# Prescription and Prescribing: An Overview of Basic Concepts Mostly Overlooked

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***Author's contribution***

*The sole author designed, analysed, interpreted and prepared the manuscript.*

**Review Article**

## ABSTRACT

While drugs have the capacity to enhance health, they all have the potential to cause harm if prescribed inappropriately. For this reason, it is recommended that healthcare professionals who prescribe medications exercise critical thinking skills to ensure the safe and effective use of therapeutic agents. Pharmacists have crucial role plays in both handling prescription and prescribing. A rational prescribing is the sole of patient safety, compliance and patient relief. This paper proposes aims that a prescriber should try to achieve, both on first prescribing a drug to maximise effectiveness, minimise risks and costs, and respect the patient's actual need.

**Background:** Historically, the pharmaceutical and medical professions have devoted considerable time and effort to the development and rational utilisation of safe and effective drugs for the treatment and prevention of illness. Today, that successful effort continues, helping to achieve the highest standards of health in the world for the American people. But in order to gain maximum benefit from the use of drugs while minimising their adverse side effects, prescribers and pharmacists must maintain effective communications not only among themselves, but with their patients as well. The directions for drug use and other information which prescribers indicate on prescription orders and which pharmacists transfer to prescription labels are critical to safe and effective drug therapy. In order to assure that this information is conveyed clearly and effectively to patients, the following guidelines have been developed by the American Pharmaceutical Association and the American Society of Internal Medicine.

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## 1. INTRODUCTION

A prescription is an order for medication issued by a physician, dentist, or other properly licensed medical practitioner. It's not just a piece of paper given to patients and suggests them to follow written instructions. It is a part of the professional relationship among the prescriber, the pharmacist, and the patient. It is the pharmacist's responsibility in this relationship to provide quality pharmaceutical care that meets the medication needs of the patient. Pharmacists now find themselves frequently contacting physicians to suggest alternative drug products for individual patients. To meet these responsibilities, it is essential that the pharmacist maintains a high level of practice competence, keeps appropriate records on the health status and medication history of his/her patients and develops professional working relationships with other health professionals.

## 2. PRESCRIPTION IRREGULARITIES WORLDWIDE AT A GLANCE

Medication errors are common in general practice and in hospitals. Both errors in the act of writing (prescription errors) and prescribing faults due to erroneous medical decisions can result in harm to patients [1]. It can be due to prescribing faults—irrational, inappropriate, and prescription errors (ineffective prescribing, under prescribing, overprescribing; writing the prescription) [2]. Doctors in US incorrectly prescribe antibiotics in nearly a third of cases. Study finds more than half of US population receives prescription annually and estimates 'inappropriate' prescriptions in doctor's office setting at up to 30% [3]. The NHS makes hundreds of millions of prescribing errors and mix-ups which contribute to as many as 22,300 deaths a year UK, according to a major report commissioned by the Government [4]. NHS medication errors raise fears thousands could be dying because of 237 million mistakes every year, some 237 million errors are made annually (HuffPost UK, 2018). Error rates varied from 7.1 % to 90.5 % for prescribing and from 9.4 % to 80 % for administration in the middle east [5]. However, UAE bans handwritten medical prescriptions due to 7,000 deaths worldwide result from illegible handwriting [6]. Prescription errors in LDC countries needs no further discussions, as only 13% drug in Bangladesh is sold under prescription, a study says 96.83% percent of the pharmacist recommended medicine taking inadequate history [7].

## 3. MPhA (2004) GUIDELINES OF PHARMACISTS JOB RESPONSIBILI-TIES

- Prepares medications by reviewing and interpreting physician orders; detecting therapeutic incompatibilities.
- Dispenses medications by compounding, packaging, and labelling pharmaceuticals.
- Controls medications by monitoring drug therapies; advising interventions.
- Completes pharmacy operational requirements by organising and directing technicians' work flow; verifying their preparation and labelling of pharmaceuticals; verifying order entries, charges, and inspections.
- Provides pharmacological information by answering questions and requests of health care professionals; counselling patients on drug therapies.
- Develops hospital staff's pharmacological knowledge by participating in clinical programs; training pharmacy staff, students, interns, externs, residents, and health care professionals.
- Complies with state and federal drug laws as regulated by the state board of pharmacy, the drug enforcement administration, and the food and drug administration by monitoring nursing unit inspections; maintaining records for controlled substances; removing outdated and damaged drugs from the pharmacy inventory; supervising the work results of support personnel; maintaining current registration; studying existing and new legislation; anticipating legislation; advising management on needed actions.
- Protects patients and technicians by adhering to infection-control protocols.
- Maintains safe and clean working environment by complying with procedures, rules, and regulations.
- Maintains pharmacological knowledge by attending educational workshops; reviewing professional publications; establishing personal networks; participating in professional societies.
- Contributes to team effort by accomplishing related results as needed.

## 4. FORM CONTENT OF PRESCRIPTION ORDER

**Date:** Prescriptions are dated at the time they are written and also when they are received and filled in the pharmacy. The date is important establishing the medication record of the patient. An unusual lapse of time between the date a prescription was written and the date it is brought to the pharmacy may be questioned by a pharmacist to determine if the intent of the physician and the needs of the patient can still be met. The date prescribed is also important to a pharmacist in filling prescriptions for controlled substances (Table 1). The *Drug Abuse Control Amendments* specify that no prescription order for controlled substances may be dispensed or renewed more than 6 months after the date prescribed.

**Rx symbol or Superscription:** The Rx symbol generally is understood to be a contraction of the Latin verb recipe, meaning take thou or you take. Some historians believe this symbol originated from the sign of Jupiter, ♃ employed by the ancients in requesting aid in healing. Gradual distortion through the years has led to the symbol currently used. Today, the symbol is representative of both the prescription and the pharmacy itself [8].

**Medication Prescribed or Inscription:** This is the body or principal part of the prescription order. It contains the names, dosages, and quantities of the prescribed ingredients.

o Today, the majority of prescriptions are written for medications already prepared or prefabricated into dosage forms by industrial manufacturers. The medications may be under their trademarked or manufacturer's proprietary name or by their nonproprietary or *generic* names.
o Pharmacists are required to dispense the trademarked product when prescribed, unless substitution of an equivalent product is permitted by the prescribing physician or by state law.
o Most states have generic substitution laws that mandate the use of a generically equivalent product for certain patients. In some instances, the patient also must consent to the drug substitution.
o Some states require the prescriber to write specific instructions or sign a specific line on the prescription to allow or disallow product substitution
o Prescription orders requiring the pharmacist to mix ingredients are termed *compounded* prescriptions. Prescriptions requiring compounding contain the names and quantities of each ingredient required. The names of the ingredients generally are written using the nonproprietary names of the materials, although occasionally proprietary names may be employed.
o Quantities of ingredients to be used may be indicated in the metric or apothecary system of weights and measures; however, the use of the apothecary system is dramatically diminishing to becoming nonexistent [9].

### Table 1. Controlled drug prescriptions

| Type | Description |
| --- | --- |
| Schedule I (C-I) | **Highest abuse risk**. No safe medical use in U.S. Examples: heroin, marijuana, LSD, PCP, and crack cocaine. |
| Schedule II (C-II) | **High abuse risk** but have safe and accepted medical use. Examples: morphine, oxycodone, methylphenidate, dextroamphetamine. |
| Schedule III (C-III) | **Abuse risk less than C-II** and safe and accepted medical use. Examples: Acetaminophen/Codeine (Tylenol #3), acetaminophen/hydrocodone (Vicodin), propoxyphene (Darvon). |
| Schedule IV (C-IV) | **Abuse risk less than C-III** and safe and accepted medical use. Examples: diazepam (Valium), alprazolam (Xanax), phenobarbital, chloral hydrate. |
| Schedule V (C-V) | **Abuse risk less than C-IV** and safe and accepted medical use. Mainly consist of preparations containing limited quantities of certain stimulant and narcotic drugs for antitussive and antidiarrheal purposes. |

*Definition - a prescription drug whose use and distribution are tightly controlled because of its abuse potential or risk*

o *Regulation is more strict, federal law and State law regulate the storage, use, and disposal of controlled substances*
o *Controlled drugs are divided into Schedules according to abuse potential*

**Directions for Patients:** Pharmacists and physicians provide their patients with written directions outlining the proper use of the medication prescribed.

- o Frequently, these directions include the best time to take the medication, the importance of adhering to the prescribed dosage schedule, what to do if a dose is missed, the permitted use of the medication with respect to food, drink, and/or other medications the patient may taking, as well as information about the drug itself. Pharmacists should avoid medical jargons (Table 2) that creates confusion in patients.
- o Certain manufacturers have prepared patient package inserts (PPIs) for specific products for issuance to patients. These present to the patient information regarding the usefulness of the medication as well as its side effects and potential hazards. Other PPIs are available to pharmacists for use in their practices from professional and commercial sources. For example, The United States Pharmacopeial Convention provides patient education leaflets containing supplementary printed instructions on many drugs and drug categories to physicians, pharmacists, and other health professionals for distribution to patients [10].
- o The information is also available on computer software, allowing leaflets to be printed in the pharmacy as needed and with a compatible computer and standard line printer. Similar computer software programs are available from various other sources, designed to generate personalised patient-counseling information for use by the pharmacist in patient education.
- o The advantages to having the name and strength of the drug identified on the prescription label include the facilitation of communication among the patient and the pharmacist and the physician and the rapid identification of the medication in times of accidental or purposeful overdose.
- o When a generic drug product is dispensed, it is customary to include the manufacture of the product on the label as well. The date after which the medication will be sub-potent (expiration date) may be placed on the label based on information included on the original manufacturer's package. This precaution is important for certain drugs that rapidly deteriorate and lose their potency. For example, many oral liquid formulations of antibiotics remain stable for only a period of 14 days under refrigeration, and one-half that time when nonrefrigerated after their preparation by the pharmacist. Certain ophthalmologic preparations and most parenteral dosage forms have relatively short shelf lives once removed from refrigeration and thus containers must include the expiration date.

**Table 2. Words easily misunderstood by patients**

|  | Medical term | Preferred words |
|---|---|---|
| Medical Word Examples | Benign | Won't cause harm; is not cancer |
|  | Condition | How you feel; health problem |
|  | Lesion | Wound; sore |
|  | Oral | By Mouth |
| Concept Word Examples | Avoid | Stay away from; do not use or eat |
|  | Intake | What you eat or drink; what goes into your body |
|  | Option | Choice |
|  | Referral | Ask you to see another doctor; get a second opinion |
| Category Word Examples | Adverse | Bad |
|  | Hazardous | Not Safe; dangerous |
|  | Generic | Product sold without a brand name, like ibuprofen (Advil is brand name) |
|  | Noncancerous | Not cancer |
| Value Judgment Adequate Enough Word Examples | Adequate | Enough |
|  |  | Example (adequate water): 6–8 glasses a day |
|  | Excessive | Too much |
|  |  | Example (bleeding): if blood soaks through the bandage |
|  | Increase | Add to |
|  | gradually | Example (exercise): add 5 minutes a week |
|  | Moderately | Not too much |
|  |  | Example (exercise): So you don't get out of breath |

*Adapted from Words to Watch Fact Sheet. Partnership for Clear Health Communication*

## 5. PROCESSING THE PRESCRIPTION ORDER UPON RECEIVING

The individual receiving the prescription should be trained to accept it in a professional manner and obtain the correct name, address, and other pertinent patient information.

- o Patients having a prescription filled for the first time at a pharmacy may be asked to complete a brief health and medication history to establish a database in the pharmacy's computer for the patient.
- o It is important to determine if the patient's medications are provided through insurance coverage and whether the patient wishes to wait, call back, or have the medication delivered.
- o Many pharmacists make it a practice to price prescriptions before dispensing, especially in the case of unusually expensive medication, to avoid subsequent questions concerning the charge.

**Reading and checking the prescription:** The prescription order first should be read completely and carefully. There should be no doubt as to the ingredients or quantities prescribed.

- o From the pharmacy's prescription computer or other record of the patient's medication history), the pharmacist should determine the compatibility of the newly prescribed medication with other drugs being taken by the patient and also consider if any drug–food or drug-disease interactions may exist. Most prescription computer software programs identify possible drug–drug interactions.
- o However, these software programs do not always identify the potential significance of the drug–drug interaction. This is the point at which the pharmacist must use information specific to this patient to determine the significance of the interaction and to determine if the prescriber should be contacted.
- o In addition, references may be used for this purpose, such as *USP Dispensing Information (USP DI)* or *Drug Interaction Facts*. Should the probability or likelihood of a drug interaction exist, the pharmacist should first consider alternative drug products that might be used and then consult with the prescriber to determine best therapeutic alternative for the patient and be prepared to make

recommendations. The same would apply when a medication is prescribed for a patient who has a known drug allergy or sensitivity to the prescribed drug or to other drugs of the same chemical class. If something is illegible or if it appears that an error has been made, the pharmacist should consult another pharmacist or the prescriber.

- o *A pharmacist should never guess at the meaning of an indistinct word or unrecognised abbreviation.* Unfamiliar or unclear abbreviations represent a source of error in interpreting and dispensing prescriptions.
- o The amount and frequency of a dose must be noted carefully and checked. In determining the safety of the dose of a medicinal agent, the age, weight, and condition of the patient (eg, liver function, kidney function), dosage form prescribed, possible influence of other concomitant drugs being taken, and the frequency of administration all must be considered.
- o Several guides are available to the pharmacist in evaluating the safety of a prescribed dose. The *USP DI* provides usual doses and dosage ranges for many drugs in use. Manufacturers' catalogs, file cards, and package inserts provide dosage information on their products.
- o References such as *Physicians' Desk Reference, AMA Drug Evaluations, American Hospital Formulary Service Drug Information, Drug Facts and Comparisons, Handbook of Clinical Drug Data, Pharmacist's Drug Handbook, and Pediatric Dosage Handbook* are useful general sources of such information. Some computer software programs now can check doses for pediatric patients when the child's weight is entered.
- o Measurement of liquid medication may lead to dosage variation caused by differences in the capacity of household spoons and interpretation of which measuring device to use by the patient. The problems associated with teaspoonful dosage have long been recognised. A standard teaspoon has been established by the American National Standards Institute as containing 4.93 ± 0.24 mL. For practical purposes, the standard teaspoonful is considered to be equivalent to 5 mL, although different household teaspoons vary widely in capacity. Thus, 1 fl oz (29.57 mL) of a medicated liquid is

considered to provide approximately 6 standard teaspoonful doses.

**Labelling:** The prescription label may be typewritten or prepared by computer, using the information entered by the pharmacist or pharmacy assistant.

- o A prescription should have an aesthetic and professional appearing label.
- o The name and address of the pharmacy are legally required to appear on the label; the telephone number is also commonly included. The prescription number, prescriber's name, patient's name, directions for use (in easy to understand language for the patient), and the date of dispensing also are legally required; and the name and strength of the medication are also frequently included.
- o Some state laws require that the name or initials of the pharmacist dispensing the medication appear on the label.
- o Some pharmacists indicate the refill or renewal status of the prescription on the primary label or use an auxiliary label to indicate this information. Occasionally, the manufacturer's lot number for the medication dispensed is entered on the label to aid in rapid identification of medication that might be recalled.
- o Auxiliary labels are used to emphasise important aspects of the dispensed medication, including its proper use, handling, storage, refill status, and necessary warnings or precautions. A shake-well label is indicated for a prescription containing ingredients that may physically separate on standing (eg, suspensions, lotions, and emulsions). The use of labels such as For the Ear, For the Eye, and External Use is recommended because of the added safety these offer, even when the primary directions indicate their proper use. Other precautionary labels may be used to warn that the medication should not be swallowed, used internally or should be kept out of reach of children and others for whom it is not intended. Auxiliary labels are available in various colours to give them special prominence. They should be placed in a conspicuous spot on the prescription container.
- o In certain circumstances it may be desirable for the pharmacist to supplement the instructions or directions of the prescriber. For example, a pharmacist might advise that a medication be taken with a large volume of water or that certain foods or activities are to be avoided when taking the medication.

**Preparing the Prescription:** After reading and checking the prescription order, the pharmacist should decide on the exact procedure to be followed in dispensing or com-pounding the ingredients.

- o *Pharmacy compounding* is defined as the preparation, mixing, assembling, packaging, or labeling of a drug or device as a result of a practitioner's prescription-drug order or initiative based on the prescriber–patient–pharmacist relationship in the course of professional practice. *Extemporaneous compounding* is essential in the course of professional practice to prepare drug formulations in dosage forms or strengths that are not otherwise commercially available. The process may include the use of readily available bulk pharmaceutical chemicals, or it may require the use and conversion of a commercially available dosage form into another form. For example, it is not uncommon to fortify or reduce the strength of an active ingredient in a dermatological preparation, to reformulate adult dosage forms, such as tablets or capsules, into an oral suspension for use by pediatric patients, or to prepare intravenous admixtures in the hospital, nursing home, or home-care setting.
- o When a prescription requiring compounding is received, the pharmacist should take into consideration of the~
  - Chemical and physical compatibility of the ingredients
  - The proper order of mixing, the need for special adjuvants or techniques, and
  - The mathematical calculations required.
- o Once deciding on the procedure, the pharmacist assembles the necessary materials in a single location on the prescription counter. As each ingredient is used, it is transferred to another location away from the workstation. The use of this technique provides the pharmacist with a *mechanical check* on the introduction of each ingredient. If the pharmacist is interrupted during the process, there is then no doubt as to which ingredients already have been used. When the

pharmacist has finished, all the ingredients are returned to their storage places.
o Through this process, the pharmacist has the *opportunity to read the label of each ingredient* three times:
   ▪ Once, when the container is removed from the storage shelf,
   ▪ Again, when the contents are weighed and measured and,
   ▪ Finally, when the container is returned to the shelf.

**Prescription Ownership and Refilling:** When a prescription is written it is the property of the prescriber until he delivers it to the patient, or to the druggist for the patient; it then ceases to be his and he has no legal right to recall it.

o If the patient has the prescription it is his to do with as he chooses, and when it is delivered to the druggist to be filled it becomes and remains the property of the druggist.
o The patient cannot demand its return nor can the physician, and should a prescriber for any reason wish to regain possession of one of his prescriptions that has been filled, he should remember that he is to ask the druggist for the favor of its return and not, demand it.
o It is the same proposition as if the doctor sent an order to a merchant to deliver to his servant a pair of shoes. The merchant should retain the order as his evidence of the transaction. Of course, the major object in the pharmacist retaining prescriptions is really that he may have them in case it is necessary to have them refilled.
o Any calculations or compounding information that would be useful in *refilling* the prescription at a later date should be noted either on the face or back of the prescription order and also in the computer system.
o Adjuvants used, order of mixing, amount of each ingredient, capsule size used, type and size of the container, name and product identification number of the manufacturer, auxiliary labels used, clarification of illegible words or numbers, price charged, and any special notations should be recorded. The failure to do this may result in differences in the appearance of the prescription when refilled and possibly create doubt and apprehension in the mind of the patient.

# 6. PACKAGING

When dispensing a prescription, pharmacists may select a container from among various shapes, sizes, mouth openings, colors, and composition. Selection is based primarily on the type and quantity of medication to be dispensed and the method of its use.

**Types of Containers in Use:** Among the types of containers generally used in the pharmacy are

▪ *Round vials***:** Used primarily for solid dosage forms as capsules and tablets
▪ *Prescription bottles***:** Used for dispensing liquids of low viscosity
▪ *Wide-mouth bottles***:** Used for bulk powders, large quantities of tablets or capsules, and viscous liquids that cannot be poured readily from the narrow-necked standard prescription bottles
▪ *Dropper bottles***:** Used for dispensing ophthalmic, nasal, otic (ear), or oral liquids to be administered by drop
▪ *Applicator bottles***:** Used for applying liquid medication to a wound or skin surface
▪ *Ointment jars and collapsible tubes***:** Used to dispense semisolid dosage forms, such as ointments and creams
▪ *Sifter-top containers***:** Used for topical powders to be applied by Sprinkling
▪ *Hinged-lid or slide boxes***:** Used for dispensing suppositories and powders prepared in packets
▪ *Aerosol containers***:** Used for pharmaceutical aerosol products (These are pressurised systems dispensed by the pharmacist in the original container.)

**Important packaging considerations:** Most of the prescription containers usually are available in colourless or amber-coloured glass or plastic.

o *Amber-coloured containers* are most widely used because these provide maximum protection of their contents against photochemical deterioration.
o *Plastic amber containers* are generally used except in situations where moisture sensitive drug products dictate the use of glass bottles of vials.
o The use of *outer wrappings or cartons* also may be used to protect light-sensitive pharmaceuticals.
o The *closure on a prescription container* is as important as the container itself. By law, prescription containers must be moisture-

proof and thus the ability of the closure to restrict entrance of moisture into the container is of prime importance.

o Moisture has a deteriorating effect on many dosage forms, especially capsules, tablets, and powders. For example, aspirin tablets are hydrolysed in the presence of moisture and broken down into acetic acid and salicylic acid. Sublingual nitroglycerin tablets are always dispensed in their original glass bottles to minimise exposure to air and moisture. Many pharmacies use screw-cap glass or tight-fitting closures to reduce moisture penetration.

o *Plastic containers* have widespread use in the pharmaceutical industry and in prescription practice. The advantages of plastic over glass containers include lightness of weight, resistance to breakage on impact and greater versatility in container design. Flexible polyethylene is used widely in the packaging of squeeze bottles for medication to be administered as drops or as a spray. Nose drops, eye drops, and throat sprays, as well as oral medication to be administered in a dropwise manner, frequently are packaged and dispensed in these containers.

o Lotions, medicated shampoos, and creams also are packaged conveniently in *flexible polyethylene containers*. Pliable ointment tubes and flexible plastic containers for intravenous fluids also are used widely.

o *Rigid polystyrene vials* are employed commonly by pharmacists to dispense capsules and tablets. This type of plastic also is used widely in ointment jars and box packages for suppositories.

o The *modern compact-type container* used for oral contraceptives, which contain sufficient tablets for a monthly cycle of administration and permit scheduled removal of one tablet at a time, is a prime example of the imaginative packaging possible with plastic [11].

**Child Resistant Containers (CRCs):** The high number of accidental poisonings after ingestion of medication and other household chemicals by children led to the passage of the *Poison Prevention Packaging Act in 11010*.

o The initial regulation called for use of *childproof closures* for aspirin products and certain household chemical products shown to have significant potential for causing accidental poisoning in youngsters. As the technical capability in producing effective closures was developed, the regulations were extended to include the use of such safety closures in the packaging of both legend and OTC medications.

o The *Consumer Product Safety Commission* has ruled that manufacturers must place prescription drugs in child-resistant packages if the original package is intended to go directly from the pharmacist to the patient. However, manufacturers need not place drugs in safety packaging if the drugs are intended to be repackaged by pharmacists. All legend drugs intended for oral use must be dispensed by the pharmacist to the patient in containers having safety closures unless the prescribing physician or the patient specifically requests otherwise.

o A request for a *non-child-resistant container* may be applied to a single prescription or to all of a patient's dispensed medications. The pharmacist should clarify the patient's desires, obtain and file a signed waiver request, and maintain the information in the prescription computer for future reference. There are some exceptions to the overall requirements, such as

▪ *Oral contraceptive packages* because of their unique and useful design, and

▪ *Certain cardiac drugs* (eg, nitroglycerin) because of the importance to the patient for direct and immediate access to the medication.

▪ Exemptions also are permitted in the case of *OTC medication* for one-package size or

▪ Specially marked packages to be available to consumers for whom safety closures might be unnecessary or too difficult to manipulate. These consumers include *childless persons, arthritic patients, and the debilitated*.

# 7. PHARMACISTS AS PRESCRIBERS AND THE LEGAL FRAMEWORK

Evolution of non-medical prescribing -- Independent prescribing is defined as 'prescribing by a practitioner (doctor, dentist, nurse, pharmacist) who is responsible and accountable for the assessment of patients with undiagnosed or diagnosed conditions and for decisions about the clinic management required including prescribing'. At the end of the 1990s, in

line with the then UK government's desire to widen access to medicines by giving patients quicker access to medicines, improving access to service and making better use of the skills of health care professionals, the role of prescriber was proposed for other health care professionals. This change in prescribing to include nonmedical prescribers (pharmacists, nurses and optometrists) was developed following a further review [12].

## 7.1 The Prescribing Process

o *Consultation*: The consultation is a fundamental part of the prescribing process and the prescriber needs to understand and utilise this in order to help them practice effectively. The five key stages of the consultation are*:*
  • Initiating the session
  • Gathering information
  • Physical examination
  • Explanation and planning
  • Closing the session.
  A broad range of practical skills are needed in the consultation:
  1) *Interpersonal skills:* the ability to communicate and make relationships with patients.
  2) *Reasoning skills:* the ability to gather appropriate information, interpret the information and then apply it both in diagnosis and management.
  3) *Practical skills:* the ability to perform physical examinations and use clinical instruments.
o *Executing A Safe and Effective Prescription Order*: It requires communication of complete information to all intended readers. A complete order should contain, at a minimum:
  i. Patient name
  ii. Patient specific data
  iii. Generic and brand name (ideally, both names should be provided; if only one name used, generic is preferred)
  iv. Medication strength, in metric units by weight
  v. Dosage form
  vi. Amount to be dispensed, in metric units (terms such as bottle, tube or ampule should be avoided)
  vii. Complete directions for use including route of administration, duration, dosing frequency, medication purpose, and number of authorised refills.

o *Dosing Calculations*: A well-recognised cause of medication errors. Performing routine, independent cross-checking of dosing calculations are useful when verifying dosages for pediatric, geriatric, oncology, transplant, or other populations with special medication requirements. For verifying dosages, use of both mg/kg and mg/m2 (or other expressions as unit per weight or body surface area) in addition to actual dose calculated is recommended [13].
o *Dosage Standardisation*: Another potential safety improvement, whenever possible as well as the use of commercially available dosage forms. This will require prescriber approval and cooperation. However, avoiding complex calculations is one way to avoid calculation errors. If transcription of medication orders is part of the health care organisation's practice to transfer prescribing information to a medication administration record, similar guidelines and standards for evaluating standards, completeness, and accuracy should be put into place with a routine evaluation of practice compliance.
o *Communicating Risks and Benefits of Treatment*: Explaining the risks and benefits of treatment in an effective manner is an essential skill for health care professionals. This ensures patient's consent to treatment is informed and that the patient has an opportunity to participate in shared decision making about their treatment. A few related statements are added later part of this article.
o *Consulting the Prescriber***:** It is in the additional role of managing medication therapy, in collaboration with prescribers, that pharmacists can now make a vital contribution to patient care. To do so, the role of the pharmacist needs to be redefined and re-orientated. The traditional relationship between the doctor as prescriber, and pharmacist as dispenser, is no longer appropriate to ensure safety, effectiveness and adherence to therapy. Pharmacists need to pay more attention to patient-centered, outcomes-focused care to optimise the safe and effective use of medicines. Dispensing is, and must remain, a responsibility of the pharmacy profession, but prescribing and dispensing should not be done by the same person. By taking direct responsibility for individual patients' medication-related needs, pharmacists can make a unique contribution to the outcome of medication therapy and to their patients' quality of life [14].

o *Management of ADEs*: Prescribing can be improved if prescribers have the necessary data to assure that decisions can be made (i.e., indications for use, the potential for interactions, risks and benefits, monitoring concerns). The process of medication prescribing via computer order entry would greatly affect the rate of errors associated with ADEs. A computerised medication ordering system could provide alerts regarding specific prescribing concerns in the medication ordering process (e.g., identifying dose, allergy, drug-drug interactions). Having a routine approach to detect, intercept, and prevent these problems will reduce the potential for an adverse event to occur. Clinical information systems can also assist in reducing adverse drug events and medication errors by:

- Increasing patient profile access and systematic screening of medication orders
- Alerting medical staff of abnormal doses, medication interactions, or allergies (based on patient profile)
- Generating 24-hour patient medication updates
- Recording medication administration

o *Medication Review*: Reviewing all medications for appropriateness is good practice and also a systematic method to review the indication for use and monitoring plan in place for the patient. Another technique used to assure safe and effective prescribing practice is the use of a medication formulary. While physicians often consider a medication formulary as simply a method to control expenditures, formularies can be used as instructional and quality tools to assure that only agents that are safe, effective, and necessary for use are provided for patients under care. An organised formulary process comprises of a systematic peer review of medications for use and monitoring within a health system. Medications are typically evaluated for safety, effectiveness, policy implication, and practice requirements. Use of a formulary can assure that information is provided in a timely fashion, because the product has been thoroughly evaluated for use. *Potential Benefits of Medication review***:**

- Improves the current and future management of the patient's medical condition;
- Provides an opportunity to develop a shared understanding between the patient and the health care professional about

medicines and their role in the patient's treatment;
- Improves health outcomes through optimal medicines use;
- Reduces adverse events related to medicines;
- Provides an opportunity to empower the patient and carers to be actively involved in their care and treatment;
- Reduces unwanted or unused medicines.

o Other Considerations:

i. *Use of Abbreviations*: While abbreviations might appear to be a time saver, their use can lead to confusion, misinterpretation, and increase the potential for error. Misplaced or missing decimal points also pose concerns. Recommendations for improving orders requiring fractions or decimal indications include adding a zero before a decimal point and eliminating trailing decimal points and zeros. Various organisations, including the Institute for Safe Medication Practices, have published lists of abbreviations and decimal point miscommunications (Tables 3 and 4) that have been associated with medication errors and should not be used.

ii. *Preprinted Order Forms*: To reduce error potential, preprinted order forms have been suggested to reduce error potential. It is important to note that if preprinted orders are not carefully developed, they may actually induce errors. As standard orders, algorithms or preprinted guidelines are developed, all disciplines involved in the ordering process, should be involved in the development, review, and approval of these documents. Prescribing improvement efforts should include the development of policies and procedures that support safe medication use and ordering. Practitioners should routinely be required to assess and document the need for and selecting the correct medication. Regimen selection should assure that specific, individual treatment goals are identified. Improvement efforts should also include attention to avoiding delay in treatment or in responding to a medication use concern, including inappropriate indication (or no clear treatment indication) and failure to provide preventive care or prophylactic treatment. Prescribing plans should include monitoring or follow up treatment.

iii. *Failure to Write Prescription Orders*: The use of verbal orders, electronic order

transmission via facsimile machine, use of global prescription orders such as resume all previous orders provide many opportunities for miscommunication. Whenever possible, verbal orders should be avoided. Only specific personnel (e.g., physicians, pharmacists, nurses) should be allowed to dictate and receive verbal medication orders and only in approved circumstances. When used, verbal orders should be enunciated slowly and distinctly. Difficult medication names and instructions should be spelled out. Ambiguity should be clarified (Drug names can be mistakenly changed due to look alike or sound alike drugs listed in Table 5). The individual receiving the order should transcribe the order and then immediately read the information back to the prescriber. In the inpatient or long-term care setting, the prescriber should countersign and verify the verbal order as soon as possible. Many health care organisations now use facsimile transmissions for prescription order transmission. Streaked, blackened, or faded areas and phone line noise appearing as random markings are often present on facsimile transmissions. Careful inspection of the copy is necessary to evaluate if extraneous markings interfere with the actual order. Transmission of prescription orders in this manner still can contain illegible, ambiguous, or improper abbreviations. Failure to write a prescription order can also provide many opportunities for error. When medications are held or resumed or patient care is transferred to another location or provider, it is imperative that a complete review of medications is occurs. Simply stating resume all, hold all, or continue all previous medications is not acceptable practice.

**Table 3. Common abbreviations used for prescriptions**

| Abbreviation | Actual Meaning |
|---|---|
| a.c. | before meals (from "ante cibum," before meals) |
| ad lib: | use as much as one desire (from "ad libitum") |
| b.i.d. | twice a day |
| t.i.d. | three times a day (from "ter in die," 3 times a day) |
| caps | capsules |
| da or daw | dispense as written |
| g (or gm or GM) | gram, gtt. = drops (from "guttae," drops), h. = hour, mg = milligram, ml = milliliter |
| p.c. | after meals (from "post cibum," after meals) |
| p.o. | by mouth, orally (from "per os," by mouth) |
| p.r.n. | when necessary (from "pro re nata," for an occasion that has arisen, as circumstances require, as needed) |
| q.d. | once a day (from "quaque die," once a day) |
| q.i.d. | four times a day (from "quater in die," 4 times a day) |
| q.h. | every hour, (q.2h. = every 2 hours, q.3h. = every 3 hours) |

**Table 4. List of dangerous abbreviations, acronyms, and symbols**

| Abbreviation | Potential problem | Preferred term |
|---|---|---|
| U (unit) | Mistaken as zero, four, or cc | Write "unit" |
| IU (international unit) | Mistaken as IV or 10 | Write "international unit" |
| Q.D., Q.O.D. | Mistaken for each other. Period after Q and O after Q can be mistaken for "I" | Write "daily" and "every other day" |
| Trailing zero and lack of leading zero | Decimal point missed | Never write a zero by itself after a decimal point, and always use a zero before a decimal point |
| MS, MSO4, MgSO4 | Confused for one another | Write "morphine sulfate" or "magnesium sulfate" |
| µg (microgram) | Mistaken for mg (milligram) | Write "mcg" |
| H.S. (at bedtime or half – strength) | Mistaken for either meaning: Also mistaken for every hour | Write out "half – strength" or "at bedtime" |
| T.I.W (three times a week) | Mistaken for three times a day or twice weekly | Write "three times weekly" or "3 times weekly" |
| S.C. or S.Q. (subcutaneous) | Mistaken for SL for sublingual or "5 every" | Write "Sub-Q" or "subQ" or "subcutaneously" |

| Abbreviation | Potential problem | Preferred term |
|---|---|---|
| D/C | Interpreted as discontinue whatever medication follows (typically discharge meds) | Write "discharge" |
| c.c. | Mistaken for U (units) when poorly written | Write "ml" for milliliters |
| A.S., A.D., A.U. (Latin abbreviations for left, right, both ears) O.S., O.D., O.U. (Latin abbreviations for left, right, both eyes) | Mistaken for each other (A.S. for O.S., A.D. for O.D., A.U. for O.U., Vise-versa) | Write out "left ear" or "right ear" or "both ears" Write out "left eye" or "right eye" or "both eyes" |

### Table 5. Examples of look alike and sound alike drugs

| List 1 | | List 2 | |
|---|---|---|---|
| Adriamycin | Achromycin | Methotrexate | Metolazone |
| Albuterol | Atenolol | Myleran | Mylicon |
| Alupent | Atrovent | Nicardipine | Nifedipine |
| Amikin | Amicar | Orinase | Ornade |
| Apresoline | Priscoline | Pediapred | PediaProfen |
| Brevital | Bretylol | Penicillin | Penicillamine |
| Carafate | Cafergot | Percodan | Percocet |
| Cefoxitin | Cefotaxime | Phenobarbital | Pentobarbital |

## 8. CRITICAL ISSUES OF PATIENT COMMUNICATION

*It is important to communicate the risks and benefits of treatment in relation to medicines.* This is because many medicines are used long term to treat or prevent chronic diseases, but we know they are often not taken as intended. Sometimes these medicines do not appear to have any appreciable beneficial effect on patients' symptoms, for example medicines to treat hypertension. Most patients want to be involved in decisions about their treatment, and would like to be able to understand the risks of side effects versus the likely benefits of treatment, before they commit to the inconvenience of taking regular medication. An informed patient is more likely to be concordant with treatment, reducing waste of health care resources including professional time and the waste of medicines which are dispensed but not taken [15]. *Communicating risk is not simple.* Many different dimensions and inherent uncertainties need to be taken into account, and patients' assessment of risk is primarily determined by emotions, beliefs and values, not facts. This is important, because patients and health care professionals may ascribe different values to the same level of risk. Health care professionals need to be able to discuss risks and benefits with patients in a context that would enable the patient to have the best chance of understanding those risks. It is also prudent to inform the patient that virtually all treatments are associated with some harm and that there is almost always a trade-off between benefit and harm. How health care professionals present risk and benefit can affect the patient's perception of risk. *Some important principles to follow when describing risks and benefit to patients:*

a. Patients' assessments of risk are primarily determined by emotions, not by facts
b. Communicate the trade-off between benefits and harms
c. Avoid purely descriptive terms of risk, for example 'low risk'
d. Use a consistent denominator, for example 1 in 100, 5 in 100; not 1 in 100, 1 in 20
e. Use absolute numbers (not relative, or percentages)
f. Describe outcomes in both a negative and positive perspective.

## 9. FACTORS THAT INFLUENCE PRESCRIBING PROCESS

There are many different factors which affect use of drugs. If one were to broadly classify the factors, they could be divided in to: those deriving from patients, chemists' shop, prescribers, the workplace the supply system, industry influences, cognitive biases (Table 6) regulation, drug information and misinformation [16].

**Table 6. Examples of types of cognitive biases that influence prescribing Type**

| Type of cognitive bias | Description |
| --- | --- |
| Novelty preference | The belief that the progress of science always results in improvements and that newer treatments are generally better than older treatments |
| Over optimism bias | Tendency of people to over-estimate the outcome of actions, events or personal attributes to a positive skew |
| Confirmation bias | Information that confirms one's already firmly held belief is given higher weight than refuting evidence |
| Mere exposure effect | More familiar ideas or objects are preferred or given greater weight in decision making |
| Loss aversion | To weigh the avoidance of loss more greatly than the pursuit of an equivalent gain |
| Illusory correlation | The tendency to perceive two events as causally related, when in fact the connection between them is coincidental or even non-existent |

**Table 7. AIDA adoption model for influencing prescribers**

| | |
| --- | --- |
| **Awareness** | Make the prescriber aware of the issues, prescribing data and evidence for the need to change |
| **Interest** | Let the prescriber ask questions and find out more about the proposed change: what the benefits are, what the prescriber's concerns are |
| **Decision** | Help the prescriber come to a decision to make a change. How can the change be applied to their patients, what support is there to overcome the barriers to change, provide further information and training to support the change |
| **Action** | Action of making a change by the prescriber. Support this with simple reminders, patient decision support, feedback data and audit |

## 10. MANAGERIAL APPROACHES TO INFLUENCE PRESCRIBING

In order to change prescribing practice, pharmacists need to be aware of how to use an adoption model-based approach to convey key messages to the prescriber to help them change practice. One such model is known as AIDA. More sophisticated multifaceted educational interventions can also be effective at changing prescribing behaviour but need to be flexible to meet the needs of individual clinicians (Table 7). This sort of combination approach includes small group learning, audit and feedback, practical support to make changes in practice, and involvement and education of patients.

## 11. SYSTEM FAILURES IDENTIFIED IN THE PRESCRIBING PROCESS

Varieties of systems failures have been identified in hospitals that have studied factors associated with adverse events. These system failures are listed below:

- Deficiencies in medication knowledge, including prescribing of incorrect medications, doses, forms, frequency, or routes of administration
- Inaccessibility of patient information including laboratory test results, current medications, and information on the patient's current condition
- Incorrect transcription of orders, often due to illegibility of the physician's handwriting
- Failure to note known medication allergies
- Inefficient order tracking, making it difficult to determine when a medication has been given, missed/discontinued or changed
- Poor communication between services, including between nurses and pharmacists
- Improper use of administration devices
- Poor information transfer when patients are moved from one patient care area to another
- Inadequate or nonexistent system for resolving conflicts related to medication orders.

## 12. INAPPROPRIATE OR IRRATIONAL PRESCRIBING

Good prescribing is sometimes defined as the lack of irrational prescribing. Prescribing can be described as irrational for many reasons:

- Poor choice of a medicine
- Polypharmacy or co-prescribing of interacting medicine
- Prescribing for a self-limiting condition
- Continuing to prescribe for a longer period than necessary
- Prescribing too low a dose of a medicine

- Prescribing without taking account of the patient's wishes [17].

## 13. ERROR POTENTIAL IN THE PRESCRIBING PHASE

The three most common forms of prescribing errors include dosing errors, prescribing medications to which the patient had an allergic history, and errors involving the prescribing of inappropriate dosage forms. In the examples listed, timely access and use of information is essential to avoid adverse drug events. Although not a panacea, use of a computerised medication order entry system can significantly contribute to the prevention of medication errors [18]. The type of health care information that is best suited for computerisation includes:

- General information storage (e.g., patient or medication information, retrieval)
- Repetitive functions (e.g., dosage guidelines, medication names, allergy information)
- Complex processes that depend on reproducible results
- Items where legibility is essential
- Items that require timely attention
- Items where accuracy is vital.

## 14. GUIDELINES FOR PRESCRIBERS

The following guidelines are recommended for prescribers when writing directions for drug use on their prescription orders:

1. The name and strength of the drug dispensed will be recorded on the prescription label by the pharmacist unless otherwise directed by the prescriber.
2. Whenever possible, specific times of the day for drug administration should be indicated. (For example, Take one capsule at 8:00 am, 12:00 noon, and 8:00 pm is preferable to Take one capsule three times daily. Likewise, Take one tablet two hours after meals is preferable to Take one tablet after meals.)
3. The use of potentially confusing abbreviations, ie, qid, qod, qd, etc, is discouraged.
4. Vague instructions such as Take as necessary or Take as directed which are confusing to the patient are to be avoided.
5. If dosing at specific intervals around-the-clock is therapeutically important, this should specifically be stated on the prescription by indicating appropriate times for drug administration.
6. The symptom, indication, or the intended effect for which the drug is being used should be included in the instructions whenever possible. (For example, Take one tablet at 8:00 am and 8:00 pm for high blood pressure, or Take one teaspoonful at 8:00 am, 11:00 am, 3:00 pm, and 6:00 pm for cough.)
7. The Metric System of weights and measures should be used.
8. The prescription order should indicate whether or not the prescription should be renewed and, if so, the number of times and the period of time such renewal is authorised. Statements such as Refill prn or Refill ad lib are discouraged.
9. Either single or multi-drug prescription forms may be used when appropriately designed, and pursuant to the desires of local medical and pharmaceutical societies.
10. When institutional prescription blanks are used, the prescriber should print his/her name, telephone number and registration number on the prescription blank.

## 15. GUIDELINES FOR PHARMACISTS

1. Pharmacists should include the following information on the prescription label: name, address and telephone number of pharmacies; name of prescriber; name, strength and quantity of drug dispensed (unless otherwise directed by the prescriber); directions for use; prescription number; date on which prescription is dispensed; full name of patient and any other information required by law.
2. Instructions to the patient regarding directions for use of medication should be concise and precise, but readily understandable to the patient. Where the pharmacist feels that the prescription order does not meet these criteria, he should attempt to clarify the order with the prescriber in order to prevent confusion. Verbal reinforcement and/or clarification of instructions should be given to the patient by the pharmacist when appropriate.
3. For those dosage forms where confusion may develop as to how the medication is to be administered (for example, oral drops which may be mistakenly instilled in the ear or suppositories which may be mistakenly administered orally), the

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pharmacist should clearly indicate the intended route of administration on the prescription label.

4. The pharmacist should include an expiration date on the prescription label when appropriate.

5. Where special storage conditions are required, the pharmacist should indicate appropriate instructions for storage on the prescription label.

## 16. OTHER ISSUES

**Supplementary Prescribing:** Supplementary prescribing is defined as a voluntary prescribing partnership between an independent prescriber (doctor or dentist) and a supplementary prescriber (nurse, pharmacist, chiropodists/podiatrists, physiotherapists, radiographers and optometrists) to implement an agreed patient-specific clinical management plan with the patient's agreement. This prescribing arrangement also requires information to be shared and recorded in a common patient file.

**Off-Label and Unlicensed Prescribing:** For a medicine to be licensed for use in a specific country, the manufacturer must obtain a marketing authorisation, formerly called the product license. This details the patients, conditions and purpose under which the medicine is licensed for use. Any medicine which does not have a marketing authorisation for the specific country where it is prescribed is termed 'unlicensed'. Unlicensed medicines prescribed include new medicines undergoing clinical trial, those licensed and imported from another country but not licensed in the country where they are to be used. It also includes 'specials' manufactured to meet a specific patient's needs or produced when two licensed medicines are mixed for administration. However, if a licensed medicine is prescribed outside that specified in the marketing authorisation, then this is described as 'off-label'. This happens in practice, for example many medicines are not licensed for use in children but are prescribed for them. In addition, some established medicines are prescribed for conditions outside their marketing authorisation, for example amitriptyline for neuropathic pain and azathioprine in Crohn's disease [19].

**Monitoring Adverse Drug Reactions (ADRs):** The FDA has specific requirements for drug manufacturers of investigational and marketed pharmaceutical products to report adverse drug reactions (ADRs). Pharmacists have the opportunity to participate in reporting such incidents through practices in the institutional and community pharmacy settings. The FDA provides the MedWatch form for filing a voluntary—or in the case of user facilities, distributors, or manufacturers, a mandatory—report. The form includes space for entering patient information; adverse reaction information, including a description of the reaction experience and relevant laboratory tests or data; suspect drug information, such as the drug name, manufacturer, lot number, daily dose, route of administration, dates of administration and duration of administration; concomitant drugs taken and record of administration; and name and contact information for the person or manufacturer filing the report. In some institutions in which clinical studies are conducted, computer programs are used to record, monitor, and report suspected ADEs. ADR reports may result in changes in product labelling, warning letters to health-care professionals regarding safe conditions of use, requirements for further clinical or safety studies or, in some instances, withdrawal of the product from the market [20].

## 17. RECOMMENDATIONS FOR ADRs IMPROVEMENTS

Many opportunities exist to improve the safety of the medication use process. The prescribing phase of the medication use process, however, encompasses the majority of medication errors that result in preventable ADRs. The most important element of any safety measure is trained and competent people, not technology. The trick is to remember that technology can't save the day [21]. The system has to be built around the people. Highly trained and competent people (Table 8) bring to a task a quality not found in and technology. The knowledge that ADRs can be prevented compels organisations to identify the factors or system failures that contribute to the errors in the prescribing phase. Such factors identified in the prescribing phase include:

- Availability of medication information at time of prescribing
- Access to patient information at time of prescribing
- Availability of dosing information at time of prescribing
- Availability of allergy information at time of prescribing

- Accuracy or completeness of order by prescriber
- Legibility of handwriting
- Use of abbreviations
- Use of decimals in expressions of weight and measure
- Use of varied units of measure
- Medication name look-alikes or sound-alikes.

**Table 8. Overview of the competency framework for pharmacists**

| Competency area | Competency |
|---|---|
| Consultation | Clinical and pharmaceutical knowledge |
| | Establishing options |
| | Communicating with patients |
| Prescribing effectively | Prescribing safely |
| | Prescribing professionally |
| | Improving prescribing practice |
| Prescribing in context | Information in context |
| | The NHS in context |
| | The team and individual context |

## 18. POTENTIAL ADVANTAGES ASSOCIATED COMPUTER SUPPORT

Computer support in the prescribing process is beneficial due to the fact that this process demands attention to detail related to the medication product, patient, and population characteristics, clinical information, and administrative issues. It is important to remember that practitioners receiving the information within the organisation are still required to use the appropriate skills to determine the relevance of this information for the patient. Simply automating the prescriptive process does not in and of itself make it safer. Lessons have been learned in other domains regarding the impact and implications of technology. If one thinks technology can solve security problems, then the person doesn't understand the problems and the technology. New technologies have enormous capacity, but what is seldom thought about is not how well it works, but how well it fails. Benefits of electronic prescriptions are:

1) Reducing or eliminating the errors associated with illegible handwriting;
2) Prescribers can receive on-screen prompts for drug-specific dosing information;
3) Information from the patient's medical record can be linked with information from the patient's prescription records;
4) Prescribers would be notified if a drug product is covered by the patient's insurance plan when the order is being generated rather than when it is presented at the pharmacy;
5) Refill requests can be expedited; and
6) Computers can facilitate data exchange between the physician and pharmacist allowing individuals to better manage their time and facilitate interactions with their patients [22].

## 19. CONCLUSION

Prescribing is difficult. It requires a thorough knowledge and understanding of the pathophysiology of disease, the pharmacological properties of the relevant drugs, and the ways in which the two dovetails. No single intervention can be relied upon to improve prescribing, and a combination of interventions may be required to be taken as often as possible (learning should be lifelong). Special study modules, to be taken as required. Proper assessment in the final examination, to be taken once or twice. A national prescription form for hospitals, to be applied uniformly. The American Pharmaceutical Association and the American Society of Internal Medicine believe that the guidelines as stated above will serve as an initial step toward patients achieving a better understanding of their medication and dosing instructions. The two associations urge state and local societies representing pharmacists and prescribers to appoint joint committees for the purpose of refining these guidelines further as local desires and conditions warrant. The associations believe that such cooperative efforts between the professions are essential to good patient care and that significant progress can be made in other areas by initiating discussions between the two professions concerning common interests and goals.

## COMPETING INTERESTS

Author has declared that no competing interests exist.

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