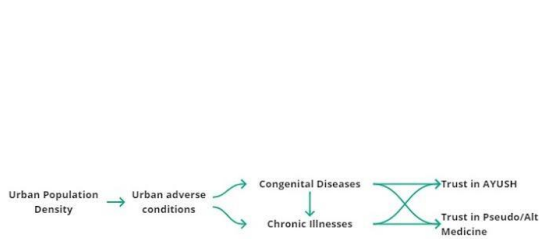


Medication errors often occur due to self medication

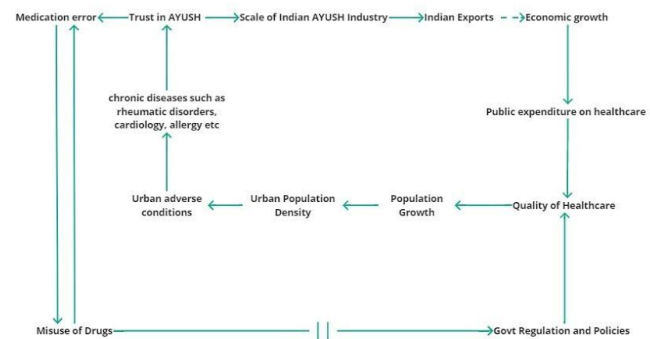


Misuse of drugs due to self medication

2. Large consumption of over-the-counter drugs occurs due to **a lack of consumer awareness** regarding their relevant risks, and the prominence of self-medication in India. People who self-medicate are prone to misuse drugs and have medication error-related issues.

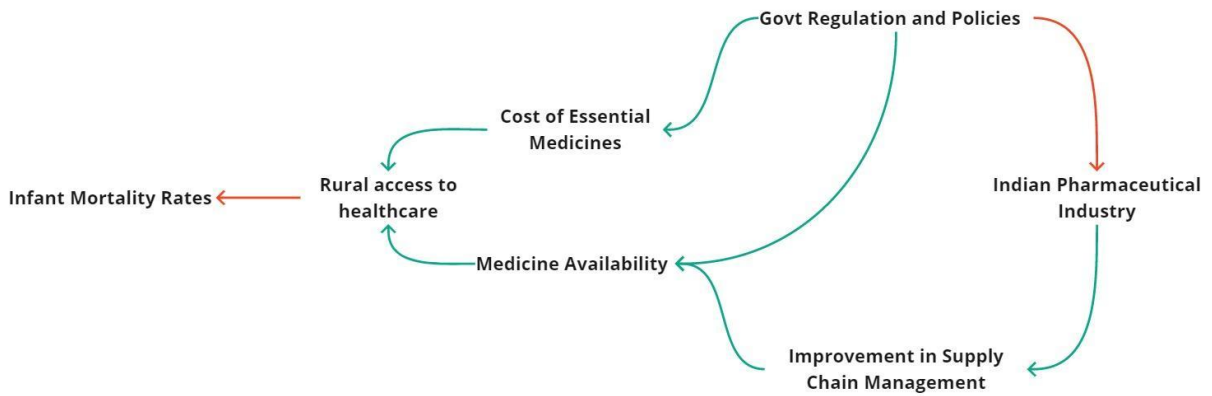


Urbanisation and its subsequent adverse conditions lead to an increased trust in AYUSH and also Alt Healthcare solution



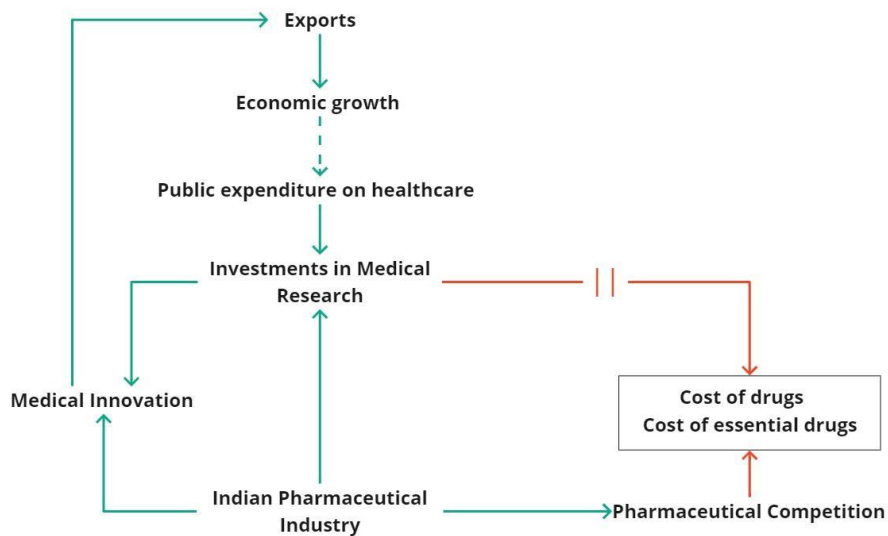
Trust in AYUSH positively affects the economy which in turn leads to urbanization and an increase in chronic disease which positively loops back. It also increases misuse of drugs which can lead to changes in government regulations

3. The growing urban population density leads to related adverse health conditions like respiratory issues and since people have a **growing faith in Ayurvedic treatments** when it comes to respiratory, gastronomic, and other similar chronic illnesses, this subsequently leads to increased trust and growth of the AYUSH industry.



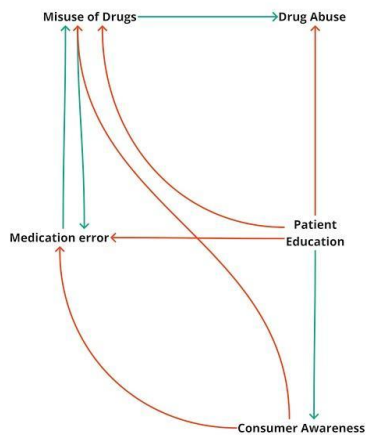
*Govt Regulations incentivize Pharma industry to create efficient supply chains to improve rural healthcare*

4. Strict regulations by the Indian govt on pharmaceutical companies lead to the companies creating more efficient supply chains to maximize reach and profits. This in turn leads to **increased rural access** to life-saving medicines and further reduces the severe infant mortality rates in rural India. Effective policies also help reduce the on-paper costs of drugs which increases rural access to medication.

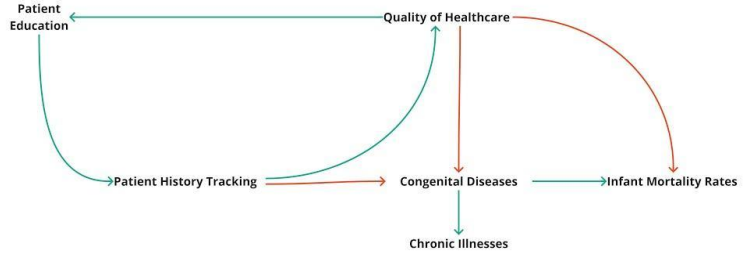


*Investment in Medical Research and the Pharmaceutical Industry helps reduce consumer-side cost of drugs and encourages medical innovation*

5. Increased **investments in the medical research** industry translate to fewer out-of-pocket expenses for Indian patients.



*Patient Education leads to less medication errors and misuse of drugs and leads to better consumer awareness.*



*Patient Education leads to better patient history tracking which improves the prognosis of congenital diseases and chronic illnesses.*

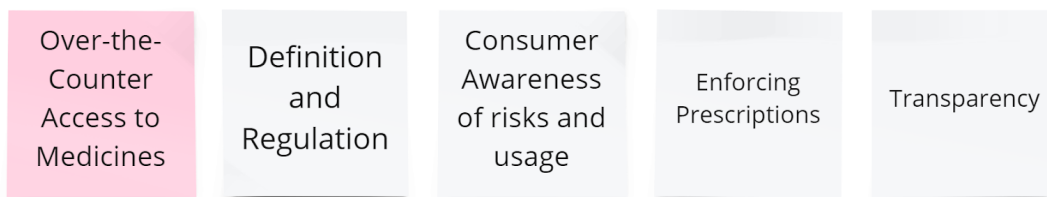
6. Increased **patient education** leads to less misuse and abuse of drugs as well as fewer medication errors. It also leads to increased consumer awareness. Increased education leads to better patient history tracking which reduces the risk and improves the prognosis for congenital and chronic diseases.

## Possible Opportunities

The insights from our system mapping have been summarised into these 5 problem areas where we can intervene.

1. **Over-the-Counter Access to Medicines**

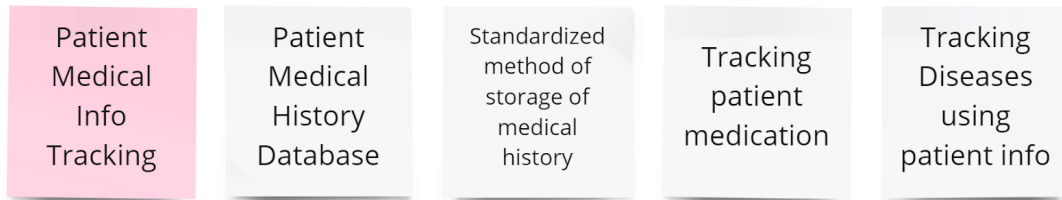
Improving safe over the counter access to medication, addressing issues in govt regulations, and the complications with self-medication.



2. **Patient Medical Info Tracking**

Standardised tracking of patient medical information





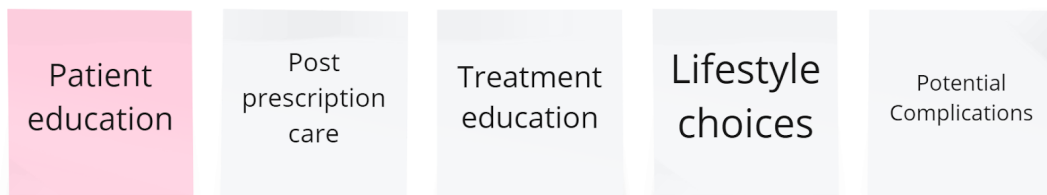
### 3. Consumer Medication Errors

Reducing Medication errors: improving awareness about usage, risks and processes to mitigate those risks



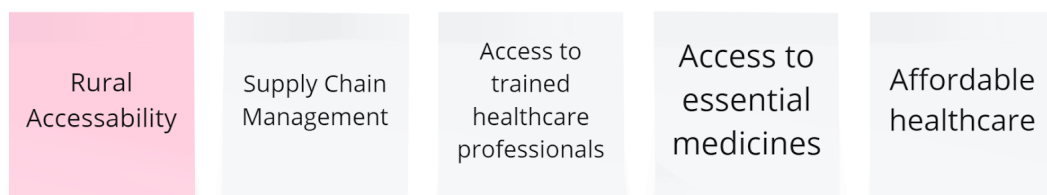
### 4. Patient Education

Increasing patient education on treatment, prescription and post-treatment action



### 5. Rural Accessibility

Improving Rural Accessibility to better healthcare and medicines





- Patient education helps mitigate self-medication risks in areas with limited access to healthcare.

## Final Problem Space

Through these connections we saw that **Patient Education** had the most potential to impact the system. It was the problem space with the most connections with the other segments of the healthcare system. It especially had many interconnections with OTC abuse and medication errors.

## Problem Statement

Once we had fixed on a problem space, we started working on a concrete problem statement based on our study of that space. We identified 3 major areas within patient education:

### 1. Patient Effort,

Patient effort includes some level of independent diagnostic & treatment action by the patient. Independent habits like tracking symptoms well.

### 2. Communication

Communication between the patient and the doctor and the quality of this communication.

### 3. Insufficient Attention

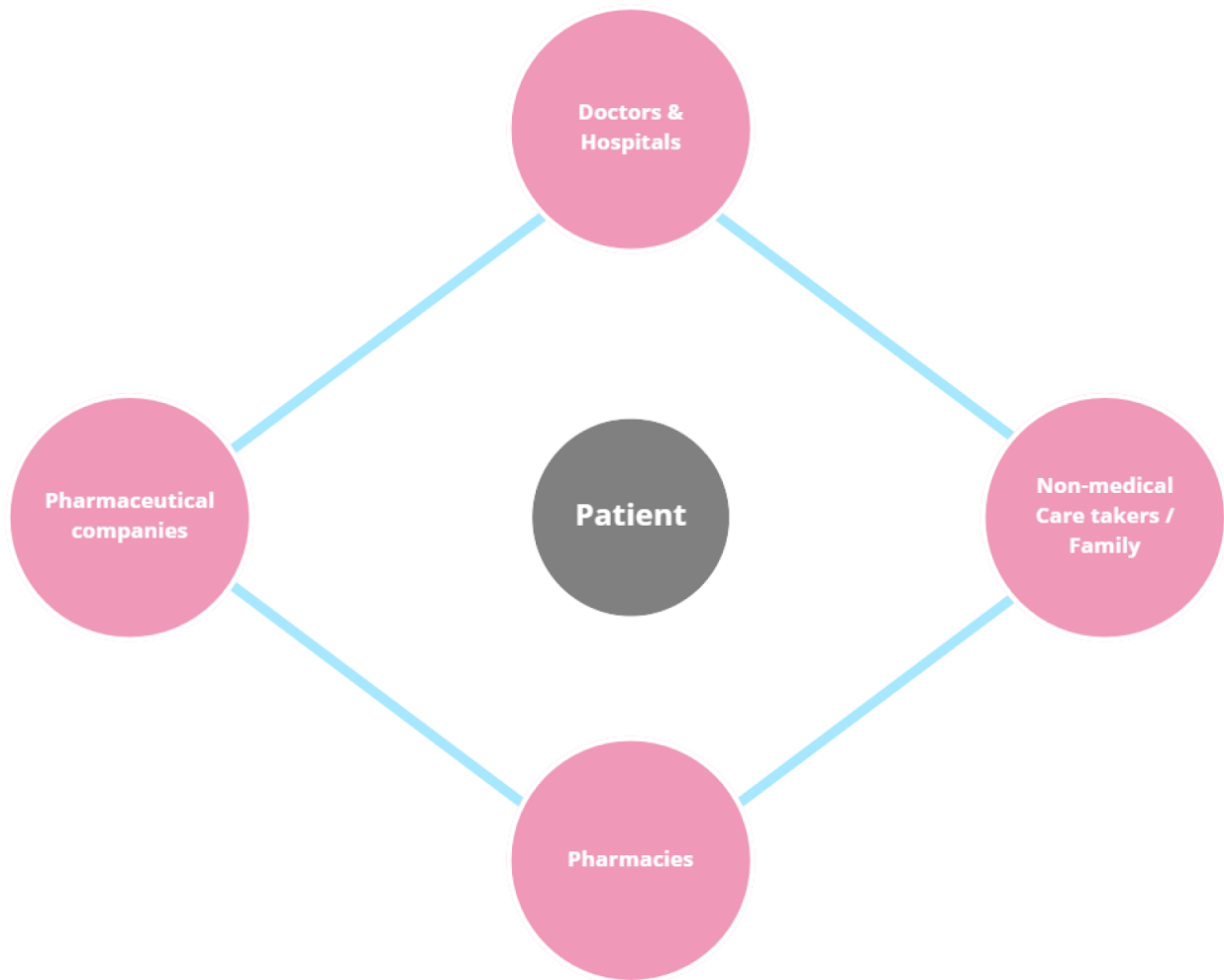
We noticed a trend of patient claims about insufficient attention from doctors which includes rushed diagnoses, quick treatments and not feeling heard.

And hence we consolidated the following problem statement:

**Ineffective communication** between doctors and patients leaves patients with an **insufficient understanding** of their condition and treatment, and leaves them unable to perform subsequent self-care. Doctors have to diagnose incomplete or inaccurate information.

This statement bridges all 3 of the areas we had identified.

## Stakeholders



Parallely, we worked on identifying the stakeholders of this system. Our main focus was on the **patients** and so they are our primary stakeholders. We also identified other stakeholders who are integral to the system surrounding the patients, **doctors** and hospitals, Non Medical care providers like **family and caretakers, pharmacies** and pharmaceutical **companies**.

# Primary Research

Once the stakeholders were identified, we set up interviews to gather primary, first hand data and insights from them. We interviewed doctors, patients, medical students and pharmacists.



The patients we interviewed ranged from ages 20 to 60 years. There were also a range of patients from completely healthy (except for infrequent visits to the doctor) to chronic patients who rely on daily medication, self diagnoses and visit the doctor frequently.

Among the doctors we interviewed, we met general practitioners, who usually see patients for a shorter period of time and mostly deal with acute illnesses, and specialists who look after patients with chronic illness and have fostered strong relationships with their patients.

We also interviewed a medical student to get an idea of what doctors are taught in regards to patient communication and diagnostic methods.

Finally, we interviewed three pharmacists from retail stores and pharmacy franchises.

# Insight Summary

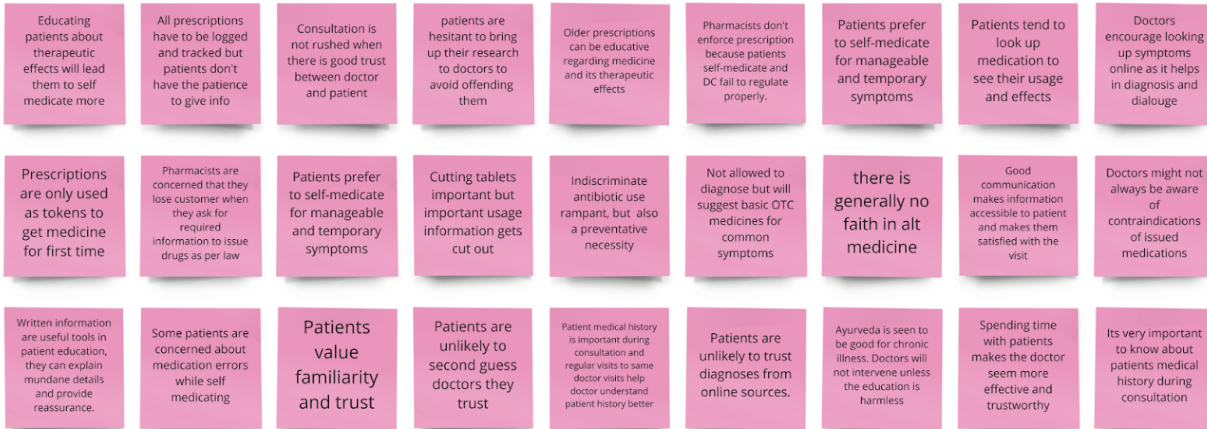
From the primary research we collected a plethora of insights.



We then clustered them into more relevant insight summaries.



These insight summaries helped us validate and sometimes invalidate some of our secondary research and general assumptions, hence allowing us to prioritize issues for our ideation.



We compiled some of our **key insights**:

1. Patients prefer to self-medicate for manageable and temporary symptoms.
2. All prescriptions have to be tracked but the patients don't usually have the patience to give information during purchases.
3. Consultation doesn't feel rushed when there is good trust and communication between the doctor and patient.
4. Doctors encourage looking up symptoms online beforehand as it helps diagnosis and dialogue.
5. Indiscriminate antibiotic use is rampant but it is also a preventative necessity.
6. Pharmacists aren't allowed to diagnose but still regularly recommend basic OTC medications if asked.
7. Doctors might not always be aware of contra-indications of issued medicines.
8. Written information is a useful tool in patient education for explaining seemingly mundane details and also to provide reassurance.
9. People have some faith in Ayurvedic treatments for chronic illness and doctors don't intervene or reject it unless the alternative treatment can potentially cause harm.

# Target Demographics

The healthcare system provides a diverse slew of challenges at all levels of society and for the sake of this academic exercise, we wanted to pursue the most challenging set of constraints we could identify- the rural population of India. Unfortunately, this required a large amount of primary research which we were unable to do during the lockdown.

Hence we decided to focus on the next best thing and address the issues of the semi-urban population. Each of the team members have a good first hand understanding of this population and one of us currently lives in a semi urban town.



- 01 Semi-Urban
- 02 Tier 2, Tier 3 Cities
- 03 Medium to Low Income Households
- 04 Limited Healthcare Infrastructure
- 05 Crowded Healthcare Facilities
- 06 Limited Education and Literacy

Semi-urban towns are places with medium to low-income households, with limited healthcare infrastructure where doctors often deal with a high volume of semi-literate patients who may have limited technological access. This selected demographic means that we need to design for linguistically and technologically illiterate users.



# Personas

Based on our primary research we came up with the following 4 personas to epitomize and duly represent our target demographic. Each having their own unique constraints and requirements.

01



Mammootty

- 24, Male, Educated
- Unlikely to Self-Medicate
- Avid Smartphone User
- Trusts Doctors
- No Chronic Illnesses

02



Mohanlal

- 78, Male, Literate
- Self-Medicates Often
- Uses a Feature Phone
- Does Not Trust Doctors
- Chronic Diabetic

03



Manju

- 47, Female, Uneducated
- Unlikely to Self-Medicate
- Smartphone User
- Trusts Doctors
- Diabetes and Hypertension

04



Mamta

- 35, Female, Educated
- Self-Medicates
- Smartphone User
- Somewhat Trusts Doc
- Has chronically ill family members

- Mammootty is a young adult who only visits the doctor sporadically for acute issues.
- Mohanlal is an elderly literate male, suffering from chronic diabetes.
- Manju is an uneducated woman. who is literate in Kannada.
- Mamta is a well-educated and has chronically ill family members

We selected **Manju** as our **primary persona** since she faces the most challenges and constraints such that if we accommodate her we would be able to accommodate everyone else as well.

## Primary Persona



**Manju K S**

**47, Female**



Paddy Farmer



Hirebidanur



Literate in Kannada



Diabetes and Hypertension



Cannot Self Medicate  
due to English Instructions



Emergent Smartphone User



Trusts her Doctor implicitly

Manju is a paddy farmer from Hirebidanur, a small village 10 km away from the nearest hospital. She did not go to school but is literate in Kannada. She has chronic diabetes and hypertension. And cannot self medicate as she does not know how to use common over-the-counter medicines and cannot read English to understand their instructions. She has a basic understanding of her smartphone. She trusts her doctor implicitly.

These personas helped us while ideating and will further come to use when we share scenarios in the final presentation.

## Preliminary Ideation

Some ideas were identified that we believe will positively affect the system. Being a system level problem, the final solution has the potential to include one or more of these multiple ideas to address the issue from multiple angles and to ensure a sustainable solution

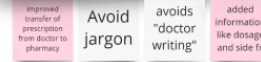
Literature handout containing adequate information accessible to all patients



Improved medicine packaging for informed risks and usage



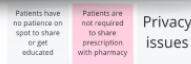
Redesigning prescriptions to improve communication



Online medicine database to educate people and allow safe self-medication



Central Prescription Database



Patient Portal to keep track medical records including prescription



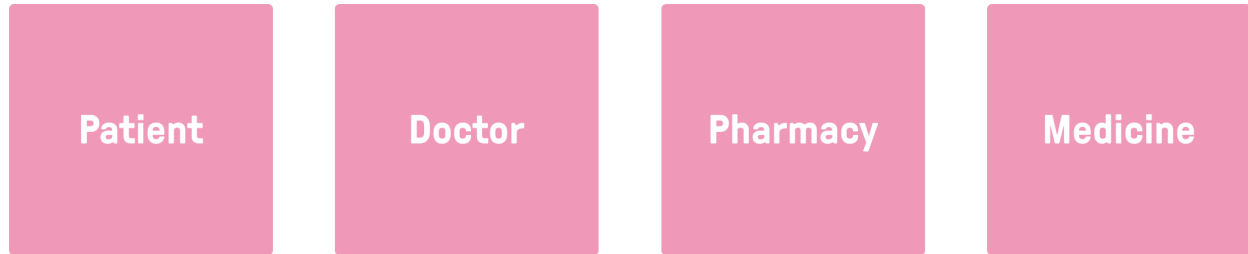
- Literature:** Literature is an important aspect of patient education, this includes all the various handouts and brochures patients receive. The issue is that much of this literature is unavailable for Indian contexts, and the ones that are, are not accessible enough, using a lot of medical jargon and are rarely available in local languages. This literature is especially important for chronic illnesses where patients need to be constantly reminded and reinforced. This also allows doctors to impart large amounts of information without spending a large amount of time with the patient, as we have observed doctors in India have very little time per patient.
- Packaging:** The existing packaging is poorly designed with regards to information relevant to the patient. The existing designs prioritize the branding of the manufacturer over useful instructions and warnings. They often also contain medical jargon which might be unfamiliar to the patients and cause further confusion. The existing form factor of pill sheets should be addressed especially when it comes to important data on the back of the pills being lost when the pills are popped out of the packaging, or when pharmacists cut the strips to suit the prescribed dosage.

3. **Prescriptions:** Prescriptions are important records not only during medicine procurement but also for reference throughout the course of the treatment and it's important for patients to be able to come back to them and understand usage, dosage and side effect information in order to avoid fatal medication errors and also to alleviate undue stress.
4. **Database of relevant information regarding treatment:** A lack of trustworthy data when it comes to treatments and medicines causes many patients to be wary of doing any research about their condition. This can be addressed by creating an accessible and personalised database which presents the patients with all the relevant information about their treatments including side effects and contraindications as well as warning signs to look out for. This also emboldens safe self medication in the case of long term chronic treatments.
5. **Central Prescription Database:** A centralized prescription database helps sort out many of the issues regarding people accessing high risk medicines over the counter with little to no oversight or education about potential risks. Only being able to access the medicines if you have the required prescription on the database ensures that Pharmacies can validate and track that prescription.
6. **Patient Portal:** Allowing patients to access all the information relevant to their condition like their medical files in non academic and easy to understand language will alleviate stress and increase transparency.

# Ideation

With our experience trying to understand and address system-level solutions, we understood that to sustainably tackle the issue of Patient Education we would need separate interventions at multiple levels in the system.

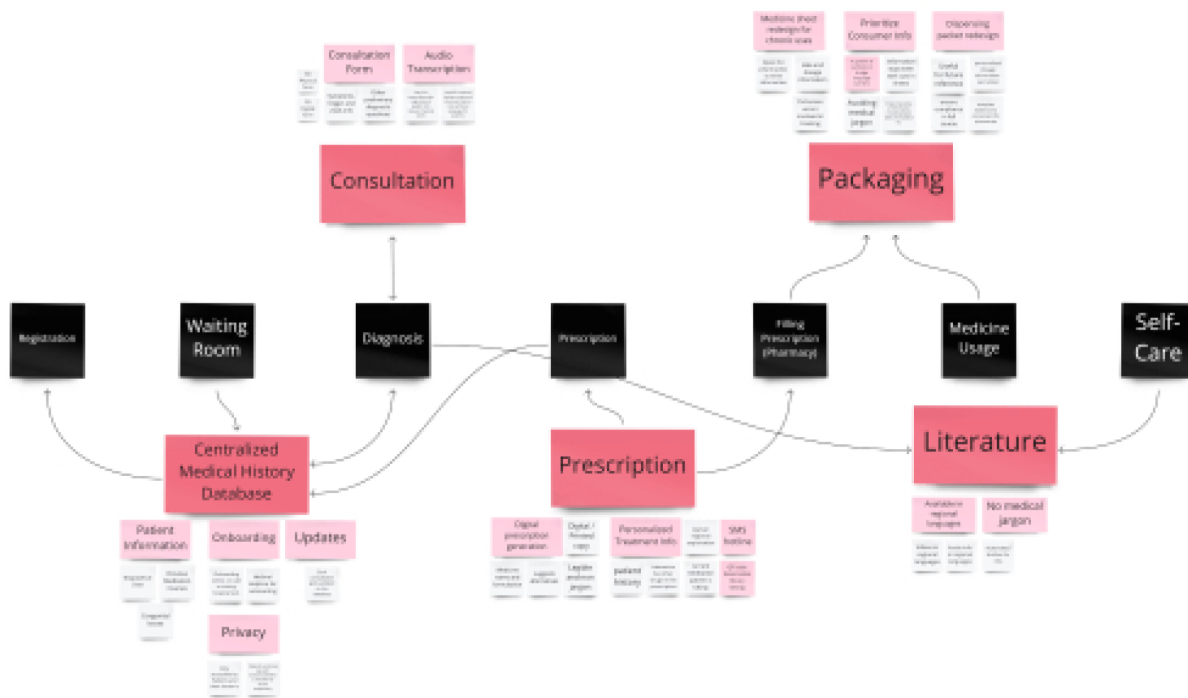
We identified 4 stages at which patient education should be empowered:



1. Patient initiated research.
2. Medical information provided by doctors and other healthcare professionals
3. Information about medicines from pharmacists.
4. Medicine labelling and packaging.

# Design Solution

To explain our final design solution, which is a compilation of several smaller design interventions at multiple points in the system, we made a basic flow of a patient's journey and mapped where our interventions fit onto that journey.



We broke down our interventions into five broad categories:

- Medical history
- Consultation
- Prescription
- Packaging and
- Literature

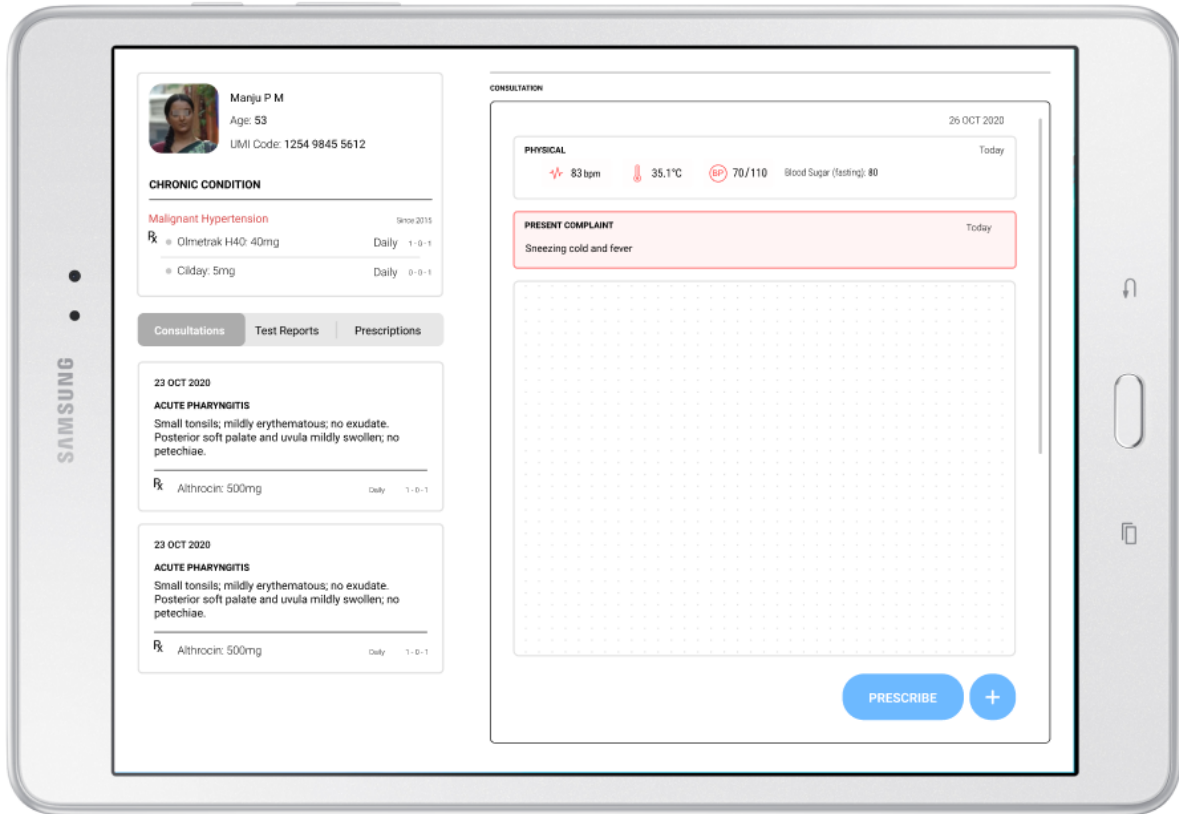
# Medical History



Information about existing conditions, medication and other relevant biographical data is vital during consultation in order to avoid any lapses during diagnosis or prescription. Our primary research offered many cases where patients faced complications because their doctor was unaware of their previous conditions.

Hence we're proposing a centralized database for patient history.

We plan to distribute an application, which will allow the doctors to update this database during consultations and assist in prescribing medicines.



It will also allow patients to track their prescriptions and consultations.



## Consultation

### Pre-Consultation Form

A basic summary of patient illness to help start the diagnosis

- + Identified Symptoms
- + Triggering Event
- + Lifestyle Information
- + Duration of Symptoms
- + Type of Pain



Considering the high volume of patients in semi-urban clinics, each patient generally spends about 20 to 40 mins in the waiting room and about 3 mins in the actual consultation. There is scope to make better use of the time that patients spend sitting outside to make efficient use of whatever little time they get with the doctor, hence we came up with the idea of a pre-consultation form, so that patients can collect their thoughts and symptoms even before they walk into the examination room. This form can be scanned and uploaded to patients' medical timeline.

Most people even if they can't read/write about their symptoms in detail can still be functionally literate here and easily mark the area on the diagram.



**Consultation Transcription** ★

Digitizing Doctor's Consult Notes

+ Preserving Consultation Details

+ Valuable future reference for:

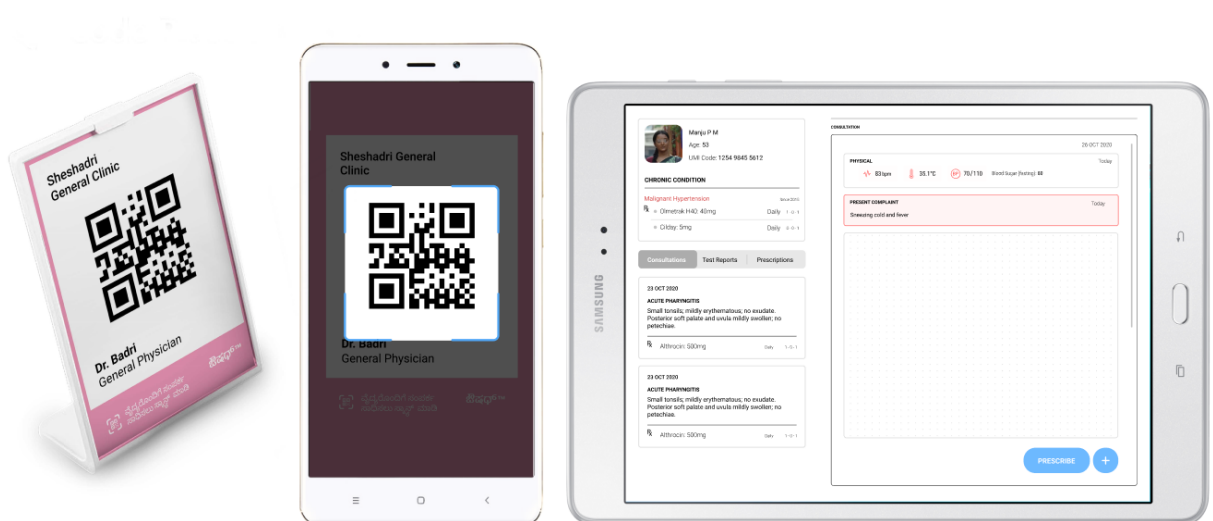
- Patients
- Doctors
- Caretakers

“Immense need for digital documentation of OPD notes”



Patient's consultation is very important for patients to refer back to a doctor's visit or even understand and track their healthcare.

Our app allows doctors to see a patient's medical timeline such as previous medical conditions, current medications etc after a quick QR scan. And doctors can write important OPD notes on a patient's diagnosis and treatment directly on a digital tablet using a stylus. This is later transcribed and translated into the patients preferred language in simple non-technical terms.



# Prescriptions

## Prescription and Personalized Literature

Digitizing Prescriptions

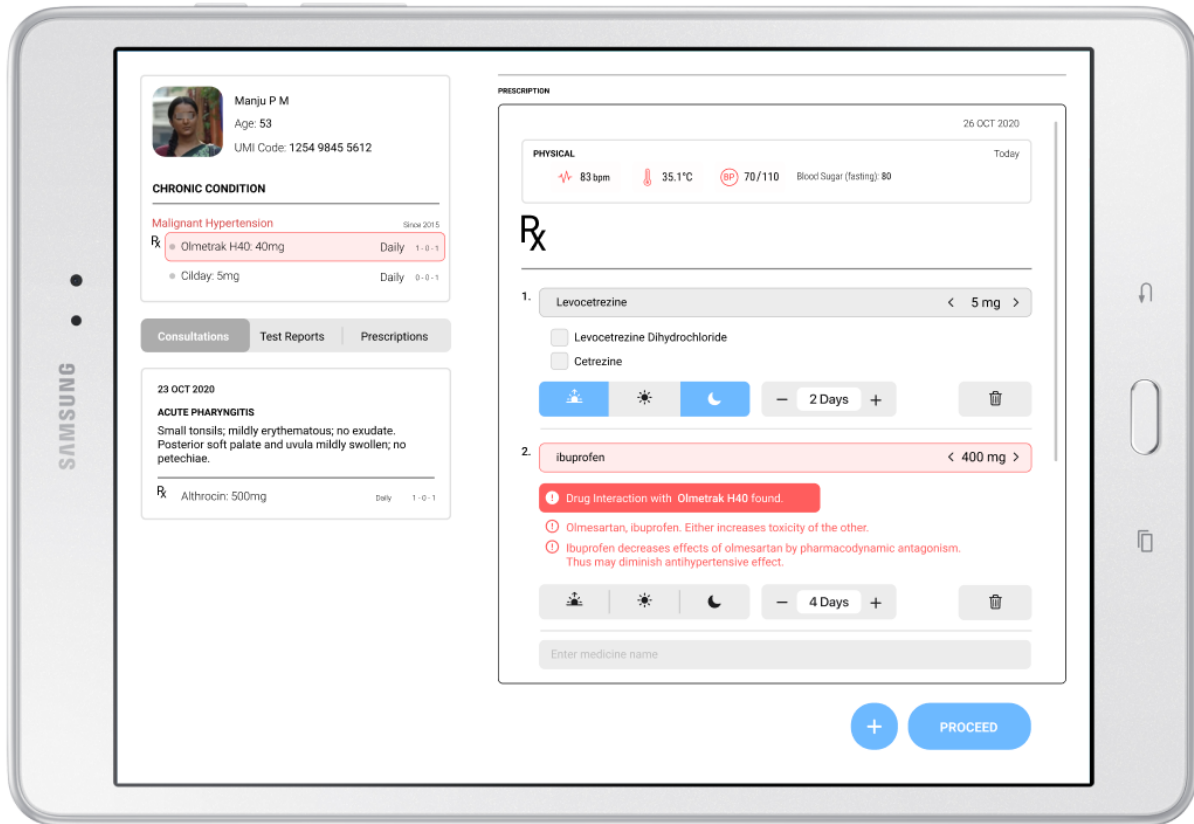
- + Current prescriptions not legible
- + Only used as a medicine purchase token
- + Lacks vital usage information



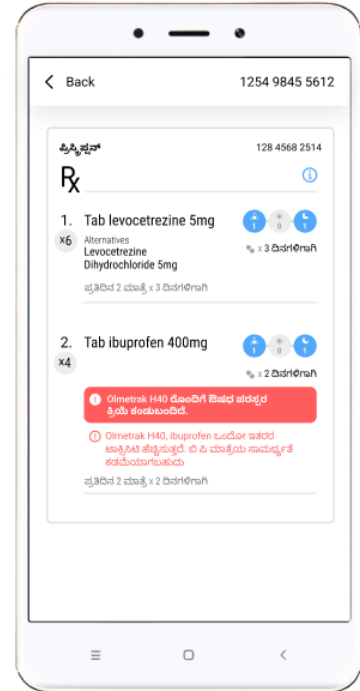
Existing prescriptions are completely illegible to patients, so they work as mere tokens to purchase medicines rather than an important document for patients' reference. Illegibility is a big issue even for a pharmacist. Instances from our primary research show pharmacies misreading the prescriptions and even giving wrong medicines to patients.

Digitally generated prescriptions address all these issues and more. While some medicines do come with package inserts which list side effects and contraindications, they are full of medical jargon and are way too generalized. Since our proposed digital prescriptions are connected to the medical history database, it automatically detects the patient's existing conditions and possible drug interactions.

Our app allows doctors to search for medicines and prescribe dosage and usage instructions. The app checks for drug interactions and possible side effects with any previous medical conditions or medications. The interface then gives a heads up for the doctor so he can decide to let the patient know about it or make changes in prescription.



Prototype: In this example the app shows newly prescribed drugs interacting with patient's hypertension tablets, as ibuprofen lowers the working power of B.P. tablets.



The generated prescription gets updated to the patient's health record, and the patient can get a low-cost thermal printout for convenience. The generated prescription would include:

1. Vitals recorded in the waiting room or during consultation.
2. Unique QR/prescription ID which patients can use to track back the prescription and the consultation it was issued in.
3. Medicines name with doctor approved alternatives.
4. Easy to read icons for dosage instructions.
5. Doctors approved personalised warnings in preferred language.
6. Patients and doctors name and space for doctors to write any additional information.

Manju K 984 548 512  
 9584635215  
 24-Apr-21 6:23 PM

83 bpm 35.1°C BP 70/110

Rx Dr. P R Afulla  
 General Physician

1. Tab levocetrezine 5mg x6  
 OR/  
 Levocetrezine  
 Dihydrochloride 5mg  
 1 - 0 - 1  
 x 2 ದಿನಗಳಿಗಾಗಿ

2. Tab ibuprofen 400mg x4  
 1 - 0 - 1  
 x 2 ದಿನಗಳಿಗಾಗಿ

ibuprofen ಮತ್ತು  
 Olmetrak H40 ಒಂದೋ  
 ಇತರರ ಟಾಕ್ಸಿಸಿಟಿ  
 ಹೆಚ್ಚಿಸುತ್ತದೆ. ಬಿ ಪಿ  
 ಮಾತ್ರೆಯ ಸಾಮರ್ಥ್ಯತೆ  
 ಕಡಮೆಯಾಗಬಹುದು

Use alternative medicine if  
 prescribed by pharmacist only

SHESHADRI GENERAL CLINIC  
 Gaur 1b1danur  
 PH: 9475265412

ಜೀವಕೋಶಗಳು Today

83 bpm 35.1°C BP 70/110

Blood Sugar (fasting): 80

ಪ್ರಿನ್ಸಿಪಲ್ 128 4568 2514

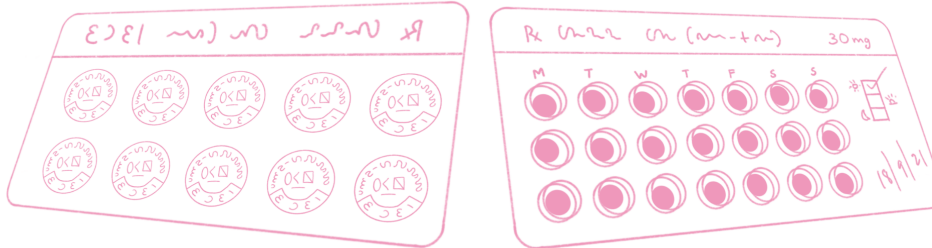
Rx

1. Tab levocetrezine 5mg x6  
 Alternatives  
 Levocetrezine  
 Dihydrochloride 5mg  
 ಪ್ರತಿದಿನ 2 ಮಾತ್ರೆ x 3 ದಿನಗಳಿಗಾಗಿ

2. Tab ibuprofen 400mg x4  
 Olmetrak H40 ರೊಂದಿಗೆ ಔಷಧ ಪರಸ್ಪರ  
 ತ್ರಿಯ ಕಂಡುಬಂದಿದೆ.  
 Olmetrak H40, ibuprofen ಒಂದೋ ಇತರರ  
 ಟಾಕ್ಸಿಸಿಟಿ ಹೆಚ್ಚಿಸುತ್ತದೆ. ಬಿ ಪಿ ಮಾತ್ರೆಯ ಸಾಮರ್ಥ್ಯತೆ  
 ಕಡಮೆಯಾಗಬಹುದು  
 ಪ್ರತಿದಿನ 2 ಮಾತ್ರೆ x 2 ದಿನಗಳಿಗಾಗಿ

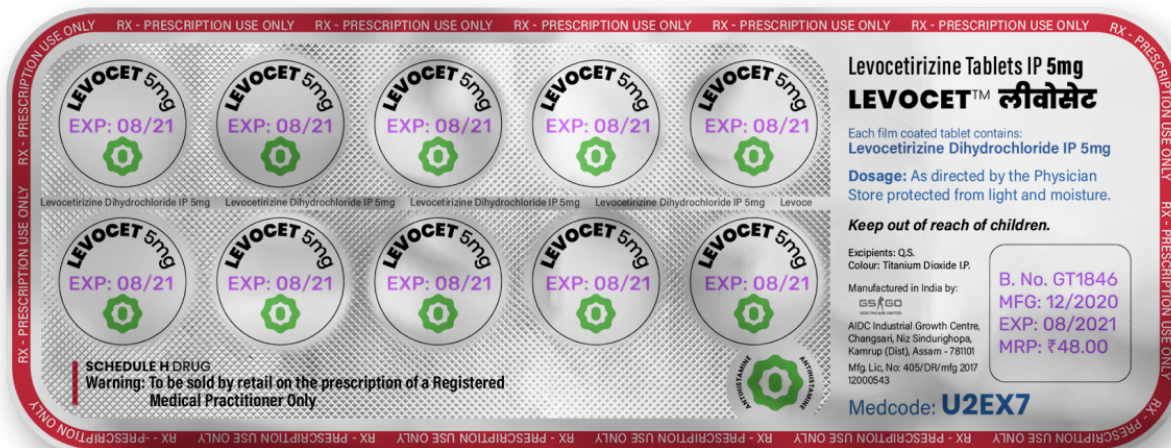
Prototype: printed prescription (left) digital UI of the prescription (right) show all the discussed information in kannada.

## Packaging



Existing medicines have important information stuffed together with pharmaceutical jargon, things absolutely irrelevant to the patient but still legally mandatory.

Our proposal for redesigned packaging, clearly focuses on the patient's use, separating legally required information like manufacturers address etc aside.



Prototype: Rendering of improved drug packing with essential information on all pill blisters

And the name, expiry date is printed on the back of each tablet, so even if the pharmacist has to cut the tablet, important information is carried over.





DIETARY SUPPLEMENT



STIMULANT



ANTIHISTAMINE



ANALGESIC

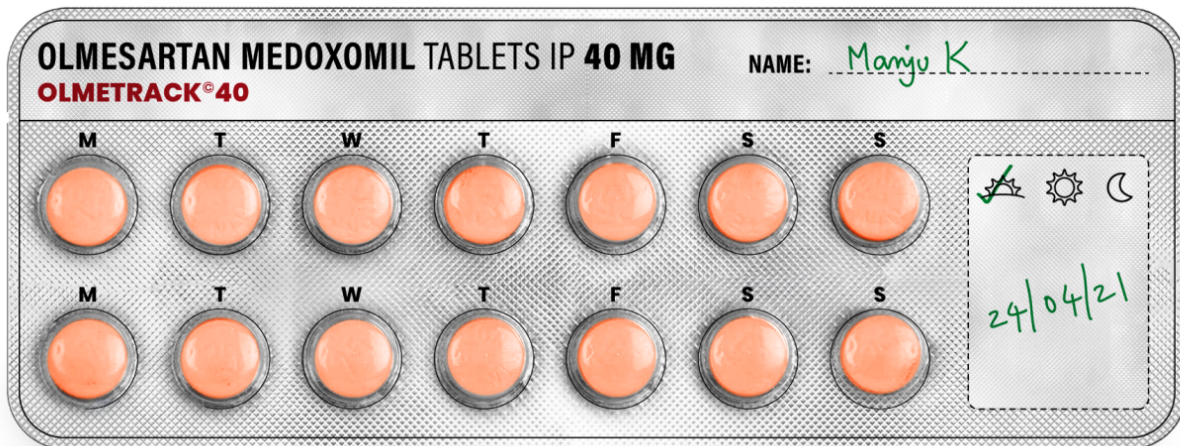


ANTIBIOTIC

Prototype: The proposed new icons for medicine classes

We also designed symbols for different medicine classes such as dietary supplements, Stimulants, anti histamines, analgesics etc. to immensely improve accessibility.

Chronic medications are currently packed like any other medicine, but the compliance of these daily medications is very important, And there are a lot of human errors involved like accidentally taking medicines twice, or missing one or even taking the medicine of someone else in your household.



Prototype: Rendering of improved drug packing for chronic medication with day markers and a space for patient to write important information

Our redesign has day markings to track medicines, and offers demarcated blank space for patients to write their own relevant information such as date of purchase etc.

And lastly, most pharmacies dispense tablets by cutting them from strips. In this process, a lot of the printed information is lost.

To address this issue, we have proposed a simple packaging solution



Prototype: Rendering of improved paper envelopes used for putting medicine into.

By printing a template on the existing paper envelopes, relevant dosage information can be quickly inputted by the pharmacist, which also allows patients to easily access dosage information. This splits the information from a singular prescription into per tablet basis, so it's easier for patients convenience.

# Patient Literature

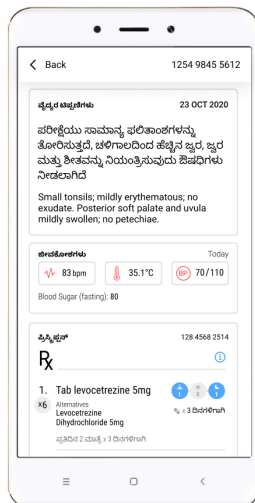
## Literature

Available but Inaccessible

- + Relevant Medical Information on Usage, Side-effects and Contraindications.
- + Avoiding Medical Jargon
- + Available in Vernacular and Regional Language
- + Informational Videos and Audios
- + Accessible through SMS or Info Hotline Service



Existing literature is primarily available in English text and to address this problem, we suggest alternative mediums; videos and audio. Consumers can either search the medicines on our medicine database and find personalized info for each medicine or they can SMS the medicine code to our hotline and receive the information via text or as an audio recording on call in their preferred language.



Prototype: Translated OPD notes in Kannada on patients app (left) , Video on hypertension suggested by the doctor (right)

# Evaluation

During the ideation and development phase of the design process, we worked constantly with our stakeholders, getting feedback and inputs on our designs. Once we had detailed the concepts to a high degree of fidelity, we took feedback from our stakeholders on each of the ideas in isolation, as well as how the solutions worked on a system's scale.

To gain better insight into how our solution will fit into and affect the system, we did a preliminary evaluation with a medical student we had interviewed earlier. She loved the idea of personalized treatment information, patients have little patience and being able to provide specifics instead of generalized jargon is a very realistic need, and integrating that information with the prescription is very useful. But she did take concern with one idea- audio transcription, something we had thought to be a fairly simple intervention.

Transcribing the patient's visit will not work due to privacy issues, especially in cases where people would not want certain things on the record. Any lack of transparency between the patient and their doctor could have disastrous consequences. We decided instead to go with an alternative option of digitising doctors consultation notes. This works not only as a future reference for patients but also for reference by other doctors that the patients may consult. Since these notes only contain medically relevant information, the patient's personal sensitive info stays private.

We started our final evaluation with an adult male with a chronic illness who takes medication multiple times a day

- They were very appreciative of the central medical database as they had faced a lot of issues when moving hospitals.
- They did however have some issues with privacy concerns and were worried about malicious doctors selling their information to third parties. We plan to address this by using secure means of data transfer and storage, so doctors only have access while a patient is being treated or has consented.
- They also had concerns about the chronic medication redesign. They were concerned with the english letters on the tablets and said that older people from rural areas might have difficulties understanding them. We have addressed this to some extent using medcodes for each medicine, allowing

people to use the internet or the automated SMS service to get personalized medicine info in their preferred language.

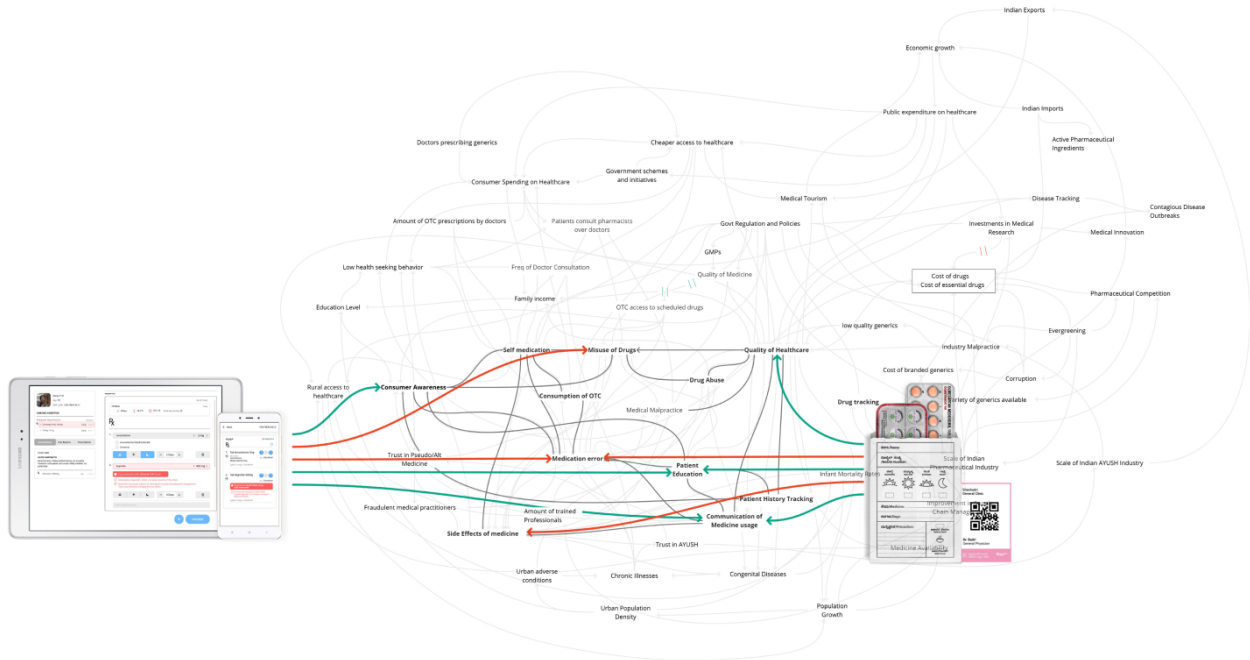
And finally, we ran the idea through Dr Chaitanya who works in a hospital that sees a high volume of semi-urban patients, Since he works in the OPD, he was able to validate our ideas in the exact situation we imagined - crowded hospitals where doctors get around 3 or 4 minutes per patient.

- He really appreciated the idea of a central database, drug interaction heads up and redesigned packaging.
- He had some suggestions regarding doctors having control over what part of OPD notes are shared with patients, as doctors tend to not reveal everything to patients in psychiatric or cancer cases.
- He suggested we should also look into the fact that many patients have doubts regarding medication or symptoms but don't have many channels to contact the doctor or gain relevant information and they end up asking this in their next consultations which will usually be a few months away.
- Apart from this, he wholly agreed to many of our points about the current system and showed massive support and encouragement towards our project, lauding us for our understanding so far.

We also conducted some amount of self-evaluation, and with regards to these symbols, we realise that while their information often empowers users, sometimes it can cause more harm than good as well. Trying to reduce something as complex as medicine types into a handful of symbols is too reductionist and could very often lead to people associating completely different medicines with each other, potentially leading to a plethora of serious medication errors, especially with regards to the elderly.

# System Connect

We isolated the variables that were directly affected by our interventions into a subsystem. We then placed our designs into the mapping and drew connections with the variables they affected.



From this mapping we saw that Patient education, patient history tracking, and overall quality of healthcare all were positively affected by our interventions. We also saw a decrease in Medication errors, drug misuse and adverse side effects of medication.

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# Bibliography

- Viswanath Pilla, *How drug prices are regulated in India:*  
<https://www.moneycontrol.com/news/business/explainer-how-drug-prices-are-regulated-in-india-4606751.html>
- Victoria Rees, *The potential of the Indian pharmaceutical system:*  
<https://www.europeanpharmaceuticalreview.com/article/103336/the-potential-of-the-indian-pharmaceutical-industry/>
- Pooja Mehta, *7 major problems of health services in India:*  
<https://www.economicdiscussion.net/articles/7-major-problems-of-health-services-in-india/2305>
- V Soma and C Venkatesh, *Preventing Paracetamol overdose in children:*  
<https://indianpediatrics.net/may2013/may-526.htm>
- Dr. R Kumar, *Medication mistake can take a life:*  
<https://www.theweek.in/health/more/2020/12/24/medication-mistake-can-take-a-life.html>
- Bureau of Pharma PSUs of India: <http://janaushadhi.gov.in/pmij.aspx>
- Akanki Sharma, *Indian Healthcare: the needs and demands:*  
<https://www.expresshealthcare.in/public-health/indian-healthcare-the-needs-and-demands/416037/>
- Anup Soans, *Quality, Not Price, is the Key Issue When Prescribing Generic Drugs in India:* <https://thewire.in/health/drugs-generics-branded-health>
- Pooja Mehta, *7 Major Problems of Health Services in India:*  
<https://www.economicdiscussion.net/articles/7-major-problems-of-health-services-in-india/2305>
- [Drug misuse in India: Where do we stand & where to go from here?](#)
- [Biosimilar versus generic drugs: same but different?](#)
- [Generic medicines: issues and relevance for global health](#)
- [Over-the-counter medicines: Global perspective and Indian scenario](#)
- [Awareness about prescribed drugs among patients attending Out-patient departments](#)



- [Drug advertisements published in Indian Medical Journals: Are they ethical?](#)
- [Prescribing generics: All in a name](#)
- [Indian Pharmaceutical Regulations and Guidelines](#)
- [Regional Aspects of Urban-Rural Differential in Literacy in India](#)
- [India Over the Counter Drugs \(OTC\) Market: Growth, Trends, and Forecast \(2020 - 2025\)](#)
- [Data: Infant Mortality Rate \(IMR\) in Rural areas 1.5 times the rate in Urban areas](#)
- [Cancer Statistics, 2020: Report From National Cancer Registry Programme, India](#)
- [Stakeholder perceptions of a new model of care for medication supply at hospital discharge](#)
- [Patient-centred improvement to repeat prescribing using the Always Event concept](#)
- [Stricter rules for antibiotics use coming](#)
- [Labeling of OTC Drugs in India: Dilemma Whether Pharmacy Centred or Patient Centred](#)
- [Over-the-counter medicines: Global perspective and Indian scenario](#)
- [Pharmacy-based dispensing of antimicrobial agents without prescription in India: appropriateness and cost burden in the private sector](#)
- [India's drug price fix is hurting healthcare - Livemint](#)
- [Preventing Paracetamol Overdose in Children: Do We Really Need a 500 mg/5mL Preparation?](#)
- [Alcohol Interactions With Medications: Effects and Guidelines](#)
- [Health Risk from Improper Medication Storage](#)
- [17 Rights of Patients, as Tabled in India's First Charter of Patients' Rights.](#)
- [Improving health outcomes through patient education and partnerships with patients](#)
- [Internet emboldens patients, transforms doctor-patient relationship](#)
- [MedRec – Medical Records Tracking System](#)
- [Patient Education and Counseling | Journal](#)
- [Internet Health Information Seeking and the Patient-Physician Relationship: A Systematic Review](#)
- [Doctors in India see patients for just two minutes: study](#)

