### APPENDIX 17: SOUND ALIKE/LOOK ALIKE MEDICATIONS

*National Patient Safety Goal- 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.*

Confusing drug names is a common system failure. Unfortunately, many drug names can look or sound-like other drug names, which may lead to potentially harmful medication errors. Increasingly, pharmaceutical manufacturers and regulatory authorities are taking measures to determine if there are unacceptable similarities between proposed names and products on the market. But factors such as poor handwriting or poorly communicated oral prescriptions can exacerbate the problem. In 2001, the Joint Commission on Accreditation of Healthcare Organizations published a *Sentinel Event Alert* on look-alike and sound-alike drug names.

This NPSG recognizes that healthcare practitioners and organizations need to be aware of the role drug names play in medication safety as well as system changes that can be made to prevent errors. An organization’s list of look-alike/sound-alike drugs must contain a minimum of 10 drug combinations from specific tables. Organizations should reassess previous choices in light of new information, including the revised list, and selection of replacement or additional pairs as indicated by the results of that assessment.

<table>
<thead>
<tr>
<th>Potential Problematic Drug Names</th>
<th>Names Brand Name(s) (UPPERCASE) &amp; Generic (lowercase)</th>
<th>Potential Errors and Consequences Suggested Safety</th>
<th>Strategies**</th>
</tr>
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<tbody>
<tr>
<td>1. Avandia and Coumadin</td>
<td>AVANDIA (rosiglitazone) COUMADIN (warfarin)</td>
<td>Poorly handwritten orders for Avandia (used for type II diabetes) have been misread a Coumadin (used to prevent blood clot formation), leading to potentially serious adverse events. Mix-ups originally occurred due to unfamiliarity with Avandia- staff read the order as the more familiar Coumadin. However, mix-ups between these two products continue to occur. Neither medication is safe without appropriate monitoring that is specific to the drug.</td>
<td>See general recommendations below.</td>
</tr>
<tr>
<td>2. Celebrex and Celexa and Cerebyx</td>
<td>CELEBREX (celecoxib) CELEXA (citalopram hydrobromide) CEREBYX (fosphenytoin)</td>
<td>Patients affected by a mix-up between these three drugs may experience a decline in mental status, lack of pain or seizure control, or other serious adverse events</td>
<td>See general recommendations below.</td>
</tr>
</tbody>
</table>

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**Appendix:** Sound alike/look alike medications  
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<td>3. clonidine and Klonopin</td>
<td>CATAPRES (clonidine) Klonopin (clonazepam)</td>
<td>The generic name for clonidine can easily be confused as the trade or generic name for clonazepam.</td>
<td>See general recommendations below.</td>
</tr>
<tr>
<td>4. Concentrated liquid morphine products vs. conventional liquid morphine concentrations</td>
<td>Concentrated: ROXANOL morphine oral liquid (conventional concentration)</td>
<td>Concentrated forms of oral morphine solution (20 mg/mL) have often been confused with the conventional concentration (listed as 10 mg/5 mL or 20 mg/5 mL), leading to serious errors. Accidental selection of the wrong concentration, and prescribing/labeling the product by volume, not milligrams, contributes to these errors, some of which have been fatal. For example, “10 mg” has been confused with “10 mL.” If concentrated product is used, this represents a 20-fold overdose.</td>
<td>Dispense concentrated oral morphine solutions only when ordered for a specific patient (not as unit stock). Segregate the concentrated solution from the other concentrations wherever it is stored. Purchase and dispense concentrated solutions in dropper bottles (available from at least two manufacturers) to help prevent dose measurement errors and differentiate the concentrated product from the conventional products. Verify that patients and caregivers understand how to measure the proper dose for self-administration at home. Dispense concentrated solutions in unit-doses if possible for residents in long-term care facilities.</td>
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<tr>
<td>5. hydromorphone injection and morphine injection</td>
<td>DILAUDID (hydromorphone) ASTRAMOPRH, DURAMORPH, INFUMORPH (morphine)</td>
<td>Some health care providers have mistakenly believed that hydromorphone is the generic equivalent of morphine. However, these products are not interchangeable. Fatal errors have occurred when hydromorphone was confused with morphine. Based on equianalgesic dose conversion, this may represent significant overdose, leading to serious adverse events. Storage of the two medications in close proximity to one another and in similar concentrations may contribute to such errors. Confusion has resulted in episodes of respiratory arrest due to potency differences between these drugs.</td>
<td>Stock specific strengths for each product that are dissimilar. For example, stock units with hydromorphone 1 mg unit dose cartridges, and morphine in 2 mg unit dose cartridges. Ensure that health care providers are aware that these two products are not interchangeable.</td>
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<td>6. Insulin products</td>
<td>HUMULIN (human insulin products)</td>
<td>Similar names, strengths and concentration ratios of some products (e.g., 70/30) have contributed to medication errors. Mix-ups have also occurred between the 100 unit/mL and 500 units/mL insulin concentrations.</td>
<td>For drug selection screens, emphasize the word “mixture” or “mix” along with the name of the insulin product mixtures. Consider auxiliary labels for newer products to differentiate them from the established products. Also apply bold labels on atypical insulin concentrations.</td>
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<tr>
<td></td>
<td>HUMALOG (insulin lispro)</td>
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<td></td>
<td>NOVOLIN (human insulin products)</td>
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<td></td>
<td>NOVOLOG (human insulin aspart)</td>
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<td></td>
<td>NOVOLIN 70/30 (70% isophane insulin [NPH] and 30% insulin injection [regular])</td>
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<tr>
<td></td>
<td>NOVOLOG MIX 70/30 (70% insulin aspart protamine suspension and 30% insulin aspart)</td>
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<tr>
<td>7. Lorazepam and alprazolam</td>
<td>ATIVAN (lorazepam)</td>
<td>These benzodiazepines have different potencies. A mix-up, especially in the elderly, would likely cause excessive sedation and increase fall risk.</td>
<td>See general recommendations below</td>
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<td></td>
<td>XANAX (alprazolam)</td>
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<tr>
<td>8. Metformin and metronidazole</td>
<td>FLAGYL (metronidazole)</td>
<td>Potentially serious mix-ups between metronidazole and metformin have been linked to look-alike packaging (both bulk bottles and unit-dose packages) and selection of the wrong product after entering MET as a mnemonic. Metformin is contraindicated in certain clinical situations where use might contribute to lactic acidosis. Administration of intravenous iodinated contrast media during radiological procedures has been associated with acute renal dysfunction.</td>
<td>To avoid order entry errors, program computer order entry software to display entire names of associated products whenever the MET stem is used as a mnemonic. Use tall man letters for unique letter characters in names. Pharmacy should consider stocking metronidazole in only 250 mg tablets (metformin tablets are not available as 250 mg tablets.) See also the general recommendations below.</td>
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<td></td>
<td>GLUCOPHAGE (metformin)</td>
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<tr>
<td>9. Topamax and Toprol XL</td>
<td>TOPAMAX (topiramate)</td>
<td>Error is likely attributable to the similarity in names with the “X” in XL of the beta-blocker, Toprol XL, looking like the ending of Topamax, an anticonvulsant. In addition, available dosage strengths (25, 50, 100, 200) are identical, adding to likelihood of mix-up. Imprint on the Topamax tablet is &quot;TOP&quot; on one side and 25 mg strength has &quot;25&quot; on the other, risking confusion with Toprol XL 25 mg. Patients needing Topamax may develop seizures and/or have adverse effects with Toprol XL. Patients needing a beta-blocker may have worsened disease symptoms without treatment. These products might be stored near one another if medications are stocked alphabetically by brand name or might appear near one another on computer screens.</td>
<td>Separate the storage of these products. Use both brand and generic names when prescribing these medications to differentiate the two drug names. See general recommendations below.</td>
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<td></td>
<td>TOPROL-XL (metoprolol)</td>
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<td>10. Zyprexa and Zyrtec</td>
<td>ZYPREXA (olanzapine) ZYRTEC (cetirizine)</td>
<td>Name similarity has resulted in frequent mixups between Zyrtec, an antihistamine, and Zyprexa, an antipsychotic. Patients who receive Zyprexa in error have reported dizziness, sometimes leading to a related injury from a fall. Patients on Zyprexa for a mental illness have relapsed when given Zyrtec in error.</td>
<td>See general recommendations below.</td>
</tr>
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</table>

Note: The name pairs listed were selected after a review of error report descriptions received by the Institute for Safe Medication Practices, the United States Pharmacopeia, the US Food and Drug Administration, and the Pennsylvania Patient Safety Reporting System (Pa-PSRS). Ratings based on judgments of severity and likelihood of confusion in the clinical setting were provided by outside experts using a modified Delphi process. The list was updated in August 2006 with deletions or additions recommended by medication safety staff at ISMP, USP and FDA and also based upon frequency of reports and potential outcome severity.

** These safety strategies are not inclusive of all possible strategies to reduce name-related errors. Also see General Recommendation for Preventing Drug Name Mix-ups below

**Other name pairs that were rated or suggested by experts:**
- Acetohexamide – acetazolamide
- Advicor and Advair
- Amicar - Omacor
- Avinza – Evista
- Cardura - Coumadin
- Darvocet - Percocet
- Diabeta – Zebeta
- Diflucan – Diprivan
- Effexor XR - Effexor
  - folic acid – leucovorin calcium (“folinic acid”)
  - heparin - Hespan
- Hydrocodone – oxycodone
  - idarubicin – doxorubicin - daunorubicin
  - lamivudine – lamotrigine
  - Leukeran – leucovorin calcium
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MS Contin – Oxycontin
Mucinex. - Mucomyst
opium tincture – paregoric (camphorated opium tincture)
Prilosec - Prozac
Retrovir - Ritonavir
tizanidine - tiagabine
tramadol – trazadone
Wellbutrin SR - Wellbutrin XL
Zantac – Xanax
Zantac – Zyrtec
Zestril - Zyprexa
Zestril - Zetia
Zocor – Zyrtec

General Recommendations for Preventing Drug Name Mix-ups

What prescribers can do: 1,2:
• Maintain awareness of look-alike and sound-alike drug names as published by various safety agencies.
• Clearly specify the dosage form, drug strength, and complete directions on prescriptions. These variables may help staff differentiate products.
• With name pairs known to be problematic, reduce the potential for confusion by writing prescriptions using both the brand and generic name.
• Include the purpose of medication on prescriptions. In most cases drugs that sound or look similar are used for different purposes.
• Alert patients to the potential for mix-ups, especially with known problematic drug names. Advise ambulatory care patients to insist on pharmacy counseling when picking up prescriptions, and to verify that the medication and directions match what the prescriber has told them.
• Encourage inpatients to question nurses about medications that are unfamiliar or look or sound different than expected.
• Give verbal or telephone orders only when truly necessary, and never for chemotherapy. Include the drug’s intended purpose to ensure clarity. Encourage staff to read back all orders, spell the product name, and state its indication.
• Whenever possible, determine the purpose of the medication before dispensing or drug administration. Most products with look or sound-alike names are used for different purposes.
• Accept verbal or telephone orders only when truly necessary, and never for chemotherapy. Encourage staff to read back all orders, spell the product name, and state its indication.
• Consider the possibility of name confusion when adding a new product to the formulary. Review information previously published by safety agencies.
• Computerize prescribing. Use preprinted orders or prescriptions as appropriate. If possible, print out current medications daily from the pharmacy computer system and have physicians review for accuracy.

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• When possible, list brand and generic names on medication administration records and automated dispensing cabinet computer screens. Such redundancy could help someone identify an error.
• Change the appearance and of look-alike product names on computer screens, pharmacy and nursing unit shelf labels and bins (including automated dispensing cabinets), pharmacy product labels, and medication administration records by highlighting, through bold face, color, and/or tall man letters, the parts of the names that are different (e.g., hydrOXYzine, hydrALAzine).
• Install and utilize computerized alerts to remind providers about potential problems during prescription processing.
• Configure computer selection screens and automated dispensing cabinet screens to prevent the two confused drugs from appearing consecutively.
• Affix “name alert” stickers to areas where look or sound-alike products are stored (available from pharmacy label manufacturers).
• Store products with look or sound-alike names in different locations in pharmacies, patient care units, and in other settings, including patient homes. When applicable, use a shelf sticker to help locate the product that has been moved.
• Continue to employ independent double checks in the dispensing process (one person interprets and enters the prescription into the computer and another reviews the printed label against the original prescription and the product prior to dispensing).
• Encourage reporting of errors and potentially hazardous conditions with look and sound-alike product names and use the information to establish priorities for error reduction. Also maintain awareness of problematic product names and error prevention recommendations provided by ISMP (www.ismp.org), FDA (www.fda.gov), and USP (www.usp.org).

References