

# Comparative Trends and Forecasts for Pharmacy Retail in America and India

## Running Head: Pharmacy Practice in America and India

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**Abstract** This comparative study investigates and analyzes pharmacy practices in India and the United States, focusing on present trends, regulatory structures, dispensing models, and the evolution of pharmaceutical services. The background for this research stems from the growing importance of globally harmonized pharmacy standards to ensure patient safety and improve health outcomes. The study aims to explore critical aspects such as drug dispensing procedures, packaging and labelling protocols, medication error management, and pharmacist roles in both countries. Using a descriptive analytical approach, this paper evaluates current policies, healthcare infrastructure, and the extent of pharmaceutical care in community pharmacy settings. Findings reveal a pronounced emphasis on patient-centered care and clinical pharmacy services in the United States, where pharmacists play an active role in counselling, medication therapy management, and preventive care including vaccination services. In contrast, Indian pharmacies predominantly follow a transactional model where medications are dispensed in pre-packed formats with limited clinical interaction. While this method improves efficiency in

high-volume environments, it may compromise personalized care. Additionally, labeling standards and safety checks are more stringent and consistently applied in the U.S., contributing to a reduced incidence of medication errors. The study concludes that although there are overlapping elements in pharmacy operations, significant differences arise due to varying regulatory frameworks, educational standards, and healthcare priorities. These variations impact service delivery, patient satisfaction, and healthcare accessibility. A key contribution of this research lies in highlighting the potential for mutual learning and system improvements through the integration of best practices from both contexts. The research is limited by the variability of data sources and region-specific policies, yet it offers practical implications for policymakers, educators, and pharmacists seeking to enhance operational efficiency and therapeutic outcomes. Bridging the identified gaps through regulatory reform, training, and technology can lead to more unified and patient-focused pharmacy services worldwide.

**Keywords** Pharmacy Practice, Pharmacy, India,

America, Drugs

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## 1. Introduction

By 2030, the pharmaceutical sector in India is expected to have grown from its anticipated \$42 billion in 2021 to \$130 billion. India produces more generic medications than any other country in the world, making over 20% of all pharmaceutical exports. Furthermore, it contributes more than 60% of the world's total vaccine production, making it the biggest vaccine supplier. Pharmaceutical products from India are exported to the US, UK, EU, and Canada, among other controlled markets. As per the Economic Survey 2023, the pharmaceutical market in the country had a turnover of almost \$41 billion. According to Pharmexcil, India's pharmaceutical export earnings for the fiscal year 2022–2023 totalled \$25.3 billion. In terms of the financial worth of medical exports, India ranked third in the world, 2024. Cities like Vadodara, Ahmedabad, Ankleshwar, Vapi, Baddi, Sikkim, Kolkata, Visakhapatnam, Hyderabad, Bangalore, Chennai, Margao, Navi Mumbai, Mumbai, Pune, Aurangabad, Pithampur, and Paonta Sahib are important centers for the pharmaceutical industry in India [1].

Important legislative measures like the Drugs and Cosmetics Act, 1940, which establishes criteria for quality, safety, and efficacy and regulates the import, production, distribution, and sale of pharmaceuticals and cosmetics, serve as the foundation for India's pharmaceutical regulatory system. The Drugs and Cosmetics Act, 1945, which includes comprehensive guidelines on licensing, clinical trials, and import/export procedures, serves as a complement to this. Through the Pharmacy Council of India, the Pharmacy Act, 1948, guarantees professional standards in pharmacy practice. Furthermore, in order to protect the public's health, the Narcotic Drugs and Psychotropic Substances Act, 1985 unifies and modifies laws pertaining to narcotic drugs and psychotropic substances, emphasizing prohibition, control, licensing, and misuse prevention.

The Medicinal and Toilet Preparations (Excise Duty) Act, 1955, which levies excise duty on pharmaceutical products containing specific drugs, supports these statutes. Pharmaceutical developments are protected by intellectual property rights, which are upheld by international agreements such as TRIPS and the Patents Act of 1970. The New Drugs and Clinical Trials Rules, 2019 simplify the approval procedures and guarantee adherence to the safety guidelines specified in Schedule Y of the Drugs and Cosmetics Rules. In addition to the Medicine Price Control Order of 1987, the National Pharmaceutical Pricing Authority (NPPA) regulates medicine prices to guarantee accessibility and affordability.

India's regulatory structure extends beyond medicines to include more general industrial and labor regulations like the Industrial Disputes Act, 1947, and the Industries (Development and Regulation) Act, 1951, which support safe workplaces and ethical labor practices. A number of laws protect trademarks and designs as intellectual property, and the Prevention of Food Adulteration Act of 1954 strengthens regulations about food safety. India has state-specific Shops and Establishment Acts that govern labor laws. This extensive regulatory framework highlights India's determination to strike a balance between rapid industrial development and strict public health protection protocols in a variety of industries. Government sources and reputable legal databases offer thorough insights into various legislative frameworks for more in-depth knowledge [2].

As of 2023, the pharmaceutical market in the United States was valued at USD 0.52 billion. From 2024 to 2030, it is projected to expand at a CAGR (compound annual growth rate) of 5.48%. This increase can be linked to a number of factors, including an increase in the prevalence of chronic diseases, an aging population, rising government spending on healthcare worldwide, and significant attempts to make medications more accessible and affordable. U.S. policymakers are concentrating on prescription drug affordability, according to a May 2022 article, because unaffordable prescription drug prices put consumers' purchases at risk and subsequently raise health issues. In order to improve patient outcomes and increase healthcare efficiency, leading corporations in the U.S. pharmaceutical market and drug research sectors consistently prioritize the advancement and enhancement of technology. For instance, Pfizer Inc. received FDA clearance in May 2023 for PAXLOVID, a combination of ritonavir and nirmatrelvir tablets, to treat mild-to-moderate COVID-19 patients. Strategic mergers and acquisitions, cutting-edge product introductions, and regional expansions all support market growth. AbbVie, AstraZeneca, Bristol Myers Squibb, GlaxoSmithKline (GSK), Johnson & Johnson, Merck & Co., Novartis, Pfizer, Roche Holding, and Sanofi are some of the major companies in the US pharmaceutical market. These businesses are in the vanguard of pharmaceutical discovery and healthcare innovation because of their inventiveness, adherence to new regulations, and efforts to expand their markets internationally [3].

Federal drug regulation in the United States is based on the Federal Food, Drug, and Cosmetic Act (FD&C Act), which was passed in 1938 and later amended. It requires that pharmaceuticals be safe, effective, and correctly labeled before they can be supplied [4]. Simultaneously, substances with abuse potential are governed under the Controlled Substances Act (CSA) of 1970, which schedules them according to their propensity for addiction and medicinal usage. Enforcing CSA laws, the Drug Enforcement Administration (DEA) makes sure that controlled narcotics are produced, supplied, and delivered

in a secure manner [5]. State boards of pharmacy are in charge of enforcing the various state-level Pharmacy Practice Acts that regulate pharmacist responsibilities, requirements for licensure, requirements for continuing education, and operating guidelines for pharmacies [6].

The Hatch-Waxman Act of 1984, also known as the Drug Price Competition and Patent Term Restoration Act, streamlined the clearance procedures for generic drugs while protecting patent rights and striking a balance between affordability and innovation [7]. Moreover, the Health Insurance Portability and Accountability Act (HIPAA) of 1996, which established guidelines for electronic healthcare transactions, has an impact on pharmacy practice despite its primary goal of protecting patient health information [8]. These laws are supplemented by FDA rules, which regulate the production, labeling, and distribution of drugs to guarantee adherence to quality and safety requirements [9].

The importance of automation and artificial intelligence in modern drug manufacturing is highlighted, as is how these technologies are influencing both current and future pharmaceutical processes. Future trends and current practices in tablet and parenteral dosage forms are also discussed [10,11].

A brief discussion of several trends in medicine dispensing, labeling, prescription handling, and other areas of Indian and American pharmacies is given, taking into account the laws that apply in each country.

## 2. Present Pharmacy Practice Trends in India and the United States

Pharmacy practice in India is retail-driven, mainly with high dependency on manual operations, where medications are often pre-packaged and regulatory oversight varies across regions. Controlled drugs follow specific classifications (Rx, NRx, XRx), with Schedule H1 aimed at curbing antibiotic misuse. Record-keeping and prescription control are emphasized, especially for narcotic and psychotropic substances. In contrast, the U.S. pharmacy model is more systematized and technology-driven, with tight FDA and DEA regulations. Drugs are categorized into Schedules I–V based on abuse risk, and pharmacies follow structured workflows involving electronic prescriptions, barcode tracking, and insurance integration. U.S. pharmacists also offer services like immunizations, reflecting a broader healthcare role. While both systems aim for safe medication use, India's model is more commerce-focused, and the U.S. approach prioritizes clinical accuracy and patient care.

### 2.1. Current Trends in Indian Pharmacy Stores

Numerous dosage forms, including syrups, tablets, capsules, injections, suppositories, and others, are widely available in the Indian market. The purchasing and sale of

pharmaceuticals by the Indian pharmaceutical industry are heavily reliant on pharmacies. Pharmacists, cashiers, and other assistants staff the medical store in India and keep it maintained. OTC and prescription medications were the two categories into which the drugs were separated. The pharmacy receives its medications from four to five different shops in a single city, yet there is only one wholesaler in the city for over-the-counter goods. Retailers have a 40 percent profit, which provides the pharmacy a 25–30 % margin for regular products, and generic products lose between 70- 80 % of their margin.

In medical prescriptions, the symbol "Rx" is often seen at the beginning. This symbol comes from the Latin word "Recipere," which means "to prepare." Historically, pharmacists were responsible for compounding medications, and doctors would write prescriptions detailing the components and amounts needed. Patients would then take these prescriptions to the pharmacists, who would prepare the medications according to the doctors' instructions. Today, pharmacists no longer prepare drugs but dispense them. The "Rx" symbol now signifies medications that are classified under Schedule H and H1 non-narcotic drugs, which can only be obtained with a prescription and not over-the-counter.

The prefix "NRx" indicates that the medication prescribed has narcotic properties and is potentially addictive. This classification requires that the prescription be filled out and signed by a doctor each time the medication is needed. Furthermore, the prescription must have a recent date to be valid. This stringent regulation ensures that narcotic medications are monitored closely to prevent misuse and addiction, ensuring that patients receive them only under appropriate medical supervision.

"XRx" denotes prescriptions that contain narcotic and psychotropic drugs. These medications are subject to even stricter regulations due to their potential for abuse and psychological effects. Retailers who dispense these drugs must keep a copy of the prescription for at least two years. They are also required to produce these records upon request, such as during a court order or regulatory inquiry. This measure ensures a robust tracking system for highly controlled substances, aiming to prevent illegal distribution and misuse. In general, doctors write "Adv" for "Advice" before writing the medications. The pharmacist's responsibility is to determine the medication administered and record it for potential use as evidence in prosecution. There are 536 Schedule H substances, according to a notification issued by the Department of Health under the Ministry of Health and Family Welfare on March 16, 2006. Abacavir, Abciximab, Acamprosate Calcium, Acebutolol Hydrochloride, Aclarubicin, Albendazole, Alclometasone Dipropionate, Actilyse, Acyclovir, Adenosine, Adrenocorticotrophic Hormone (ACTH), Alendronate Sodium, Allopurinol, Alpha Chymotrypsin, Alprazolam, Alprostadil, Amantadine Hydrochloride, Amifostine, Amikacin Sulphate, and Amiloride Hydrochloride are among the numerous medications on the list [12,13].

The main purpose of scheduling H1 medications was to limit antibiotic sales through over-the-counter (OTC) channels. The implementation of this policy was prompted by concerns regarding antibiotic resistance and misuse, as it was observed that these medications were freely available for purchase from pharmacies throughout India. By limiting the sale and use of these powerful drugs, the Schedule H1 classification guarantees that they can only be purchased with a legitimate prescription from a licensed healthcare provider [14].

A wide range of antibiotics and other treatments that need to be carefully regulated are included in the Schedule H1 drug list. Alprazolam, Balofloxacin, Buprenorphine, Capreomycin, Cefdinir, Cefditoren, Cefepime, Cefetamet, Cefixime, Cefoperazone, Cefotaxime, Cefpirome, Cefpodoxime, Ceftazidime, Ceftibuten, Ceftizoxime, Ceftriaxone, Clofazimine, Codeine, Diazepam, Diphenoxylate, Doripenem, Ertapenem, Ethambutol HCl, Ethionamide, Faropenem, Gemifloxacin, Imipenem, Isoniazid, Levofloxacin, Meropenem, Midazolam, Pentazocine, Prulifloxacin, Pyrazinamide, Rifabutin, Rifampicin, Sodium Para-aminosalicylate, Sparfloxacin, Thiacetazone, Tramadol, and Zolpidem are some of the medications in this category. Since these medications are used to treat a variety of bacterial infections as well as other illnesses, their sale must be regulated to guard against abuse and guarantee patient safety [14].

Following things Prescription contains Prescriber office information, Date, Patient data (Name, Age, Sex, and Address of the Patient), Superscription (Symbol R), Inscription (Medication prescribed)- Main part of a prescription, Subscription (Direction to Pharmacist/Dispenser), Signature or Transcription (Direction for Patient), Renewal instructions, Prescriber's signature and registration number.

In Indian pharmacies, Over-the-counter (OTC) products are placed on the shelves, but customers must inform a staff member or pharmacist to obtain the product. Afterward, the customer pays for the product at its marked price using online payment, a debit card, or cash, for medications are ordered according to a company-wise or ABC-wise system. All A-first medications, such as aspirin, apixaban, alprazolam, aripazole, and many others, are grouped together on one shelf. Product distribution according to company names is one aspect of the company-wide distribution. For instance, XYZ company's EF, CE, and AZ products are arranged beneath the company name so that chemists who read the prescriptions go straight to the company to pick up the medications.

They have the authority to dispense tablets, capsules, syrups, lotions, and injections, but not to administer vaccines to patients without a prescription. The pharmacist advises the patient to empty the water for injection container that comes with the dry powders syrup, shake it, and then use it. The sole responsibility of a chemist in India is to administer medication to patients in blister packs or strips and to affix stickers with the words "morning,"

"afternoon," and "night." They are not permitted to offer counselling to patients. The patient does not receive any advice; they are just given a small sticker that tells them when to take their prescription. The majority of prescription drugs were paid for privately, while emergency care and procedures were covered by insurance.

The majority of pharmacy chains in the USA do not encourage in-store shopping. When consumers inform them that they require an over-the-counter product or medication, they provide it to them. Public access to medications is provided by government-run pharmacies, which get funding from grants and offer all medications to patrons at no cost. There is a chain of government-owned offline pharmacies called Pradhan Mantri Bhartiya Janaushadi Pariyojano (PMBJP) that offers generic medications to the general public and private companies like Apollo, Zydus, and Dava India at reasonable prices. Online players include Topmeds, Medplus, Apollo 247, Pharm Easy, Netmeds, Tata 1mg, and further ones. Figure 1 shows the distribution of medicines in India from manufacturer to the pharmacy.

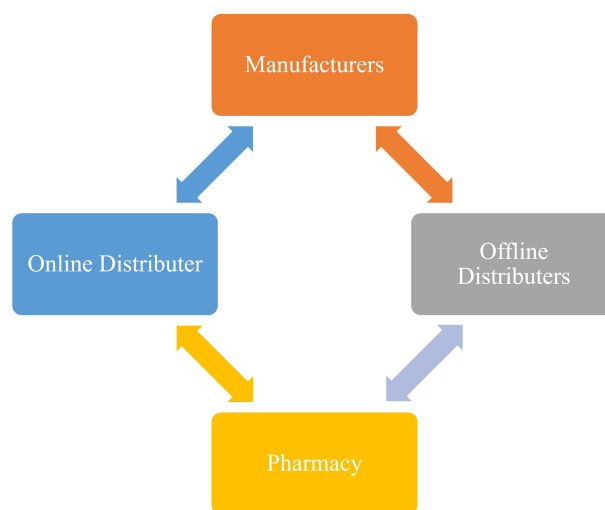


Figure 1. Flow chart of distributions of medicines in India

Delivery of medicines is done by a delivery boy from retail office or a pharmacy helper can go there and get medicines from the distributors. In the Indian market, one knows the distributors can get medicines very easily, which are not bound to the pharmacy, but they can also sell their medicines to the customers. It destroys the business of retailers and helps the wholesaler a lot even some time wholesaler directly delivers the medicines to the customer's home. First, the pharmacy contacts the wholesaler by phone or online to place an order. Next, the wholesaler prints the product memo, which includes the manufacturer, expiration date, batch number, required quantity, pharmacy name, taxes, and other details. As he gathered every product and placed it in bags, he distributed the memo to the assistants. The delivery lad received those bags after they had been checked by additional assistants and before

they were delivered to the pharmacy.

Pharmacy personnel get product memos where chemists verify items and sign delivery slips for whole sellers. After the product name, schemes, taxes, batch number, quantity, and expiration dates were checked later in the pharmacy, the assistants arranged the products on the shelves. The computer was updated with the correct stock inventory information. If the pharmacy receives a physical copy of the patient's prescription that they brought from the hospital, then medications are delivered as blisters, strips, or syrups. Ninety-nine percent of prescriptions were usually written down, and five to ten percent of prescriptions were written electronically. The pharmacist then labels the strips with morning, evening, or nighttime stickers, makes sure the products match the prescription, packs them in bags, and hands the patient the bill after stamping the prescription with the medications they received. Usually, branded drugs are affordable here, but OTC and infant goods are not. Savings on branded products are typically between 10% and 20%, however depending on the manufacturer, savings on generic products could be as high as 60%. In this case, the patient gets his prescription drugs in India.

Product labels included various things on strips or bottles like Brand name or generic name, active ingredients, uses of medicine, direction for use, Warning declaration, storage condition, manufactured by, batch number, date of expiry, maximum Retail price, quantity of tablet and other information as specified on the label. Additional leaflets were also provided by the manufacturer in which various pharmacokinetic actions, pharmacodynamic actions, the chemical structure of the drug, stability of the drug, adverse effects, and other information about the drug are mentioned in detail. When branded medications expire, they are usually returned to the business by the wholesaler pharmacy, whereas generic medications and infant supplies are disposed of properly. This complete dispensing cycle begins with the manufacturer and ends with the patient.

A variety of dispensing errors were identified by the study, including incorrect drug dosage or strength, inaccurate frequency labeling, incorrect quantity or number of doses, incorrect drug dispensed, neglected prescriptions, incorrect combination drugs, and miscellaneous errors [15]. Focusing on the pharmacy staff's training program will help to lower errors in the pharmacy. Should use AI to cut down on errors, should adhere to SOPs, and in particular circumstances, if a pharmacy's layout is not appropriate, they should work to fix it. These are possible reasons for reducing errors.

## 2.2. Current Trends in American Pharmacy

Numerous dosage forms, including syrups, tablets, capsules, injections, suppositories, and more, are available on the American market. Pharmacies play a major role in the American pharmaceutical industry's procurement and

distribution of medications. In America, the medical store is staffed and maintained by pharmacists, pharmacy technicians, cashiers, and other helpers. The pharmaceuticals were divided into two categories: over-the-counter and prescription medications. American pharmacies are regulated and monitored by the U.S. Food and Drug Administration (FDA), which conducts audits to ensure compliance with federal standards.

The pharmacy purchases its drugs from four to five different online distributors; in a single state, only one distributor monopolizes the offline market. In contrast to India, where three to four physical stores were run, just one distributor delivered over-the-counter medications and other items twice a day, depending on the quantity ordered. In American pharmacy receives a 25–30% margin from the wholesaler for regular items, but earns between 70–80% for generic products. The wholesaler makes a 50% profit depending on products. The two sections of the medications are labelled Rx and NRx, as the same classification just like Indian prescriptions. Medications classified as Rx, or prescription pharmaceuticals, include amlodipine, lisinopril, prednisone, pantoprazole, losartan, and other medications. On the other hand, medications classified as NRX include oxycodone, codeine, tramadol, morphine, and other controlled medications. The FDA categorized the controlled substance under regulation from Schedule I to Schedule V.

Controlled (scheduled) drugs, substances, and certain chemicals are tightly regulated due to their potential for abuse and risk of dependence. The Drug Enforcement Administration (DEA) categorizes these substances into five schedules, ranked from Schedule I to Schedule V based on their abuse potential, accepted medical use, and safety under medical supervision.

Schedule I (CI) drugs are classified as having the highest potential for abuse and no accepted medical use in the United States. Due to the high risk associated with these substances, they are not considered safe even under medical supervision. Examples of Schedule I drugs include heroin, marijuana, lysergic acid diethylamide (LSD), phencyclidine (PCP), and crack cocaine. These substances are deemed to have no therapeutic benefits and are therefore illegal for any kind of use, whether medical or recreational. The classification of these drugs emphasizes the severe legal and health implications associated with their use and distribution.

Schedule II (CII) substances also have a high potential for abuse but differ from Schedule I drugs in that they have accepted medical uses in the United States. Despite their therapeutic benefits, these drugs can lead to severe psychological or physical dependence if not used correctly. Examples of Schedule II drugs include narcotics like morphine and oxycodone (OxyContin®), stimulants such as cocaine and methylphenidate (Ritalin®), and other depressant drugs like dextroamphetamine (Dexedrine®).

Drugs in Schedule III (CIII) have a lower abuse potential compared to Schedule I and II substances, but can still lead

to moderate or low physical dependence or high psychological dependence. These drugs have accepted medical uses and include medications that contain limited quantities of certain narcotics. Examples of Schedule III drugs include products containing less than 15 milligrams of hydrocodone per dosage unit (e.g., acetaminophen with codeine), buprenorphine (used in addiction treatment), and anabolic steroids. Schedule III drugs can be refilled up to five times within six months if authorized by the prescriber, reflecting a balance between control and accessibility for medical use. This schedule includes medications that are essential for managing various health conditions but still require oversight to prevent misuse.

Schedule IV (CIV) drugs have a lower potential for abuse relative to Schedule III substances and have accepted medical uses in the United States. These drugs primarily include anti-anxiety medications, sedatives, and non-narcotic analgesics. Examples of Schedule IV drugs include diazepam (Valium®), alprazolam (Xanax®), lorazepam (Ativan®), and tramadol. While the risk of dependence is lower, there is still some potential for abuse. Regulations for Schedule IV drugs are similar to those for Schedule III, with prescriptions being refillable up to five times within six months. The inclusion of these drugs in a less restrictive schedule allows for their use in treating anxiety, sleep disorders, and pain, with an emphasis on monitoring to prevent abuse.

Schedule V (CV) drugs are considered to have the lowest potential for abuse relative to substances listed in Schedule IV and consist of preparations containing limited quantities of certain narcotics. These drugs are primarily used for antitussive (cough suppression), antidiarrheal, and analgesic purposes. Examples include cough preparations containing not more than 200 milligrams of codeine per 100 milliliters or 100 grams (Robitussin AC®), diphenoxylate with atropine (Lomotil®), and pregabalin (Lyrica®). Due to their low abuse potential, some Schedule V drugs may be available over-the-counter in some states, though regulations can vary. This schedule ensures that medications necessary for common ailments are accessible while still being controlled to prevent misuse [13].

The following things of Prescription contain the Clinician's name, address, license number, DEA number (DEA Registration Number is a unique identifier provided by the Drug Enforcement Agency to medical practitioners), The National Provider Identifier number- is a unique identification number for covered health care providers, Date of issue, Patient's name and address, Patient's date of birth, Prescription number Rx or NRx, Drug name, Drug strength, Dosage form, Quantity prescribed, Directions for use, Substitution permissible/ Do not substitute, Number of refills, Signature of the prescriber. There are legal limits on the number of refills and the number dispensed with a prescription.

The over-the-counter (OTC) products in American pharmacies are arranged on the counter so that anyone can

walk in, grab the product, and take it to the cash register where the cashier will scan it and provide the product's price. Afterwards, the consumer pays with a card, cash, or online payment method based on the price. In order to prevent children from abusing over-the-counter medications, certain medications, such as those containing pseudoephedrine or their combinations, require that we obtain an ID card from the customer and enter their information, including age, address, the product they bought, its name, quantity, and final signature, into the computer.

All "A" letter initial pharmaceuticals, like aspirin, apixaban, alprazolam, ariprazole, and many more, are grouped on one shelf in the ABC system of medicine arrangement. The pharmacy technician takes the medications from her own possession after a prescription is filled. However, the CIII, CIV, and CV pills were placed on the person; in contrast, the CII drugs are stored within the safe according to the ABC system, where they are arranged separately.

When a patient brings a prescription to the pharmacy in hard copy with the doctor's copay, the doctor's office sends the prescription electronically to the pharmacist. Once the prescription is scanned into the computer, both items go through the same processing process, which involves processing payment through insurance or cash if the patient does not have insurance. After processing, the computer prints the label. The pharmacy technician then takes the medication and checks the National Drug Code (NDC) on the bottle. After the computer provides the NDC, the technician scans the label into the system and counts in accordance with the label. Label includes information like Name of patient address, Pharmacy name, Pharmacy address and fax number, Rx number, Filled date, Name of the doctor, Number of refills, Number of quality, Name of medication, Strength, dose, Barcode for the verification, Warnings, Expiration date, and other information are printed on labels.

After the pills have been counted by pharmacy technicians, medicines are placed in vials, with sticker labels adhered to the caps. Figure 2(a) illustrates a picture of vials. On the right side, standard vial packaging is shown, but on the left, an example of how to use an EZ cap—where the cap is placed upside down to make opening the bottle easier for elderly people—is shown. The representation of an amber-colored syrup bottle is displayed in Figure 2(b). After dispensing the tablet in Vails the Pharmacist verifies the tablet before packing the medication into bags. When a patient is waiting to pick up their prescription, liquid syrups can be delivered in ambered color bottles, and dry powder syrups can be prepared by pharmacists by adding water. When a patient needs a vaccination, American pharmacists and pharmacy technicians can administer it straight to them, and several insurance plans even cover the cost of the shot. When prescribing controlled substances, the pills are tracked, the relevant information is entered into the registry, and a red

warning label is attached to the bottle. Additionally, the sticker is scanned into the system, and the client must sign the medication when they pick it up. If the medication is paid for in full with cash, a debit card, an online payment method, or insurance, there is no copayment. Finally, a customer emerges from the pharmacy.



**Figure 2.** Representation of (a) Vial Bottles and (b) Syrup Bottles

The distribution system adheres to the same guidelines as Indian pharmacies. Orders can be placed from the pharmacy online or in person, but you are unable to visit the distributor store since the delivery boys were assigned to specific areas and only made deliveries in the morning and afternoon. All we need to do is get the inventory; as soon as the drug is delivered from the distributor, it appears automatically in our computer system. OTC and medications were received, control drug entries were made in the register appropriately, and other information was entered into the system.

Product labels included various things on strips or bottles like Brand name or generic name, active ingredients, direction for use, Warning declaration, storage condition, manufactured by, NDC, GTIN no, Sno, Lot No, date of expiry, product QR code and Barcode, quantity of tablet and other information as specified on the label. Additional leaflets were also provided by the manufacturer in which include indication and use, dosage and administration, Dosage form and strength, Contraindications, Warning and precautions, Adverse reactions, Drug Reactions, Use in Specific populations, overdose, description, clinical pharmacology, Nonclinical Toxicology, clinical studies, How supplied/storage and handling, and Patient Counselling Information. After their expiration, generic and over-the-counter products were disposed of properly, while branded ones were given back to their distributors. Vaccines, insulin, and injectable materials are disposed of under disposal rules. After their expiration, generic and over-the-counter products were disposed of properly, while branded ones were given back to their distributors. Vaccines, insulin, and injectable materials are disposed of by disposal rules.

Some of the errors of pharmacy are listed below like Expired Product, Incorrect Preparation, Incorrect Strength, Incorrect Dose, Incorrect Dosage Form, Incorrect Rate, Incorrect Timing, Incorrect Drug Substitution, Incorrectly

Transcribed Orders, Incorrect Dispensing by Pharmacy, Incorrect Compounding Techniques, Incorrect Dilution of Medications, Incorrect Infusion Rates, Medication Omission, Use of Abbreviations, Incorrect Interpretation of Dosage Instructions, Use of Outdated Drug References, Lack of Double-Check Systems, Incorrect Labeling of Prepared Medications, Misidentification of Look-Alike/Sound-Alike Drugs, Incorrect Use of Multi-Dose Vials, Incorrect Use of Single-Dose Vials, Incorrect Use of Automated Dispensing Systems, Incorrect Use of Barcode Scanners, Incorrect Reuse of Single-Use Devices, Incorrect Patient Information Input, Failure to Perform Medication Reconciliation, Incorrect Storage Conditions [16].

Preventing medication errors in pharmacy settings requires addressing both judgmental and mechanical errors through standardized protocols and improved communication. Pharmacies should implement robust internal processes to ensure the correct dosage delivery, identification of contraindications, drug allergies, and drug interactions, particularly for drugs with narrow therapeutic indexes. Addressing workload issues, reducing interruptions, ensuring adequate support staff, and allowing sufficient time for patient counseling are critical steps. Pharmacists must actively engage in patient education, emphasizing the importance of understanding drug dose, route, frequency, and potential interactions. Effective communication with prescribers, clear verbal and written orders, and meticulous discharge processes are vital to minimize discrepancies and errors. Utilizing technology, such as automated dispensing systems and barcode scanners, can further enhance accuracy and safety in medication dispensing.

### 3. Forecasting the Future of Pharmacy Practice in Both Nations

The future of pharmacy practice in India and the United States is moving toward automation and AI integration, but each country approaches this transformation differently. In India, the focus is on introducing robotics to streamline prescription filling, reduce human error, and improve customer service, mimicking digital banking convenience. Automation is expected to reduce dependency on manual labor and enhance operational efficiency. In the U.S., the future envisions an even more technology-driven system where robots manage routine tasks like counting, labeling, and packaging, while pharmacists continue providing clinical services such as patient counseling and immunization. AI will support end-to-end prescription handling, ensuring accuracy, speed, and compliance. Both nations are heading toward tech-enhanced pharmacy systems, but the scale and sophistication of implementation will vary based on infrastructure, regulation, and workforce readiness.

### 3.1. Future Prospects and Predictions for the Pharmacy Business in India

In the evolving landscape of the Indian pharmacy business, AI and machine learning technologies are set to revolutionize operations akin to the seamless convenience of ATM transactions. Customers will soon be able to insert their prescriptions at a pharmacy's entrance, triggering robotic arms behind the scenes to fetch medication labels and input prescription data into the system. These labels will be efficiently sorted onto conveyor belts for meticulous verification by pharmacists, who oversee the subsequent packing process. Once packed, medications will be displayed on a screen where customers can electronically settle their bills. Upon confirmation of payment, medications will be dispensed from secure boxes, ensuring accuracy and safety. This automated system promises to enhance efficiency and streamline the customer experience, although initial implementation may face challenges and require refinement. Notably, the automation of tasks traditionally managed by cashiers, assistants, and other personnel underscores the transformative impact of AI and machine learning in reshaping roles within the pharmacy sector toward a future of heightened efficiency and service delivery.

#### Advantages: [17, 18]

- AI and machine learning in Indian pharmacies enhance operational efficiency and customer convenience.
- Robotic arms swiftly retrieve and integrate medication labels and prescription data.
- Automated sorting and verification on conveyor belts supervised by pharmacists ensure accuracy.
- Expedited service delivery and reduced errors compared to manual processes.
- Integration with electronic payment platforms facilitates secure and streamlined transactions.
- Promises cost savings through improved resource utilization and inventory management.
- Represents a significant advancement in pharmacy operations in India.

#### Disadvantages: [19, 20]

- Substantial capital investment required for technology acquisition and infrastructure development.
- Potential financial barriers for smaller pharmacies to adopt AI and machine learning.
- Risk of job displacement for human personnel like cashiers and assistants.
- Reduced personal interaction between pharmacists and customers may affect patient care quality.
- Technical complexities such as system malfunctions and data security breaches.
- Stringent measures needed to safeguard patient information and ensure operational continuity.

- Regulatory compliance and adherence to healthcare standards require ongoing monitoring and adaptation.

### 3.2. Anticipated Developments and Future Outlook for the Pharmacy Business in America

Robots will drive the future of the pharmacy business, with AI playing a significant role. While the majority of tasks, such as verification, giving vaccines and patient counselling will still be performed by pharmacists, many labour-intensive duties like dispensing, arranging medications, tablet counting, tablet labelling, and delivery will be handled by machines. These machines, programmed with advanced coding, can operate 365 days a year, potentially displacing many pharmacy technicians.

Once a prescription is received from a doctor's office, AI will process it and the pharmacist will verify the prescription label. The label is then printed, and a robotic arm retrieves the medication from the shelf based on the information in the system. The medication is then moved to a counting station where another robotic arm counts, labels, and seals the bottle. The pharmacist performs a final verification, and the medication is then packed by an automatic sealing machine. Finally, the prescription is handed over to the cashier for payment.

#### Advantages: [21, 222]

- Improved accuracy and efficiency in inventory control, labeling, and medicine delivery.
- Availability 24/7, ensuring continuous service.
- Cost-effective over time, reducing operational expenses.
- Enhanced patient experience with faster service and reduced errors.

#### Disadvantages: [23, 24]

- Significant implementation operating costs required.
- Risk of job displacement for pharmacy technicians.
- Challenges with regulatory compliance.
- Technological difficulties and potential system complexities.
- Reduced one-on-one patient care due to automation.

## 4. Conclusions

Due to their different regulatory frameworks and current trends, pharmacy practices in the USA and India exhibit both similarities and distinctive variances. Through stringent clearance procedures, the U.S. Food and Drug Administration (FDA) regulates pharmacies in the United States, guaranteeing the efficacy and safety of medications. American pharmacies are renowned for their comprehensive patient care, cutting-edge technology, and seamless integration into the healthcare system. In contrast, the Central Drugs Standard Control Organization (CDSCO) oversees drug approval in India, while the Pharmacy

Council of India (PCI) controls pharmacy practice and education. Even though Indian pharmacies are improving patient care and regulations, harmonizing procedures continues to be difficult. Discussion topics covered various dispensing errors, safety precautions to take when dispensing, current pharmacy practice trends, and expected advancements in the pharmaceutical industry. All things considered, both nations must constantly revise laws and procedures to better serve patients and improve pharmacy services.

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