

Medication Errors Associated with Look-alike/Sound-alike Drugs: A Brief Review

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Abstract

The existence of confusing drug names is one of the most common causes of medication errors. There are many types of medication errors: wrong drug, wrong dose, wrong route of administration, wrong patient etc. Misreading medication names that look similar is a common mistake. These look-alike medication names may also sound alike and can lead to errors associated with verbal prescriptions. Similar sounding drugs may produce confusion and may lead to unintended interchange of drugs causing harm to patients or even patient death. The main aim of the study was to evaluate medication errors related to look alike-sound alike drug names and to find out the strategies to prevent these medication errors.

Key words: Look-alike; Sound-alike; FDA; Pharmaceutical companies

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Introduction

Medication names that look similar or sound similar have been identified as a potential source of error in healthcare systems. Medications in which packaging is visually similar to another product comes in the category of look-alikes. Medications for which generic or trade names of the product sounds similar in the spoken or written words are categorized as sound-alike drugs. Look-alike and sound-alike drug names can lead to the unintended interchange of drugs that can result in patient injury or death.¹

Look-alike and sound-alike (LASA) drug names are serious problems in healthcare, accounting for 29% of medication dispensing errors. Name confusion is a causative factor in 15–25% of all medication errors.²

Medication errors involving LASA drug names mix-up can cause serious patient harm. It is often difficult to detect the error as the dispensed medication is presumed to have been prescribed for the patient.³

Illegible handwriting, incomplete knowledge of drug names, new products and similarities in packaging and

labeling act as contributing factors to this problem. Thousands of brand names and generic drugs currently marketed, combined with new drugs released annually, make every health care provider vulnerable to involvement in this type of error.⁴

The US Food and Drug Administration (FDA) rejects approximately one-third of proposed names for new products. In spite of this, over 600 pairs of LASA drug names have been reported in 2003. Presence of thousands of drugs with trademarked (brand) or non-proprietary names increases the chance of name confusion.^{2,3}

Simplicity, standardization, differentiation, lack of duplication and unambiguous communication are some of the concepts that are relevant to the medication-use process. These principles have been ignored in the naming, labeling and packaging of medications. The consequences are predictable. Bad names, bad labels, and bad packages result in accidents waiting to happen.¹

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Over the recent years the dangers of medication errors have become increasingly recognized in both the lay and medical press. Medication errors can occur at any step in the supply of a medicine from prescribing, dispensing and administration.⁵

A number of errors have been reported and published in the Institute for Safe Medication Practices (ISMP) Medication Safety Alert newsletters on the mix-up between Lamisil® and Lamictal®.⁶⁻⁸ The FDA as well as Health Canada have noted that these two drugs, side by side, would be easily distinguished from one another by the tall-man lettering technique. This example demonstrates that a poor choice of name can cause continual problems throughout the product's lifetime.⁵

Medication errors are the most common cause of patient injuries in hospital. Adverse drug events, about half of which are due to medication errors, accounted for 19% of all injuries identified by the population based Harvard Medical Practice Study.⁹ An estimated 2–7% of patients admitted to hospitals experience a serious medication error (one that has the potential to cause injury).⁹ One study at a teaching hospital yielded an estimate that, on average, each preventable adverse event (ADE) resulted in an additional stay of 4.6 days and a cost of \$4685.¹⁰

The purpose of this review study is to create awareness among the medical practitioners about medication errors related to look-alike/sound-alike medications. The intent is to encourage thought to formulate a system to prevent this preventable cause of mortality and morbidity in our patients.

Medication error

Medication errors are errors in the process of ordering or delivering a medication, regardless of whether an injury occurred or the potential for injury was present. Some medication errors result in adverse drug events.¹¹ A medication error is any preventable event that may cause or lead to inappropriate medication use or harm to a patient.

The National Coordinating Council for Medication Error and Prevention (NCCMERP) has approved the following recommendation as its working definition of medication error: "... any preventable event that may cause or lead to inappropriate medication use or patient harm, while the medication is in the control of the

health care professional, patient, or consumer. Such events may be related to professional practice, health care products, procedures, and systems including: prescribing; order communication; product labeling, packaging and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use".¹²

Medication errors associated with look-alike and sound-alike drugs

Since 2000 FDA has received more than 95,000 reports of medication errors. Approximately 25% of errors reported to national medication error reporting programs result from confusion with drug names that look or sound alike.¹³

A retrospective study published in the American Journal of Health-System Pharmacy assessed deaths related to medication errors, including those resulting from confusing drug names. Of 5,366 medication errors identified between 1993 and 1998, 16% resulted from administration of the wrong drug and 10% from employment of the wrong administration route. Many of these errors were connected with LASA drug names.

The April 2008 issue of CAPSlink reported that between 2003 and 2006 US healthcare providers confused more than 3,170 pairs of generic and brand drug names. The problem does not stop there. A 2005 report in the Journal of Postgraduate Medicine noted frequent instances of LASAs involving foreign drug names. Commonly, Americans traveling outside the United States return with medications purchased abroad. They may think these medications are identical to US products with brand names that are the same or similar, but often this is not the case. Examples cited included Dianben (metformin) and Diovan (valsartan) in Spain, Avanza (mirtazapine) and Avandia (rosiglitazone) in Australia, and Trip (nortriptyline) and Triz (cetirizine) in India.

In February 2008, the USP released its 8th annual MEDMARX data report, detailing evaluations made between January 1, 2003 and December 31, 2006 of more than 26,000 records from more than 670 healthcare facilities. Among LASA drug errors, 384 (1.4%) had led to harmful patient outcomes. Of these, 64.4% originated at the dispensary, with pharmacy technicians committing the initial error in 39% of cases and pharmacists in 24% of cases.¹⁴

A similarity of characters in brand drug names, generic names, and brand-to-generic names can lead to confusion. Similar-sounding drug names present additional problems. These similarities are compounded by practitioners attempting to keep up with the vast array of new products introduced to the marketplace, illegible handwriting, orally communicated prescriptions, similar labeling or packaging of medications, and incorrect selection of a drug names that may appear in close proximity (e.g., ZYPREXA/ZYRTEC) when entering orders into electronic order entry systems. For example, ISMP recently wrote about a handwritten order for the bronchodilator FORADIL (formoterol) that was misinterpreted as TORADOL (ketorolac). In another report, a hospitalized patient reported taking “Plaxil” at home, but she was actually taking PLAVIX (clopidogrel).

The admitting physician misinterpreted “Plaxil” as PAXIL (paroxetine) and prescribed this medication for the patient, which caused several days of severe disorientation.¹⁵

The most serious errors reported due to similar names involve high alert medications. Insulin products were involved in 9% of the reports, and 21% involved opiate narcotics. Errors involving opiate narcotics include name confusion between morphine and meperidine (DEMEROL) as well as name confusion between immediate release and sustained release opiate products such as morphine immediate release products and morphine sustained release products (MS CONTIN); and oxycodone and sustained release oxycodone (OXYCONTIN).¹⁵

One of the most commonly confused name pairs reported to Pennsylvania Patient Safety Reporting System (PA-PSRS) has been morphine and hydromorphone. Thirty-two percent (32%) of the opiate/narcotic look-alike name reports include these two drugs. A number of events reported to national systems involving this combination have been fatal. In fact, mix-ups between these drugs are among the most common and most serious errors that occur involving two high-alert drugs, based on reports to national reporting programs. Contributing factors include the mistaken belief that hydromorphone is the generic name for morphine, as well as both drugs being

available in 1 mg/mL, 2 mg/mL and 4 mg/mL prefilled syringes.¹⁶

The issue of confusing drug names has become a concern with the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) as well. A new national patient safety goal for 2005 states that organizations, in order to improve the safety of using medications, “identify and, at a minimum, annually review a list of look-alike/sound-alike drugs used in the organization, and take action to prevent errors involving the interchange of these drugs.”¹⁷ JCAHO expects facilities to develop a list of look-alike/sound-alike drugs that contains a minimum of 10 drug combinations from a JCAHO-provided list.¹⁸

A list of JCAHO-identified name pairs that have been reported to PA-PSRS:

- Hydromorphone and morphine
- Insulin products
- Lipid-based doxorubicin (DOXIL) and conventional doxorubicin (ADRIAMYCIN)
- TAXOL (paclitaxel) and TAXOTERE (docetaxel)
- AMARYL (glimepiride) and REMINYL (galantamine)
- AVANDIA (rosiglitazone) and COUMADIN (warfarin)
- KLONOPIN (clonazepam) and clonidine (CATAPRES)
- LAMISIL (terbinafine) and LAMICTAL (lamotrigine)
- HESPAN (hetastarch) and heparin

The increasing potential for LASA medication errors was highlighted in the Joint Commission’s Sentinel Event Alert¹⁹ in the United States of America and was incorporated into the Joint Commission’s National Patient Safety Goals.²⁰ Recommendations focus on ensuring prescription legibility through improved handwriting and printing, or the use of pre-printed orders or electronic prescribing. Requiring medication orders and prescriptions that include both the brand name and nonproprietary name, dosage form, strength, directions, and the indication for use can be helpful in differentiating look-alike or sound-alike medication names. Requiring read-back clarification of oral orders and improvements in communications with patients are other important ways to reduce the potential for error.²¹

List of some similar brand named drugs with their manufacturing companies in Bangladesh

Generic names	Trade names	Manufacturing companies
Naproxen Ciprofloxacin Erythromycin	Naprosyn Maprocin Macrocin	Healthcare Orion Aventis
Amoxicillin Magaldrate	Mumox Marlox	Shamsul Alamin Incepta
Azithromycin Ranitidine	Ranzith Rantec	Rangs Medimet
Omeprazole Atenolol	Cosec Carsec	Drug International Medimet
Omeprazole Losertan	Losectil Losardil	Eskayef Drug International
Antacid Rifampicin+INH	Ribacid Rifazid	Apex Fisons
Omeprazole Metoprolol	Prolock Preloc	Ibnsina Opsonin
Lansoprazole Lisinopril	Lansopril Lisopril	Amico Navana
Atorvastatin Omeprazole	Xelpid Xeldrin	Healthcare ACI
Lactulose Salbutamol	Osmolax Asmolex	Square Aristopharma
Cephadrine Cetirizine hydrochloride	Procef Procet	Incepta Somatec

(BDNF 2006)

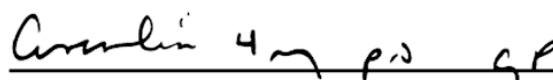
Strategies we can take to prevent medication errors related to LASA drugs

Many strategies that may help prevent medication errors due to confusion between drug names can be implemented. Identifying look-alike and sound-alike drug pairs used in our facility that are most often involved in errors can be a helpful first step. Then incorporating the following strategies to reduce the risk of errors with those medications may be considered:

• Writing orders and prescriptions

A 1979 study estimated that one-third of physicians' handwriting was illegible.²² Presumably little has changed over the years. To ensure that orders and prescriptions are legible, these may be printed instead

of handwriting, may be written in sitting position rather than standing and should be written in a quiet area for writing what safety experts describe as a "sterile cockpit". In the following prescription the drug name Avandia was incorrectly interpreted as Coumadin.



Coumadin 4mg po qd

• Problematic abbreviations

The FDA and ISMP in July 2006 embarked on a joint campaign to eliminate the use of potentially confusing abbreviations, symbols and dose designations in various forms of medical communications. These abbreviations, symbols and

dose designations have been proven to be a barrier to effective communication and have resulted in significant harm to patients. For example, instead of writing “QD” which is often misread as QID, it is recommended that health care professionals spell out the word “daily.”

- **Similar drug names**

Handwritten medication prescriptions can be difficult to interpret particularly if these involve medications that have similar names such as Isordil – Plendil, Celebrex – Cerebyx, Lamictal – Lamisil, and Zyprexa – Zyrtec – Zantac. Many, if not all, of these drugs with similar names carry different indications for use; therefore, including the indication with the medication can reduce confusion. Using bold print to clearly distinguish letters which differ on product and storage bins labels with look-alike drug names. This strategy is commonly referred to as “tall man lettering,” (e.g., chlor PROMAZINE and chlor PROPAMIDE).²³

- **Including the indication**

Including a drug's indication on the prescription is a simple safety measure. The indication, whether handwritten or communicated via check boxes, helps pharmacists and others avoid confusion between look-alike drug names. For example, if it is unclear whether a prescription says Celebrex or Cerebyx, a check mark in the “musculoskeletal” box would suggest that Celebrex is the desired drug.²²

Orders should be read back

Orders given verbally, rather than in written form, are inherently problematic because of different dialects and accents, misinterpretations of names and strengths, etc. The key to a safe process is using “read back.” The staff member should record the order directly onto the prescription pad/order sheet/computer as the prescriber is relaying it and then should read back the information to the prescriber. The prescriber should request the read back if it is not offered. During this process, spell the drug name and strength of the medication. For example, errors have been reported when the number 15 has been misinterpreted as 50. Always say “one five” for 15 or “five zero” for 50.²²

Use of electronic systems

Electronic prescribing systems can produce computer-generated prescriptions or can electronically transmit

the prescription directly to the pharmacy. These systems (e.g., iScribe, MEDeMORPHUS, Touch Script) not only eliminate illegible handwriting but also can automate screening for allergies, drug-drug interactions, duplication of therapy, etc.²²

Labeling and storage

We should follow the safe practices mentioned below for storage and usage of any medications.

Separation of problematic drugs

Drugs with look-alike names or similar packaging should not be stored in close proximity to each other in the medication storage area; medication storage area, rooms or sample closet should be examined frequently. Alphabetized drug storage can cause inadvertent mix-ups. In addition, segregate any “high-alert” medications that may be used in the practice (e.g., sedating agents or anesthetics).²²

Different vaccines, tuberculin purified protein derivatives (PPD) and other injectable products that may be confused should be kept separately and auxiliary labels may be used. ISMP has reported on several mix-ups with PPD being given in place of vaccines and vice versa.²²

External solutions, non-drug items, testing solutions, reagents and chemicals from internal products should be separated. External products such as benzoin and podophyllin should be labeled “for external use only.” Hemocult developers and glucose monitoring chemicals have been mistakenly used as eye drops.²²

Keeping the storage area well-organized

A staff member should be assigned to routinely check (at least quarterly) all medications (including samples), reagents and other products that carry an expiration date and items that have expired should be discarded. The storage area should be maintained at temperatures between 57 and 84 degrees, it should not be cramped, shelves should be at eye level with labels facing forward, and the area should be well-lit making it less likely the staff will misread labels.

Controlling access to medications

Security of medication storage area should be ensured. In addition, strict procedures for logging, storing and monitoring drug samples should be followed. All medications dispensed to patients should be properly

labeled with the name of the medication, strength, dose, frequency, purpose, lot number, expiration date and quantity of medication, along with the patient's name, date of dispensing and prescribing, and prescribing information. Patients should receive written and oral drug information for all sample medications.

Any vaccines dispensed or administered by the practice must be documented in a log that contains the name of the vaccine, lot number, expiration date, the patient name, dose and the date administered.

All multiple-dose vials of injectable medication (e.g. lidocaine, dexamethasone, prochlorperazine, vitamin B12) should be labeled with the date opened and the date on which the unused product will be discarded (ideally no later than 30 days after opening).²²

Drug devices

The use of proper drug devices, along with adequate training, can have a significant impact on patient safety.

All liquid oral medications prescribed or dispensed in the office should be administered using a proper measuring device. For parenteral administration of any drug right syringes should be used. The use of parenteral syringes to administer oral medications, a common but dangerous practice, has resulted in aspiration of the syringe tips when they are not removed. (Liquid medications can be drawn into parenteral syringes without removing the tip of the syringe)²²

Train staff to use the devices properly. All office personnel who dispense or prescribe any device (multiple daily injection devices, glucose monitoring devices, etc.) should be educated on its use. If staff members cannot educate the patient on how to use and maintain the device, they should instruct the patient to speak with the pharmacist.

Patient education

Patients should be given both oral and written instructions on the use of their medications, and they or their caregivers should be asked to repeat back the information to demonstrate complete understanding. While it may seem unnecessary, prescribers need to stress to patients the importance of getting the prescription filled and taking the medication as ordered. Health care professionals must provide adequate patient

education about the appropriate use of their medications as part of any error prevention program. Proper education empowers the patient to participate in their health care and safeguard against errors. Some examples of instructions to patients that can help prevent medication errors are²⁴

1. Know the names and indications of your medications
2. Read the medication information sheet provided by your pharmacists
3. Do not share your medications
4. Check the expiration date of your medications and dispose off expired drugs
5. Learn about proper drug storage
6. Keep medication out of the reach of children
7. Learn about potential drug interactions and warnings

Culture change

We should look for system changes that will help prevent future errors. Office personnel should share past experiences and follow the literature for errors that have been reported in articles or case presentations. This mix-up of internal and external information can be effective in leading us to system changes that will ensure safe patient care.²²

Role of pharmaceutical companies in preventing medication errors related to LASA drugs

Pharmaceutical companies have a great role to minimize confusion and reduce errors by appropriate naming, labeling and packaging of the drugs. They should work in collaboration with international agencies and industries to implement²⁵

- a. A universal drug naming convention
- b. Screening of existing drug names for potential confusion with a new drug name prior to approval of the latter
- c. Standardized suffixes (eg, sustained released medications)
- d. Strategies for focusing efforts on newly-introduced medications

Role of FDA in preventing medication errors related to LASA drugs

Steps taken by the US FDA to curtail the medication errors are listed below.²⁶

- Reviewing drug names to minimize confusion: the federation has launched “Name Differentiation Project” and issued letters to manufacturers of look-alike name pairs to voluntarily revise the visual appearance of their established names (e.g. acetahexamide and acetazolamide)
 - Working with drug companies to improve labeling/packaging. The NCC has suggested a restriction on caps and ferrules of injectables (except for convey warnings) and the use of innovative labeling
 - Use of bar codes: the use of machine-readable codes on all medication packages and containers is considered as a promising technology to reduce medication errors
 - Analyzing reported errors: the FDA is analyzing the errors for causality and trying to prevent these
 - Creating guidances for industry: the NCC has also developed recommendations for prescribing, dispensing, manufacturing and storage to prevent medication errors and patient harm
 - Educating the public: public education and awareness about medication errors is essential for its prevention.
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Recommendation

Preventive measures should be implemented to reduce the incidents of look-alike and sound-alike drugs related errors. Pre-marketing and post-marketing strategies should be reviewed properly to avoid confusion. Safety practices can be redesigned to help institutions and practitioners to minimize the errors. Finally, various risk reduction strategies may help to solve the problems associated with LASA drugs.

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