

Grant Final Report

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**Assessment of Pediatric Look-Alike, Sound-Alike
(LASA) Substitution Errors**

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Abstract

Purpose: Use a Delphi panel approach to evaluate the potential severity of specific Look-Alike, Sound-Alike (LASA) drug name substitution errors and to estimate frequencies of potential LASA substitution errors.

Scope: Medication errors occur frequently in ambulatory prescribing, but less is known about the potential severity of LASA drug substitution errors and their frequency.

Methods: 37 practicing pediatricians evaluated published LASA pairs, estimating the harm that might occur should a patient not receive the intended drug in any LASA pair and the harm that might occur from erroneously receiving the delivered drug instead. We identified subjects 0-20 years old who received both drugs in a LASA pair within a 6-month period, representing a potential LASA substitution error.

Results: Participants were able to identify pairs where the substitutions represented high risk of harm for not receiving the intended drug, high risk of harm for receiving the delivered drug in error, and pairs where the potential harm was high from not receiving the intended drug and from erroneously receiving the delivered drug. For 34% of the LASA pairs, no patient received a substitution error. For 83% of pairs, the cumulative total of subjects who received both drugs amounted to < 1 potential LASA errors per day in South Carolina. By contrast, among the remaining pairs (17%), there were 97,163 subjects who received both drugs, amounting to at least 27 potential LASA substitution errors per day. This study lays the groundwork for future efforts to prioritize LASA pairs for drug error reduction.

Key Words: patient safety; prescription error; children

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Final Report

Purpose

The objectives of this study were to:

1. Utilize a Delphi panel approach to evaluate the potential severity of specific Look-Alike, Sound-Alike (LASA) drug name substitution errors.
2. Estimate frequencies of screening alerts (potential LASA substitution errors) in these drug pairs, and determine the positive predictive values (true positives) of the screening alerts.

In summary, this study advanced the state of the art of LASA error prevention in pediatric care by developing an expanded panel of LASA drug pairs commonly used in pediatric ambulatory care and considered at high risk to patients should a substitution occur. Such a targeted, pediatric list did not previously exist. In addition, the work completed as part of this grant lays the groundwork for development of a larger-scale implementation study in pharmacy settings, with the goal of reducing LASA errors.

Scope

The frequency of medication errors in the US health care system is unacceptable and is a priority for action.¹ Among prescriptions written for children in ambulatory settings, the prescriptions contain errors 9-15% of the time, with dosing errors being the most common.^{2,3} There is also a need to quantify the degree of potential harm represented by LASA errors among children and to estimate the frequency of LASA errors in ambulatory pediatric practice. Approaches can be eventually implemented to reduce the frequency of LASA errors by developing automated screening for LASA errors at the point of either prescribing or dispensing, avoiding the prohibitive task of reviewing each prescription for LASA potential. Developing an automated method for pharmacists to screen prescriptions for a possible LASA error would appear to provide a workable approach to addressing the problem of LASA errors.

This research plan identified LASA drug pairs where substitution errors may occur in pediatric ambulatory practice, helping us to refine a method for "flagging" individual prescriptions as potential LASA errors. Prior to this study, only 1 manuscript had estimated the frequency of LASA errors in outpatient pediatric care, despite a relative wealth of data on other pediatric outpatient medication errors.⁴ In that study, LASA errors were found to occur in < 1 prescription per 1000 dispensed prescriptions, suggesting that they might occur much less often than dosing errors. However, this relatively lower frequency of occurrence may make them more difficult to detect and suggests that finding approaches to automate the process of identifying these potential errors would be a preferred approach to reducing these errors. This project was

designed to inform the development of a future randomized trial to test the implementation of the pharmacy LASA screening approach to reduce LASA errors in children. This work also has future applicability to inpatient pediatric care, since applying the approach to inpatients would be possible once an inpatient-specific pediatric LASA drug pair list is developed.

Methods

We utilized 2000-2009 South Carolina Medicaid paid claims data (provided by the South Carolina Office of Research and Statistics) for subjects less than 21 years old.

The first step in our method was to identify and create a comprehensive list of published LASA pairs. Two published lists of LASA pairs were utilized, one published online by the Institute for Safe Medication Practices⁵, and the other published by MEDMARX.⁶ After merging those two lists and eliminating one copy of LASA pairs that occurred in both lists, there were 1784 unique LASA pairs. However, the substitutions can occur in either direction, meaning that there are actually 3568 pairs in the merged list (drug A for drug B, or drug B for drug A in any pair). Our goal was to evaluate the potential harm presented by these errors in outpatient practice. Therefore, we completed a process to limit the LASA pairs to those primarily used in the outpatient setting. We also removed pairs where both drugs were of the same class. For example, many of the “statins” and many of the cephalosporin antibiotics are part of LASA pairs with other statins or other cephalosporins, respectively. Finally, we removed pairs where one of the drugs was a long-acting version of the same base drug (e.g. Ritalin® and Ritalin LA®). After those exclusions, the merged list contained 917 pairs (or 1834 pairs with reciprocals).

Development of the survey instrument was conducted within the Division of General Pediatrics at the Medical University of South Carolina. We began with focus groups of pediatricians conceptualize the concepts and refine the terminology to be used in the survey. The pediatricians involved in these focus group discussions did not ultimately participate in the data collection. In those focus groups sessions we came to consensus on the terminology to be used, including the concept of “degree of potential harm,” the physical layout of the instrument, as well as the maximum number of LASA pairs that should be contained in any survey based on reasonable time for completion.

Once the terminology and approach for the survey were developed, we conducted cognitive pretesting via in-person interviews with five practicing pediatricians who had not participated in the previous focus groups. We further refined the questions and the presentation of the survey based on the input from these key informant interviews. Through this process we developed the consensus that each LASA substitution is actually a combination of two errors. The first error is that the patient does not receive the intended drug, and the second error is that the patient receives the delivered drug instead. Each of those errors may have different degrees of potential harm. Therefore, each LASA pair was broken into two questions, asking the participant to rate the degree of potential harm represented by not receiving the intended drug and the degree of potential harm of receiving the delivered drug instead.

For collecting the data in the Delphi portion of the study, we utilized the REDCapTM online survey tool, and each question was answered on a continuous Likert-type scale whereby the participant moved a cursor to a point from 0-100 that represented his or her scoring for each error (Figure 1).

Figure 1. Screen Capture of REDCap™ Survey Instrument

| | | | |
|---|----------------------|---------------|-------------------|
| Intended Drug: BUSPIRONE (Antianxiety) | | | |
| Delivered Drug: RISPERIDONE (Atypical antipsychotic) | | | |
| Please estimate the potential harm of NOT receiving the intended drug. | No Harm/ Little Harm | Moderate Harm | Severe Harm/Death |
| * must provide value | | | 62 |
| Please estimate the potential harm of RECEIVING the delivered drug. | No Harm/ Little Harm | Moderate Harm | Severe Harm/Death |
| * must provide value | | | 57 |
| Intended Drug: ZYVOX (Linezolid; antibiotic) | | | |
| Delivered Drug: ZYFLO (Zileuton; leukotriene modifier) | | | |
| Please estimate the potential harm of NOT receiving the intended drug. | No Harm/ Little Harm | Moderate Harm | Severe Harm/Death |
| * must provide value | | | 84 |
| Please estimate the potential harm of RECEIVING the delivered drug. | No Harm/ Little Harm | Moderate Harm | Severe Harm/Death |
| * must provide value | | | 21 |
| Intended Drug: FAMOTIDINE (H2 blocker) | | | |
| Delivered Drug: LISINOPRIL (ACE inhibitor) | | | |
| Please estimate the potential harm of NOT receiving the intended drug. | No Harm/ Little Harm | Moderate Harm | Severe Harm/Death |
| * must provide value | | | 57 |
| Please estimate the potential harm of RECEIVING the delivered drug. | No Harm/ Little Harm | Moderate Harm | Severe Harm/Death |
| * must provide value | | | 65 |

In cognitive pretesting, we identified 5 anchor terms for the continuous scale: “no harm,” “little harm,” “moderate harm,” “severe harm,” and “death,” consistent with the terminology used in the MEDMARX drug error literature.⁶

As shown in Figure 1, each pair was presented as the intended drug and the delivered drug, along with a brief description of the drug class in case a participant was unfamiliar with any drug (many of the drugs in the lists of LASA pairs are rarely used in children, such as drugs to treat Parkinson’s disease, and may not be intuitively known to pediatricians). When the drug in a LASA pair was a brand-name, the generic name was also provided. Participants were instructed to make several assumptions when completing the survey. First, they were to assess the degree of potential harm that might be experienced by the “average patient” who had no acute or chronic medical conditions other than the one for which the patient was to receive the intended drug. They were to assume that drug allergies were not a concern. They were to assume that the “milligram” or other dose number in the dose of the prescription did not change, only the drug name dispensed. They were asked to assume only a one-month error, meaning that the

substitution error would not recur at the subsequent dispensing of the drug. The instructions reminded participants to not estimate the chance that harm would occur. Instead, they were to estimate the degree of potential harm that might occur should the patient experience adverse effects from the drug substitution.

Delphi participants were drawn from several different sources. All were general pediatricians. The authors recruited community practitioners from the South Carolina Pediatric Practice Research Network and the membership of the Academic Pediatric Association, primarily comprised of academic general pediatricians. 59% of the participants were female, and they were drawn from nine different states. One subject who completed Round 1 did not participate in subsequent rounds, resulting in 38 total participants over the course of the surveys.

In the first 2 rounds of the Delphi survey, the pediatricians evaluated two separate groups of 50 pairs. Therefore, every pair was scored by at least by two participants, and every participant scored 100 pairs total between rounds 1 and 2. Feedback was not provided to the participants between the rounds. After rounds 1 and 2, we completed cluster analysis of the scores to identify drugs to eliminate for the next round of the survey. Scores were not merged from the two initial evaluations, such that a pair that was scored highly by either of the two participants was retained for round three. Cluster analysis revealed that a score of 82/100 was a natural break point for LASA pairs to be retained, so pairs were retained if either rater (round 1 or round 2) rated either part of a LASA error (not getting intended drug or getting delivered drug in error) was greater than 82. Round 3 therefore contained 608 potential LASA error pairs. For round 3, the 608 pairs were sent out to 36 participants in differing combinations such that each pair was scored by three participants in round 3. The round 3 scores were then averaged to get the final scatterplot shown in Figure 2.

For the assessment of LASA error frequency, we conducted a preliminary assessment of whether any patients may have experienced a potential LASA error among the 608 pairs in round 3. Consistent with our previous approach, we considered any patient who received both drugs of a LASA pair within any six month period to represent a potential LASA error.⁴ This approach is a very inclusive estimate of the frequency of potential LASA error, producing estimates of the maximum possible error frequency. We utilized files available from the Food and Drug Administration to match National Drug Code (NDC) code numbers to generic names, all formulations (concentrations, etc.) of the drugs, including brand or generic names. LASA pairs may contain a generic or a brand name of a drug, depending on the other drug name with which it is confused. In order to account for any within-pharmacy substitutions of generic drug for a brand name listed on the prescription or a branded generic substitution for any generic drug name on the prescription, we combined the generic form of the drug and all brand versions of generic forms for analyses.

Results

The combined, non-duplicated list of LASA pairs from the Institute for Safe Medication Practices and MEDMARX contained 1784 pairs. After review to remove non-ambulatory and other excluded drugs as described in the method section, we retained 917 pairs for the Delphi surveys. When the 917 pairs were made in reciprocal versions, there were 1,834 potential error pairs. Rounds 1 and 2 identified 608 potential LASA error pairs to retain for round 3. In round 3,

few drug substitutions were graded as low potential harm, demonstrating that earlier rounds had identified the substitutions of greatest concern (Figure 2). Round 3 final rankings demonstrated that participants were able to identify pairs where the substitutions represented high risk of potential harm for receiving the delivered drug in error (e.g. did not receive Zyrtec / received Zyprexa), high risk of harm for not receiving the intended drug (e.g. did not receive Kayexalate / received kapectate), and pairs where the potential harm was high from either error (e.g. did not receive albuterol / received labetalol).

The average of the round 3 scoring for each pair is represented by a single mark on Figure 2. The mark's location on the X y-axis is determined by the answer to the question assessing the degree of potential harm that might occur from not receiving the intended drug, while the position on the Y axis is determined by the answer to the question assessing the degree of potential harm that might occur from receiving the delivered drug in error.

Figure 2: Scatterplot of Round 3 scores of the Potential Harm Represented by each of 608 LASA pair substitution errors

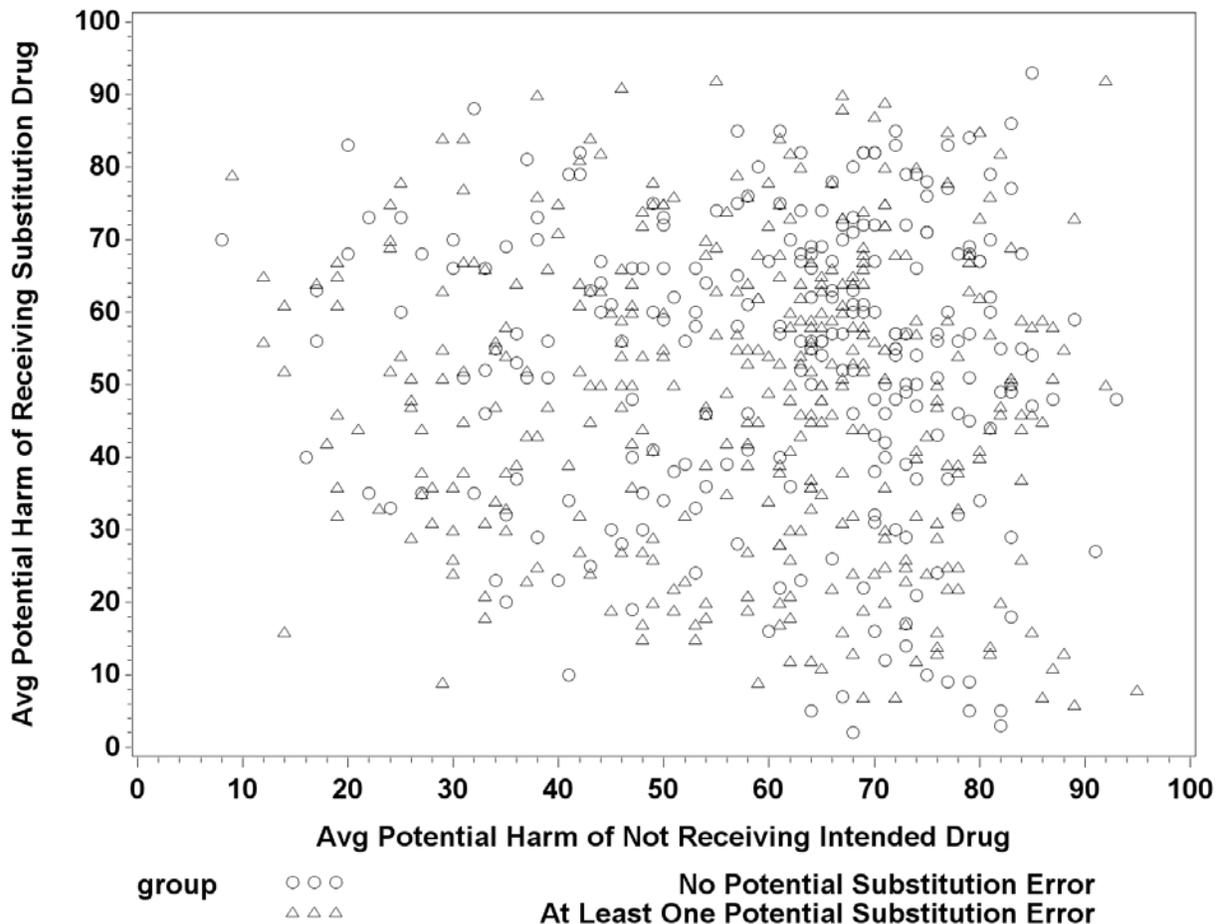


Table 1 represents the top decile (n=60 pairs) of the rank-ordered list of pairs based on the scores for the potential harm that might result from receiving the delivered drug in error. Table 2 contains the top decile of the rank-ordered list of pairs based on the scores for the potential harm

that might result from not receiving the intended drug. The full rank order lists based on the potential harm of receiving the delivered drug in error and based on not receiving the intended drug can be provided by the investigators upon request. LASA pairs that were in the top decile of both measures of harm (receiving the delivered drug in error or \ not receiving the intended drug) are represented in bold print in Tables 1, 2, and the appendix. Finally, LASA errors that did not occur appear with in italics in both Tables 1, 2, and the appendix.

Table 1: List of Top Decile of LASA Errors, Ranked by Potential Harm of Receiving the Delivered Drug in Error

| Delivered Drug* | Intended Drug† | Average Harm Score‡ | Number of Subjects§ | Delivered Drug* | Intended Drug† | Average Harm Score‡ | Number of Subjects§ |
|-------------------------|-------------------------|----------------------------|----------------------------|------------------------|--------------------------|----------------------------|----------------------------|
| <i>K Dur</i> | Kayexalate | 93 | 0 | <i>Florinef</i> | <i>Fioricet</i> | 82 | 0 |
| Cyclosporine | Cyclophosphamide | 92 | 5 | Methadone | Methylphenidate | 82 | 9 |
| Lanoxin | Levothyroxine | 92 | 15 | <i>Morphine</i> | <i>Magnesium Sulfate</i> | 82 | 0 |
| Coumadin | Cardura | 91 | 5 | Nifedipine | Nortriptyline | 82 | 1 |
| Jantoven | Januvia | 90 | 1 | Lanoxin | Lotensin | 81 | 18 |
| Warfarin | Levaquin | 90 | 52 | <i>Nolvadex</i> | <i>Flomax</i> | 81 | 0 |
| Coumadin | Mephyton | 89 | 5 | Amlodipine | Amiodarone | 80 | 3 |
| Coumadin | Avandia | 88 | 2 | Lopressor | Lyrica | 80 | 5 |
| <i>Jantoven</i> | <i>Janumet</i> | 88 | 0 | Pacerone | Pancrease | 80 | 3 |
| Azathioprine | Azithromycin | 87 | 63 | <i>Proamatine</i> | <i>Bromocriptine</i> | 80 | 0 |
| Temodar | Tambocor | 86 | 0 | <i>Tacrolimus</i> | <i>Tamsulosin</i> | 80 | 0 |
| Cyclophosphamide | Cyclosporine | 85 | 5 | Lanoxin | Lasix | 79 | 447 |
| <i>Disopyramide</i> | <i>Desipramine</i> | 85 | 0 | Leukeran | Leucovorin | 79 | 0 |
| Eskalith | Effexor | 85 | 99 | Lortab | Loratadine | 79 | 8259 |
| <i>Femara</i> | <i>Famvir</i> | 85 | 0 | <i>Loxitane</i> | <i>Soriatane</i> | 79 | 0 |
| Labetalol | Albuterol | 85 | 40 | <i>Methotrexate</i> | <i>Minoxidil</i> | 79 | 0 |
| <i>Lithium</i> | <i>Lanthanum</i> | 85 | 0 | <i>Procambid</i> | <i>Probenecid</i> | 79 | 0 |
| Amiodarone | Amlodipine | 84 | 3 | <i>Reserpine</i> | <i>Ropinirole</i> | 79 | 0 |
| Glucotrol | Detrol | 84 | 1 | <i>Avandamet</i> | <i>Anzemet</i> | 78 | 0 |
| Nitro Bid | Macrobid | 84 | 5 | Chlorpromazine | Clomipramine | 78 | 2 |
| <i>Tambocor</i> | <i>Tamoxifen</i> | 84 | 0 | <i>Clozaril</i> | <i>Pletal</i> | 78 | 0 |
| Xanax | Atarax | 84 | 430 | Lanoxin | Levsin | 78 | 24 |
| <i>Hydromorphone</i> | <i>Haloperidol</i> | 83 | 0 | Methadone | Mephyton | 78 | 1 |
| <i>Levorphanol</i> | <i>Levothyroxine</i> | 83 | 0 | Methimazole | Metaxalone | 78 | 6 |
| <i>Xeloda</i> | <i>Xenical</i> | 83 | 0 | Nitroglycerin | Nitrofurantoin | 78 | 5 |
| <i>Arimidex</i> | <i>Aromasin</i> | 82 | 0 | Janumet | Jantoven | 77 | 0 |
| Clomipramine | Clozapine | 82 | 1 | <i>Slow Bid</i> | <i>Slow K</i> | 77 | 0 |
| <i>Clomipramine</i> | <i>Clomid</i> | 82 | 0 | Vicodin | Vytorin | 77 | 20 |
| <i>Cyclosporine</i> | <i>Cycloserine</i> | 82 | 0 | Lanoxin | Lomotil | 76 | 7 |
| <i>Diazoxide</i> | <i>Diamox</i> | 82 | 0 | Lanoxin | Levaquin | 76 | 24 |
| K Dur | Kayexalate | 93 | 0 | Levothyroxine | Lamotrigine | 76 | 58 |

* Delivered Drug: The drug patient received in error

† Intended Drug: The drug patient was supposed to receive

‡ Average Harm Score: Represents the average of Round 3 evaluations of the estimated harm that might occur from this substitution, where patient received the delivered drug instead of the intended drug

§ Number of Subjects: Represents the number of subjects in the 2000-2009 data who received both drugs in the respective LASA pair within a six month period, regardless of whether this was intended or in error

BOLD typeface indicates that the LASA pair is in the highest decile for potential harm for receiving the delivered drug in error and the highest decile for potential harm of not receiving the intended drug

Italic typeface indicates that no subjects appeared to experience a substitution error of this LASA pair

Table 2: List of Top Decile of LASA Errors, Ranked by Potential Harm of NOT Receiving the Intended Drug

| Intended Drug* | Delivered Drug† | Average Number Harm of Score‡ | of Subjects§ | Intended Drug* | Delivered Drug† | Average Number Harm of Score‡ | of Subjects§ |
|-------------------------|------------------------|--------------------------------------|---------------------|-----------------------|---------------------------|--------------------------------------|---------------------|
| Warfarin | Levaquin | 95 | 52 | Digoxin | Levothyroxine | 83 | 8 |
| <i>Ethmozine</i> | <i>Ethambutol</i> | 93 | 0 | <i>Femara</i> | <i>Famvir</i> | 83 | 0 |
| Cyclophosphamide | Cyclosporine | 92 | 5 | Furosemide | Fosinopril | 83 | 5 |
| Prograf | Prozac | 92 | 8 | <i>Gabitril</i> | <i>Glucotrol</i> | 83 | 0 |
| <i>Dantrium</i> | <i>Danocrine</i> | 91 | 0 | Imdur | Inderal | 83 | 2 |
| <i>Cordarone</i> | <i>Cardene</i> | 89 | 0 | Jantoven | Janumet | 83 | 0 |
| Coumadin | Avandia | 89 | 2 | <i>Kaletra</i> | <i>Levitra</i> | 83 | 0 |
| Folex | Foltx | 89 | 1 | Tambocor | Temodar | 83 | 0 |
| Norvir | Norvasc | 88 | 1 | <i>Tikosyn</i> | <i>Ticlopidine</i> | 83 | 0 |
| Oxcarbazepine | Oxaprozin | 88 | 11 | Clozapine | Clomipramine | 82 | 1 |
| Coumadin | Cardura | 87 | 5 | Lanoxin | Levothyroxine | 82 | 15 |
| <i>Leukeran</i> | <i>Leucovorin</i> | 87 | 0 | <i>Matulane</i> | <i>Materna</i> | 82 | 0 |
| Phenytoin Sodium | Nystatin | 87 | 72 | <i>Nevirapine</i> | <i>Nefazodone</i> | 82 | 0 |
| Topamax | Tofranil | 87 | 59 | <i>Penicillin</i> | <i>Penicillamine</i> | 82 | 0 |
| Azathioprine | Azithromycin | 86 | 63 | Phenytoin Sodium | Feldene | 82 | 3 |
| Coumadin | Phytonadione | 86 | 5 | <i>Thalomid</i> | <i>Thiamine</i> | 82 | 0 |
| Neoral | Inderal | 86 | 9 | Vancomycin | Valacyclovir | 82 | 1 |
| Carbamazepine | Carisoprodol | 85 | 17 | <i>Amiodarone</i> | <i>Amantadine</i> | 81 | 0 |
| Kayexalate | K Dur | 85 | 0 | <i>Hydroxyurea</i> | <i>Hydroxychloroquine</i> | 81 | 0 |
| Levetiracetam | Levocarnitine | 85 | 123 | <i>Kaletra</i> | <i>Keppra</i> | 81 | 0 |
| Plavix | Paxil | 85 | 6 | Lamotrigine | Levothyroxine | 81 | 58 |
| <i>Tambocor</i> | <i>Tamoxifen</i> | 85 | 0 | Leucovorin | Leukeran | 81 | 0 |
| <i>Zyvox</i> | <i>Zyflo</i> | 85 | 0 | <i>Leucovorin</i> | <i>Leukeran</i> | 81 | 0 |
| Epivir | Elavil | 84 | 1 | Limbitrol | Librium | 81 | 2 |
| Isordil | Inderal | 84 | 2 | Lithium | Chlordiazepoxide | 81 | 38 |
| Keppra | Keflex | 84 | 419 | Topamax | Protonix | 81 | 48 |
| Lamotrigine | Lamivudine | 84 | 1 | Zyvox | Zithromax | 81 | 93 |
| <i>Procainamide</i> | <i>Probenecid</i> | 84 | 0 | Carbatrol | Labetalol | 80 | 4 |
| <i>Quinine</i> | <i>Quinidine</i> | 84 | 0 | Cyclosporine | Cyclophosphamide | 80 | 5 |
| Trileptal | Tegretol | 84 | 259 | Dilantin | Dilaudid | 80 | 3 |
| Warfarin | Levaquin | 95 | 52 | Digoxin | Levothyroxine | 83 | 8 |

* Intended Drug: The drug patient was supposed to receive

† Delivered Drug: The drug patient received in error

‡ Average Harm Score: Represents the average of Round 3 evaluations of the estimated harm that might occur from this substitution, where patient did not receive the intended drug

§ Number of Subjects: Represents the number of subjects in the 2000-2009 data who received both drugs in the respective LASA pair within a six month period, regardless of whether this was intended or in error

BOLD typeface indicates that the LASA pair is in the highest decile for potential harm for receiving the delivered drug in error and the highest decile for potential harm of not receiving the intended drug

Italic typeface indicates that no subjects appeared to experience a substitution error of this LASA pair

In the calculations of error frequency, we evaluated prescriptions from a total of 800,124 subjects. **Table 3** shows the demographics of the sample population, noting that children are the entire population, and female and minority patients (AHRQ priority populations) are well-represented.

Table 3: Demographic description of patients, 2000-2009 SC Medicaid Prescription Data, Children 0-19 years.

| | Black | Hispanic* | White | Other[†] |
|---------------|--------------|------------------|--------------|--------------------------|
| Male | 184996 | 19387 | 164620 | 19806 |
| Female | 201324 | 18773 | 173970 | 17176 |
| TOTAL | 386328 | 38171 | 338593 | 37032 |

* in SC Medicaid data, “Hispanic” is treated as a racial category, not as an ethnicity of any given race

† - “Other” is undefined in SC Medicaid data

For 207 (34%) of the LASA pairs, no patient received both drugs within a 6-month period. For 505 pairs (83%, includes the 34% with no errors), the cumulative total of subjects who received both drugs in a pair was 3,610, amounting to < 1 potential LASA error per day in South Carolina over the 10-year data span. By contrast, among the remaining 103/608 pairs (17%), there were 97,163 subjects who received both drugs, a total that would amount to at least 27 potential LASA errors per day in the state. There were 20 pairs (3.3%) where >1,000 subjects received both drugs within a 6-month period.

Discussion

This project was successful in rank ordering Look-Alike, Sound-Alike pediatric drug substitution errors based on pediatrician estimates of the potential harm that might occur to a patient who receives one of these substitutions. These data, combined with estimates of the frequency of pediatric LASA drug substitutions, will allow the development of a prioritized list of high potential harm LASA substitution errors for future prevention efforts. We believe this to be the only study to ascribe value to specific pediatric LASA drug substitution errors.

Given the number of drugs in published LASA pairs, it would not be reasonable at either the provider point of producing a prescription or the pharmacy point of dispensing a prescription for a provider or pharmacist to review every prescription that might be involved in a LASA error. Therefore, electronic approaches to identify prescriptions as potential substitution errors at either the point of creating them or at the point of dispensing them likely represent the best way to operationalize this aspect of patient safety. As described in previous papers, dispensing patterns can be utilized to identify patients who routinely receive one drug in a LASA pair who then are either prescribed (through electronic health records) or present to a pharmacy with a prescription to receive the second drug in a LASA pair.^{4,7} Such events could be identified via an electronic alert in an electronic health record or pharmacy’s system, prompting review by either the provider or pharmacist. The most significant challenge in implementing an alert system revolves around ensuring that the screening burden to the provider or pharmacist is not so excessive that the alerts are ignored or the alert options disabled.

In deciding which LASA errors to prioritize, it is possible that frequently-occurring but low-potential harm substitutions should not be placed into an alert system as they would provide too many alerts (e.g. substitutions between two cephalosporin antibiotics). In fact, the low-potential harm substitutions we evaluated were generally eliminated after rounds 1 and 2 of our Delphi process and are not represented in the appendices. In addition, at least for children, we have identified high potential harm errors that do not appear to occur in children based on the ten years of claims data evaluated for the second part of the study. For 34% of the LASA pairs evaluated, we did not identify any subjects who appeared to receive both drugs within 6 months

of each other. For another 59%, so few children received both drugs in a 6-month period that it would result in < 1 potential LASA errors per day across that state that would require pharmacy review. Therefore, we believe that since these errors occur rarely in children, pharmacy alert systems could be set for 83% of the drugs evaluated such that any patient who receives both drugs in these pairs within a six-month period should trigger a screening alert. We learned from this study, however, that for the remaining 17% of LASA pairs evaluated, further investigation into the best trade-off between the “value” of LASA substitution errors and frequency of these errors will be needed in order to implement screening for those LASA pair errors.

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List of Publications and Products

1. The full list of the 608 LASA pairs evaluated for Round 3 and the corresponding rankings are available from the investigator and have been provided to AHRQ.
2. A manuscript entitled, “Evaluating the Potential Severity of Look-Alike, Sound-Alike Drug Substitution Errors in Children” has been submitted to *The Journal of Patient Safety*.
3. An additional manuscript evaluating the frequency of the errors and the positive predictive value of the potential errors is in progress.

Appendix

Full tables of LASA pairs studied, with ranks by potential harm

Table 1: 608 LASA pairs, Ranked by Potential Harm of Receiving Delivered Drug in Error as Assessed by Delphi Panel Participants

| Delivered Drug* | Intended Drug† | Average Harm Score‡ | Number of Subjects§ |
|-------------------------|--------------------------|---------------------|---------------------|
| <i>K Dur</i> | <i>Kayexalate</i> | 93 | 0 |
| Cyclosporine | Cyclophosphamide | 92 | 5 |
| Lanoxin | Levothyroxine | 92 | 15 |
| Coumadin | Cardura | 91 | 5 |
| Jantoven | Januvia | 90 | 1 |
| Warfarin | Levaquin | 90 | 52 |
| Coumadin | Mephyton | 89 | 5 |
| Coumadin | Avandia | 88 | 2 |
| <i>Jantoven</i> | <i>Janumet</i> | 88 | 0 |
| Azathioprine | Azithromycin | 87 | 63 |
| <i>Temodar</i> | <i>Tambocor</i> | 86 | 0 |
| Cyclophosphamide | Cyclosporine | 85 | 5 |
| <i>Disopyramide</i> | <i>Desipramine</i> | 85 | 0 |
| Eskalith | Effexor | 85 | 99 |
| <i>Femara</i> | <i>Famvir</i> | 85 | 0 |
| Labetalol | Albuterol | 85 | 40 |
| <i>Lithium</i> | <i>Lanthanum</i> | 85 | 0 |
| Amiodarone | Amlodipine | 84 | 3 |
| Glucotrol | Detrol | 84 | 1 |
| Nitro Bid | Macrobid | 84 | 5 |
| <i>Tambocor</i> | <i>Tamoxifen</i> | 84 | 0 |
| Xanax | Atarax | 84 | 430 |
| <i>Hydromorphone</i> | <i>Haloperidol</i> | 83 | 0 |
| <i>Levorphanol</i> | <i>Levothyroxine</i> | 83 | 0 |
| <i>Xeloda</i> | <i>Xenical</i> | 83 | 0 |
| <i>Arimidex</i> | <i>Aromasin</i> | 82 | 0 |
| Clomipramine | Clozapine | 82 | 1 |
| <i>Clomipramine</i> | <i>Clomid</i> | 82 | 0 |
| <i>Cyclosporine</i> | <i>Cycloserine</i> | 82 | 0 |
| <i>Diazoxide</i> | <i>Diamox</i> | 82 | 0 |
| <i>Florinef</i> | <i>Fioricet</i> | 82 | 0 |
| Methadone | Methylphenidate | 82 | 9 |
| <i>Morphine</i> | <i>Magnesium Sulfate</i> | 82 | 0 |
| Nifedipine | Nortriptyline | 82 | 1 |
| Lanoxin | Lotensin | 81 | 18 |
| <i>Nolvadex</i> | <i>Flomax</i> | 81 | 0 |
| Amlodipine | Amiodarone | 80 | 3 |
| Lopressor | Lyrica | 80 | 5 |

| | | | |
|----------------------|---------------------------|----|------|
| Pacerone | Pancrease | 80 | 3 |
| <i>Proamatine</i> | <i>Bromocriptine</i> | 80 | 0 |
| <i>Tacrolimus</i> | <i>Tamsulosin</i> | 80 | 0 |
| Lanoxin | Lasix | 79 | 447 |
| Leukeran | Leucovorin | 79 | 0 |
| Lortab | Loratadine | 79 | 8259 |
| <i>Loxitane</i> | <i>Soriatane</i> | 79 | 0 |
| <i>Methotrexate</i> | <i>Minoxidil</i> | 79 | 0 |
| <i>Procanbid</i> | <i>Probenecid</i> | 79 | 0 |
| <i>Reserpine</i> | <i>Ropinirole</i> | 79 | 0 |
| <i>Avandamet</i> | <i>Anzemet</i> | 78 | 0 |
| Chlorpromazine | Clomipramine | 78 | 2 |
| <i>Clozaril</i> | <i>Pletal</i> | 78 | 0 |
| Lanoxin | Levsin | 78 | 24 |
| Methadone | Mephyton | 78 | 1 |
| Methimazole | Metaxalone | 78 | 6 |
| Nitroglycerin | Nitrofurantoin | 78 | 5 |
| Janumet | Jantoven | 77 | 0 |
| <i>Slow Bid</i> | <i>Slow K</i> | 77 | 0 |
| Vicodin | Vytorin | 77 | 20 |
| Lanoxin | Lomotil | 76 | 7 |
| Lanoxin | Levaquin | 76 | 24 |
| Levothyroxine | Lamotrigine | 76 | 58 |
| Methadone | Methylin | 76 | 9 |
| <i>Nadolol</i> | <i>Haloperidol</i> | 76 | 0 |
| <i>Plavix</i> | <i>Mavik</i> | 76 | 0 |
| <i>Aminophylline</i> | <i>Ampicillin</i> | 75 | 0 |
| Benicar | Benadryl | 75 | 3 |
| <i>Coreg</i> | <i>Cortone</i> | 75 | 0 |
| Coumadin | Phytonadione | 75 | 5 |
| Demerol | Demadex | 75 | 1 |
| <i>Methotrexate</i> | <i>Metolazone</i> | 75 | 0 |
| Norvasc | Zyrtec | 75 | 233 |
| Purinethol | Propylthiouracil | 75 | 1 |
| Tapazole | Trazodone | 75 | 6 |
| Tegretol | Toprol | 75 | 11 |
| Valium | Vicodin | 75 | 3330 |
| Benzotropine | Benzonatate | 74 | 19 |
| Elavil | Clinoril | 74 | 14 |
| Januvia | Jantoven | 74 | 1 |
| <i>Risperidone</i> | <i>Risedronate</i> | 74 | 0 |
| <i>Robaxin</i> | <i>Ribavirin</i> | 74 | 0 |
| <i>Tenormin</i> | <i>Tretinoin</i> | 74 | 0 |
| Avandia | Coumadin | 73 | 2 |
| <i>Calan</i> | <i>Colace</i> | 73 | 0 |
| Clonazepam | Clonidine | 73 | 569 |
| Dilaudid | Dilantin | 73 | 3 |
| <i>Hydroxyurea</i> | <i>Hydroxychloroquine</i> | 73 | 0 |
| <i>Kadian</i> | <i>Kapidex</i> | 73 | 0 |
| <i>Kayexalate</i> | <i>Carafate</i> | 73 | 0 |

| | | | |
|----------------------------|-------------------------|----|-----|
| Micronase | Microzide | 73 | 12 |
| <i>Pyridostigmine</i> | <i>Pyridoxine</i> | 73 | 0 |
| Tofranil | Toradol | 73 | 14 |
| Benztropine | Benazepril | 72 | 2 |
| <i>Isoptin</i> | <i>Isordil</i> | 72 | 0 |
| <i>Isradipine</i> | <i>Indapamide</i> | 72 | 0 |
| <i>Metyrosine</i> | <i>Metyrapone</i> | 72 | 0 |
| <i>Nexavar</i> | <i>Nexium</i> | 72 | 0 |
| Risperdal | Lisinopril | 72 | 31 |
| Topamax | Tofranil | 72 | 59 |
| Versed | Vistaril | 72 | 42 |
| <i>Zebeta</i> | <i>Zyprexa</i> | 72 | 0 |
| <i>Exelon</i> | <i>Effexor</i> | 71 | 0 |
| <i>Kaletra</i> | <i>Keppra</i> | 71 | 0 |
| <i>Plendil</i> | <i>Plavix</i> | 71 | 0 |
| Renagel | Renal Caps | 71 | 1 |
| <i>Fosinopril</i> | <i>Fosamax</i> | 70 | 0 |
| <i>Hydroxychloroquine</i> | <i>Hydroxyurea</i> | 70 | 0 |
| <i>Matulane</i> | <i>Materna</i> | 70 | 0 |
| Methadone | Metadate | 70 | 9 |
| <i>Methimazole</i> | <i>Misoprostol</i> | 70 | 0 |
| <i>Nitroglycerin</i> | <i>Neo-Syneprine</i> | 70 | 0 |
| Reserpine | Risperdal | 70 | 1 |
| <i>Zebeta</i> | <i>Zetia</i> | 70 | 0 |
| <i>Aggrenox</i> | <i>Agenerase</i> | 69 | 0 |
| <i>Anagrelide</i> | <i>Anastrozole</i> | 69 | 0 |
| <i>Diamox</i> | <i>Demadex</i> | 69 | 0 |
| Inderal | Imdur | 69 | 2 |
| Lotrel | Lortab | 69 | 86 |
| Polycitra | Bicitra | 69 | 1 |
| <i>Potassium Phosphate</i> | <i>Sodium Phosphate</i> | 69 | 0 |
| Zestril | Isordil | 69 | 1 |
| <i>Aceon</i> | <i>Trilafon</i> | 68 | 0 |
| <i>Atropine</i> | <i>Apresoline</i> | 68 | 0 |
| Chloral Hydrate | Chlorothiazide | 68 | 3 |
| Clomipramine | Chlorpromazine | 68 | 2 |
| <i>Kerlone</i> | <i>Ketorolac</i> | 68 | 0 |
| Lamotrigine | Lamivudine | 68 | 1 |
| <i>Methylergonovine</i> | <i>Methysergide</i> | 68 | 0 |
| <i>Metolazone</i> | <i>Methotrexate</i> | 68 | 0 |
| Norvasc | Nexium | 68 | 69 |
| Potassium Chloride | Sodium Chloride | 68 | 57 |
| Prazosin | Prednisone | 68 | 4 |
| Propylthiouracil | Purinethol | 68 | 1 |
| <i>Quinidine</i> | <i>Quinine</i> | 68 | 0 |
| <i>Selegiline</i> | <i>Salagen</i> | 68 | 0 |
| Tramadol | Trazodone | 68 | 376 |
| <i>Amitriptyline</i> | <i>Aminophylline</i> | 67 | 0 |
| <i>Artane</i> | <i>Navane</i> | 67 | 0 |
| Avapro | Avelox | 67 | 1 |

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|----------------------|----------------------|----|------|
| <i>Azilect</i> | <i>Aricept</i> | 67 | 0 |
| <i>Clozapine</i> | <i>Clofazimine</i> | 67 | 0 |
| Lanoxin | Levoxyl | 67 | 15 |
| <i>Nicotine</i> | <i>Nitroglycerin</i> | 67 | 0 |
| <i>Prazosin</i> | <i>Prosom</i> | 67 | 0 |
| Regonol | Reglan | 67 | 4 |
| <i>Ropinirole</i> | <i>Reserpine</i> | 67 | 0 |
| Sotalol | Sudafed | 67 | 1 |
| Toprol | Topiramate | 67 | 38 |
| Ziac | Zyrtec | 67 | 16 |
| <i>Casodex</i> | <i>Kapidex</i> | 66 | 0 |
| Clonidine | Cetirizine | 66 | 4222 |
| <i>Felodipine</i> | <i>Feldene</i> | 66 | 0 |
| <i>Haldol</i> | <i>Halcion</i> | 66 | 0 |
| Imuran | Tenormin | 66 | 6 |
| <i>Isosorbide</i> | <i>Isotretinoin</i> | 66 | 0 |
| <i>Isosorbide</i> | <i>Isoniazid</i> | 66 | 0 |
| Morphine | Meperidine | 66 | 22 |
| <i>Nitroglycerin</i> | <i>Nicotine</i> | 66 | 0 |
| <i>Norvasc</i> | <i>Navane</i> | 66 | 0 |
| Risperdal | Requip | 66 | 16 |
| <i>Zelapar</i> | <i>Zyprexa</i> | 66 | 0 |
| Zyloprim | Zovirax | 66 | 6 |
| Dipyridamole | Diphenhydramine | 65 | 1 |
| Elavil | Enalapril | 65 | 24 |
| Hydrochlorothiazide | Hydralazine | 65 | 16 |
| <i>Imuran</i> | <i>Imdur</i> | 65 | 0 |
| Labetalol | Lipitor | 65 | 6 |
| Lorazepam | Loratadine | 65 | 523 |
| Actiq | Actigall | 64 | 2 |
| Avinza | Evista | 64 | 1 |
| Diazepam | Doxepin | 64 | 22 |
| Jantoven | Orvaten | 64 | 1 |
| Lithium | Chlordiazepoxide | 64 | 38 |
| Lortab | Lipitor | 64 | 189 |
| Olanzapine | Clonazepam | 64 | 254 |
| <i>Pindolol</i> | <i>Parlodol</i> | 64 | 0 |
| <i>Prandin</i> | <i>Oxandrin</i> | 64 | 0 |
| Prinivil | Pepcid | 64 | 50 |
| Procardia | Prevacid | 64 | 34 |
| Seroquel | Provigil | 64 | 27 |
| Topamax | Sporanox | 64 | 6 |
| <i>Amiodarone</i> | <i>Amantadine</i> | 63 | 0 |
| Amlodipine | Amiloride | 63 | 8 |
| Hydrochlorothiazide | Hydrocortisone | 63 | 80 |
| <i>Nevirapine</i> | <i>Nefazodone</i> | 63 | 0 |
| Perphenazine | Promethazine | 63 | 7 |
| Procardia | Provera | 63 | 43 |
| Risperdal | Reserpine | 63 | 1 |
| <i>Rosiglitazone</i> | <i>Risperidone</i> | 63 | 0 |

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|-------------------|---------------------|----|------|
| Tegretol | Topamax | 63 | 301 |
| Trental | Tegretol | 63 | 2 |
| Zelapar | Zemplar | 63 | 0 |
| Advair | Atrovent | 62 | 869 |
| Combipres | Combivent | 62 | 3198 |
| Isotretinoin | Isosorbide | 62 | 0 |
| Labetalol | Carbatrol | 62 | 4 |
| Leukeran | Leucovorin | 62 | 0 |
| Methadone | Ketorolac | 62 | 3 |
| Mifepristone | Misoprostol | 62 | 0 |
| Selegiline | Felodipine | 62 | 0 |
| Ativan | Alprazolam | 61 | 255 |
| Brethine | Thiethylperazine | 61 | 0 |
| Clozapine | Clonazepam | 61 | 4 |
| Loniten | Lipitor | 61 | 3 |
| Minipress | Minoxidil | 61 | 0 |
| Phenoxybenzamine | Phenazopyridine | 61 | 0 |
| Risperidone | Reserpine | 61 | 0 |
| Zerit | Zyrtec | 61 | 23 |
| Zyprexa | Zyrtec | 61 | 547 |
| Atenolol | Albuterol | 60 | 196 |
| Avandia | Evista | 60 | 0 |
| Chlorpromazine | Chlorpropamide | 60 | 0 |
| Clonazepam | Lorazepam | 60 | 486 |
| Demadex | Demerol | 60 | 1 |
| Dexmethylphenidat | Methadone | 60 | 0 |
| Indapamide | Isosorbide | 60 | 0 |
| Keppra | Kaletra | 60 | 0 |
| Methimazole | Memantine | 60 | 0 |
| Methylprednisolon | Methylegonovine | 60 | 37 |
| Methylprednisolon | Medroxyprogesterone | 60 | 191 |
| Minoxidil | Minipress | 60 | 0 |
| Minoxidil | Midodrine | 60 | 0 |
| Monopril | Monurol | 60 | 0 |
| Propranolol | Pantoprazole | 60 | 21 |
| Albuterol | Atenolol | 59 | 196 |
| Altace | Artane | 59 | 0 |
| Cardene | Cordarone | 59 | 0 |
| Folex | Foltx | 59 | 1 |
| Fosamax | Zithromax | 59 | 61 |
| Lamivudine | Lamotrigine | 59 | 1 |
| Methocarbamol | Metronidazole | 59 | 135 |
| Phytonadione | Coumadin | 59 | 5 |
| Salmeterol | Solu Medrol | 59 | 145 |
| Trazodone | Trandate | 59 | 3 |
| Cardura | Coumadin | 58 | 5 |
| Hydrocortisone | Hydralazine | 58 | 3 |
| Inspira | Spiriva | 58 | 0 |
| Macrobid | Nitro Bid | 58 | 5 |
| Neoral | Inderal | 58 | 9 |

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|-------------------------|----------------------------|----|-----|
| Neurontin | Nitrofurantoin | 58 | 125 |
| <i>Normodyne</i> | <i>Norpramin</i> | 58 | 0 |
| Oxycontin | Oxandrin | 58 | 9 |
| Paxil | Plavix | 58 | 6 |
| <i>Tambocor</i> | <i>Temodar</i> | 58 | 0 |
| Triamterene | Trimethoprim | 58 | 1 |
| Accutane | Accupril | 57 | 2 |
| Altace | Actos | 57 | 9 |
| Amaryl | Accupril | 57 | 4 |
| <i>Aminophylline</i> | <i>Amitriptyline</i> | 57 | 0 |
| <i>Carbidopa</i> | <i>Carvedilol</i> | 57 | 0 |
| Chlordiazepoxide | Lithium | 57 | 38 |
| <i>Clofazimine</i> | <i>Clozapine</i> | 57 | 0 |
| <i>Lotensin</i> | <i>Lovastatin</i> | 57 | 0 |
| <i>Mestinon</i> | <i>Mexitil</i> | 57 | 0 |
| Metaxalone | Methimazole | 57 | 6 |
| <i>Quinine</i> | <i>Quinidine</i> | 57 | 0 |
| <i>Reminyl</i> | <i>Amaryl</i> | 57 | 0 |
| Reprexain | Zyprexa | 57 | 16 |
| <i>Rifaximin</i> | <i>Rifampin</i> | 57 | 0 |
| Tenex | Xanax | 57 | 45 |
| <i>Tolterodine</i> | <i>Ticlopidine</i> | 57 | 0 |
| <i>Anafranil</i> | <i>Enalapril</i> | 56 | 0 |
| <i>Chlorpropamide</i> | <i>Chlorpromazine</i> | 56 | 0 |
| Diabeta | Diazepam | 56 | 4 |
| <i>Diamox</i> | <i>Diabinese</i> | 56 | 0 |
| <i>Enalapril</i> | <i>Anafranil</i> | 56 | 0 |
| <i>Felbatol</i> | <i>Labetalol</i> | 56 | 0 |
| Hydroxychloroquine | Hydrochlorothiazide | 56 | 13 |
| <i>Lexiva</i> | <i>Levitra</i> | 56 | 0 |
| <i>Mavik</i> | <i>Plavix</i> | 56 | 0 |
| Perphenazine | Periactin | 56 | 1 |
| <i>Ropinirole</i> | <i>Repaglinide</i> | 56 | 0 |
| Sitagliptin | Sumatriptan | 56 | 1 |
| <i>Thiethylperazine</i> | <i>Brethine</i> | 56 | 0 |
| <i>Torse mide</i> | <i>Topiramate</i> | 56 | 0 |
| Zyprexa | Zaroxolyn | 56 | 1 |
| <i>Aromasin</i> | <i>Arimidex</i> | 55 | 0 |
| Atenolol | Allopurinol | 55 | 6 |
| Chlorpromazine | Chlordiazepoxide | 55 | 11 |
| <i>Chlorthalidone</i> | <i>Chlorpromazine</i> | 55 | 0 |
| <i>Femhrt</i> | <i>Femara</i> | 55 | 0 |
| Hydrocortisone | Hydrochlorothiazide | 55 | 53 |
| <i>Hydroxyurea</i> | <i>Hydrochlorothiazide</i> | 55 | 0 |
| Lasix | Lanoxin | 55 | 447 |
| Lioresal | Lotensin | 55 | 3 |
| <i>Nefazodone</i> | <i>Nevirapine</i> | 55 | 0 |
| Norvasc | Norvir | 55 | 1 |
| Phenytoin Sodium | Phytonadione | 55 | 5 |
| Phenytoin Sodium | Nystatin | 55 | 72 |

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|-----------------------|-----------------------|----|-----|
| <i>Probenecid</i> | <i>Procainamide</i> | 55 | 0 |
| Seroquel | Ferro Sequels | 55 | 70 |
| Visicol | Asacol | 55 | 6 |
| Zarontin | Neurontin | 55 | 11 |
| Abilify | Ambien | 54 | 165 |
| Acetaminophen | Acetazolamide | 54 | 68 |
| <i>Acetohexamide</i> | <i>Acetazolamide</i> | 54 | 0 |
| Alprazolam | Diazepam | 54 | 201 |
| Methadone | Dexamethasone | 54 | 8 |
| Orvaten | Jantoven | 54 | 1 |
| <i>Rifadin</i> | <i>Rifabutin</i> | 54 | 0 |
| Robaxin | Relafen | 54 | 48 |
| Spironolactone | Sertraline | 54 | 10 |
| <i>Tamoxifen</i> | <i>Tambocor</i> | 54 | 0 |
| Temazepam | Triazolam | 54 | 1 |
| <i>Vibramycin</i> | <i>Vancomycin</i> | 54 | 0 |
| <i>Chlorpromazine</i> | <i>Chlorthalidone</i> | 53 | 0 |
| Diazepam | Diltiazem | 53 | 6 |
| Loxitane | Lamictal | 53 | 1 |
| Nitrofurantoin | Neurontin | 53 | 125 |
| Nortriptyline | Nifedipine | 53 | 1 |
| Olsalazine | Olanzapine | 53 | 1 |
| Risperdal | Bisoprolol | 53 | 5 |
| Aripiprazole | Omeprazole | 52 | 61 |
| Enalapril | Elavil | 52 | 24 |
| Furosemide | Loperamide | 52 | 9 |
| Imipramine | Imitrex | 52 | 50 |
| Parafon | Profen | 52 | 346 |
| Prednisone | Prilosec | 52 | 719 |
| <i>Raloxifene</i> | <i>Rabeprazole</i> | 52 | 0 |
| Sinequan | Seroquel | 52 | 58 |
| <i>Tamsulosin</i> | <i>Tacrolimus</i> | 52 | 0 |
| <i>Tenofovir</i> | <i>Trandolapril</i> | 52 | 0 |
| <i>Vancomycin</i> | <i>Vibramycin</i> | 52 | 0 |
| Acyclovir | Retrovir | 51 | 2 |
| <i>Apresoline</i> | <i>Atropine</i> | 51 | 0 |
| <i>Gabapentin</i> | <i>Gemfibrozil</i> | 51 | 0 |
| Guanfacine | Guaifenesin | 51 | 122 |
| Levothyroxine | Digoxin | 51 | 8 |
| Metoclopramide | Metolazone | 51 | 8 |
| <i>Moban</i> | <i>Mobic</i> | 51 | 0 |
| <i>Neo-Syneprine</i> | <i>Nitroglycerin</i> | 51 | 0 |
| Requip | Reglan | 51 | 5 |
| <i>Soriatane</i> | <i>Sonata</i> | 51 | 0 |
| Tofranil | Topamax | 51 | 59 |
| Baclofen | Bethanechol | 50 | 9 |
| <i>Cycloserine</i> | <i>Cyclosporine</i> | 50 | 0 |
| Doxazosin | Dexamethasone | 50 | 1 |
| Fosinopril | Furosemide | 50 | 5 |
| <i>Glucotrol</i> | <i>Gabitril</i> | 50 | 0 |

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|----------------------|----------------------|----|------|
| Isordil | Zestril | 50 | 1 |
| Levothyroxine | Levaquin | 50 | 113 |
| Losartan | Lisinopril | 50 | 26 |
| Metaxalone | Mesalamine | 50 | 6 |
| <i>Nateglinide</i> | <i>Nadolol</i> | 50 | 0 |
| Noroxin | Neurontin | 50 | 1 |
| Olanzapine | Sertraline | 50 | 616 |
| <i>Primaquine</i> | <i>Primidone</i> | 50 | 0 |
| Prozac | Prograf | 50 | 8 |
| Rocaltrol | Risperdal | 50 | 9 |
| Triazolam | Trazodone | 50 | 4 |
| <i>Zyprexa</i> | <i>Zebeta</i> | 50 | 0 |
| Desyrel | Seroquel | 49 | 935 |
| Lorazepam | Oxazepam | 49 | 5 |
| <i>Pamelor</i> | <i>Tambocor</i> | 49 | 0 |
| <i>Penicillamine</i> | <i>Penicillin</i> | 49 | 0 |
| <i>Ticlopidine</i> | <i>Tikosyn</i> | 49 | 0 |
| Avandia | Amaryl | 48 | 4 |
| Clonazepam | Olanzapine | 48 | 254 |
| Dilantin | Nystatin | 48 | 101 |
| <i>Ethambutol</i> | <i>Ethmozine</i> | 48 | 0 |
| Fosinopril | Fluoxetine | 48 | 2 |
| <i>Leucovorin</i> | <i>Leukeran</i> | 48 | 0 |
| <i>Loniten</i> | <i>Proamatine</i> | 48 | 0 |
| <i>Pyrazinamide</i> | <i>Pyrimethamine</i> | 48 | 0 |
| <i>Soriatane</i> | <i>Loxitane</i> | 48 | 0 |
| Xanax | Xopenex | 48 | 81 |
| Buspirone | Bupropion | 47 | 179 |
| Carbamazepine | Carisoprodol | 47 | 17 |
| Feldene | Phenytoin Sodium | 47 | 3 |
| Hydrocortisone | Hydrocodone | 47 | 1490 |
| Lasix | Luvox | 47 | 1 |
| Levoxyl | Lanoxin | 47 | 15 |
| Metoprolol | Mirtazapine | 47 | 29 |
| <i>Norvasc</i> | <i>Nolvadex</i> | 47 | 0 |
| <i>Zyflo</i> | <i>Zyvox</i> | 47 | 0 |
| <i>Aygestin</i> | <i>Aromasin</i> | 46 | 0 |
| Bentyl | Benadryl | 46 | 114 |
| Carisoprodol | Carbamazepine | 46 | 17 |
| Elavil | Epivir | 46 | 1 |
| Epivir | Elavil | 46 | 1 |
| <i>Felodipine</i> | <i>Selegiline</i> | 46 | 0 |
| Hydrogesic | Hydroxyzine | 46 | 85 |
| Levothyroxine | Lanoxin | 46 | 15 |
| Megestrol | Mesalamine | 46 | 1 |
| <i>Navane</i> | <i>Norvasc</i> | 46 | 0 |
| Premarin | Remeron | 46 | 17 |
| <i>Revatio</i> | <i>Revia</i> | 46 | 0 |
| <i>Sinemet</i> | <i>Janumet</i> | 46 | 0 |
| <i>Stadol</i> | <i>Haldol</i> | 46 | 0 |

| | | | |
|------------------------|-----------------------|----|------|
| <i>Terbutaline</i> | <i>Terazosin</i> | 46 | 0 |
| Allopurinol | Atenolol | 45 | 6 |
| Inderal | Neoral | 45 | 9 |
| Limbitrol | Librium | 45 | 2 |
| Lisinopril | Verapamil | 45 | 14 |
| Loperamide | Lorazepam | 45 | 21 |
| Metformin | Methocarbamol | 45 | 17 |
| Tramadol | Toprol | 45 | 87 |
| <i>Xenical</i> | <i>Xeloda</i> | 45 | 0 |
| <i>Amantadine</i> | <i>Amiodarone</i> | 44 | 0 |
| Atrovent | Flovent | 44 | 1214 |
| Librium | Limbitrol | 44 | 2 |
| Prednisone | Prevacid | 44 | 2146 |
| Stadol | Toradol | 44 | 1 |
| Tegretol | Trileptal | 44 | 259 |
| Temazepam | Diazepam | 44 | 62 |
| Zyrtec | Zolof | 44 | 2710 |
| <i>Acetazolamide</i> | <i>Acetylcysteine</i> | 43 | 0 |
| Deltasone | Trazodone | 43 | 12 |
| <i>Flomax</i> | <i>Nolvadex</i> | 43 | 0 |
| Lotensin | Lanoxin | 43 | 18 |
| Pentasa | Pancrease | 43 | 5 |
| Zonisamide | Ziprasidone | 43 | 10 |
| Atacand | Altace | 42 | 1 |
| <i>Isoniazid</i> | <i>Isosorbide</i> | 42 | 0 |
| Lisinopril | Restoril | 42 | 13 |
| Norflex | Niferex | 42 | 3 |
| Provera | Procardia | 42 | 43 |
| Altacor | Advair | 41 | 2 |
| <i>Hytrin</i> | <i>Hydrea</i> | 41 | 0 |
| Lamisil | Lamictal | 41 | 26 |
| <i>Memantine</i> | <i>Mesalamine</i> | 41 | 0 |
| Topamax | Tapazole | 41 | 3 |
| Zonegran | Zomig | 41 | 3 |
| <i>Desipramine</i> | <i>Disopyramide</i> | 40 | 0 |
| <i>Galantamine</i> | <i>Glutamine</i> | 40 | 0 |
| Pancrease | Pacerone | 40 | 3 |
| Prevacid | Procardia | 40 | 34 |
| <i>Sinequan</i> | <i>Zonegran</i> | 40 | 0 |
| <i>Trihexyphenidyl</i> | <i>Ramipril</i> | 40 | 0 |
| Buspirone | Risperidone | 39 | 23 |
| <i>Clomiphene</i> | <i>Clomipramine</i> | 39 | 0 |
| Diuril | Diamox | 39 | 2 |
| Indomethacin | Indapamide | 39 | 1 |
| Levoxyl | Levaquin | 39 | 113 |
| Lovastatin | Lisinopril | 39 | 8 |
| <i>Midamor</i> | <i>Midodrine</i> | 39 | 0 |
| Neurontin | Neoral | 39 | 8 |
| <i>Penicillin</i> | <i>Penicillamine</i> | 39 | 0 |
| Potassium Chloride | Metronidazole | 39 | 148 |

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|---------------------|---------------------|----|------|
| Amoxil | Diamox | 38 | 107 |
| Hydroxyzine | Hydrogesic | 38 | 85 |
| <i>Imdur</i> | <i>Imuran</i> | 38 | 0 |
| <i>Ketorolac</i> | <i>Kerlone</i> | 38 | 0 |
| Methadone | Meperidine | 38 | 4 |
| Trazodone | Topamax | 38 | 330 |
| Vancomycin | Valacyclovir | 38 | 1 |
| Zyprexa | Ziprasidone | 38 | 353 |
| Inderal | Isordil | 37 | 2 |
| <i>Levitra</i> | <i>Lexiva</i> | 37 | 0 |
| Medroxyprogesterone | Methylprednisolone | 37 | 191 |
| <i>Mirapex</i> | <i>Mifeprex</i> | 37 | 0 |
| <i>Triamterene</i> | <i>Trientine</i> | 37 | 0 |
| Lariam | Levaquin | 36 | 1 |
| Lomotil | Lortab | 36 | 1326 |
| <i>Metyrapone</i> | <i>Metyrosine</i> | 36 | 0 |
| Promethazine | Phenazopyridine | 36 | 3344 |
| <i>Rifabutin</i> | <i>Rifadin</i> | 36 | 0 |
| Trazodone | Aldactone | 36 | 4 |
| Xanax | Tenex | 36 | 45 |
| Zerit | Zestril | 36 | 2 |
| Zoloft | Serevent | 36 | 97 |
| Advil | Advair | 35 | 3295 |
| Ativan | Ambien | 35 | 342 |
| <i>Corgard</i> | <i>Cozaar</i> | 35 | 0 |
| <i>Fluvoxamine</i> | <i>Flavoxate</i> | 35 | 0 |
| <i>Maxzide</i> | <i>Marinol</i> | 35 | 0 |
| Rifadin | Rifamate | 35 | 1 |
| <i>Thorazine</i> | <i>Thiamine</i> | 35 | 0 |
| <i>Baclofen</i> | <i>Blocadren</i> | 34 | 0 |
| Cardura | Avandia | 34 | 1 |
| <i>Dapsone</i> | <i>Danazol</i> | 34 | 0 |
| <i>Nexium</i> | <i>Nexavar</i> | 34 | 0 |
| Zaroxolyn | Azithromycin | 34 | 19 |
| Cyclobenzaprine | Cetirizine | 33 | 2379 |
| <i>Maxzide</i> | <i>Microzide</i> | 33 | 0 |
| Nitrofurantoin | Nitroglycerin | 33 | 5 |
| Prelone | Prozac | 33 | 347 |
| <i>Prosom</i> | <i>Proscar</i> | 33 | 0 |
| Ultram | Voltaren | 33 | 747 |
| <i>Danazol</i> | <i>Dantrium</i> | 32 | 0 |
| Dicyclomine | Diphenhydramine | 32 | 114 |
| Diovan | Zyban | 32 | 6 |
| <i>Isotretinoin</i> | <i>Tretinoin</i> | 32 | 0 |
| Lamotrigine | Levetiracetam | 32 | 388 |
| <i>Metolazone</i> | <i>Methimazole</i> | 32 | 0 |
| Nasacort | Azmacort | 32 | 87 |
| Prednisone | Propranolol | 32 | 303 |
| Clinoril | Clindamycin | 31 | 25 |
| <i>Levodopa</i> | <i>Levofloxacin</i> | 31 | 0 |

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|--------------------------|----------------------------|----|------|
| Lipitor | Lortab | 31 | 189 |
| Provigil | Proventil | 31 | 68 |
| Urised | Urispas | 31 | 4 |
| Asacol | Visicol | 30 | 6 |
| <i>Evista</i> | <i>Avandia</i> | 30 | 0 |
| Fluoxetine | Fosinopril | 30 | 2 |
| <i>Janumet</i> | <i>Sinemet</i> | 30 | 0 |
| Lipitor | Lopid | 30 | 4 |
| Pravachol | Prinivil | 30 | 28 |
| <i>Revia</i> | <i>Revatio</i> | 30 | 0 |
| Simvastatin | Valsartan | 30 | 10 |
| <i>Fioricet</i> | <i>Florinef</i> | 29 | 0 |
| <i>Levitra</i> | <i>Kaletra</i> | 29 | 0 |
| <i>Minizide</i> | <i>Maxzide</i> | 29 | 0 |
| Oxybutynin | Oxycontin | 29 | 149 |
| Sertraline | Serentil | 29 | 3 |
| Tylenol | Tegretol | 29 | 510 |
| Vytorin | Vicodin | 29 | 20 |
| Actonel | Atenolol | 28 | 1 |
| Macrobid | Micro K | 28 | 76 |
| <i>Sodium Phosphate</i> | <i>Potassium Phosphate</i> | 28 | 0 |
| <i>Urocit</i> | <i>Vitamin K</i> | 28 | 0 |
| Cyclobenzaprine | Chlorpromazine | 27 | 5 |
| <i>Danocrine</i> | <i>Dantrium</i> | 27 | 0 |
| Flumadine | Amantadine | 27 | 9 |
| Lorazepam | Clonazepam | 27 | 486 |
| Metoclopramide | Metronidazole | 27 | 1381 |
| Feldene | Paroxetine | 26 | 22 |
| Hmg Coa Reductase | Nystatin | 26 | 62 |
| Keflex | Keppra | 26 | 419 |
| Levsin | Lanoxin | 26 | 24 |
| <i>Meloxicam</i> | <i>Molindone</i> | 26 | 0 |
| Sodium Chloride | Potassium Chloride | 26 | 57 |
| Azmacort | Atrovent | 25 | 40 |
| Gatifloxacin | Gabapentin | 25 | 14 |
| Mephyton | Coumadin | 25 | 5 |
| Mirtazapine | Temazepam | 25 | 78 |
| Pediazole | Pediapred | 25 | 2101 |
| <i>Trimethobenzamide</i> | <i>Trimethoprim</i> | 25 | 0 |
| Coreg | Cozaar | 24 | 7 |
| Fluconazole | Metronidazole | 24 | 7133 |
| <i>Kapidex</i> | <i>Casodex</i> | 24 | 0 |
| Levaquin | Lanoxin | 24 | 24 |
| <i>Mobic</i> | <i>Moban</i> | 24 | 0 |
| Nefazodone | Nelfinavir | 24 | 1 |
| Valtrex | Divalproex | 24 | 84 |
| Flovent | Flomax | 23 | 7 |
| Folic Acid | Folinic Acid | 23 | 8 |
| <i>Januvia</i> | <i>Janumet</i> | 23 | 0 |
| <i>Levofloxacin</i> | <i>Levodopa</i> | 23 | 0 |

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|--------------------|----------------------------|----|------|
| Luvox | Lasix | 23 | 1 |
| <i>Rabeprazole</i> | <i>Donepezil</i> | 23 | 0 |
| Avelox | Avandia | 22 | 6 |
| Combivent | Combivir | 22 | 47 |
| <i>Gemfibrozil</i> | <i>Gabapentin</i> | 22 | 0 |
| Levetiracetam | Lamotrigine | 22 | 388 |
| Levofloxacin | Levothyroxine | 22 | 113 |
| <i>Sinequan</i> | <i>Saquinavir</i> | 22 | 0 |
| Phenergan | Phenobarbital | 21 | 310 |
| <i>Sorbitol</i> | <i>Sorbitrate</i> | 21 | 0 |
| Zegerid | Zestril | 21 | 15 |
| Zithromax | Zolof | 21 | 4784 |
| Doxycycline | Doxepin | 20 | 65 |
| Lovastatin | Losartan | 20 | 1 |
| Sertraline | Serevent | 20 | 97 |
| Tolterodine | Tacrolimus | 20 | 2 |
| Valacyclovir | Vancomycin | 20 | 1 |
| <i>Viravan</i> | <i>Vivarin</i> | 20 | 0 |
| Cephalexin | Ciprofloxacin | 19 | 3266 |
| Cipro | Ceftin | 19 | 275 |
| <i>Maxzide</i> | <i>Hydrochlorothiazide</i> | 19 | 0 |
| Pravachol | Paxil | 19 | 11 |
| Semprex | Septra | 19 | 44 |
| Cleocin | Cipro | 18 | 402 |
| <i>Famvir</i> | <i>Femara</i> | 18 | 0 |
| Flovent | Atrovent | 18 | 1214 |
| Mephyton | Methadone | 18 | 1 |
| Adderall | Inderal | 17 | 207 |
| Levaquin | Lariam | 17 | 1 |
| <i>Probenecid</i> | <i>Procanbid</i> | 17 | 0 |
| Zinacef | Zithromax | 17 | 9099 |
| Zocor | Zolof | 17 | 24 |
| Atrovent | Advair | 16 | 869 |
| Calcium | Calcitriol | 16 | 66 |
| <i>Carafate</i> | <i>Kayexalate</i> | 16 | 0 |
| Levocarnitine | Levetiracetam | 16 | 123 |
| Omeprazole | Aripiprazole | 16 | 61 |
| <i>Penicillin</i> | <i>Penicillamine</i> | 16 | 0 |
| Nephrocaps | Neutra Phos | 15 | 6 |
| Zebeta | Ziac | 15 | 128 |
| Motrin | Neurontin | 14 | 511 |
| Protonix | Topamax | 14 | 48 |
| <i>Ritalin</i> | <i>Ritodrine</i> | 14 | 0 |
| Oxaprozin | Oxcarbazepine | 13 | 11 |
| Prilosec | Prednisone | 13 | 719 |
| Simethicone | Spirolactone | 13 | 5 |
| Zithromax | Zyvox | 13 | 93 |
| Geocillin | Lamictal | 12 | 1 |
| <i>Mucinex</i> | <i>Mucomyst</i> | 12 | 0 |
| Zithromax | Zinacef | 12 | 9099 |

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|-------------------|-----------------------|----|----|
| Zyrtec | Zerit | 12 | 23 |
| Nystatin | Nitroglycerin | 11 | 6 |
| Nystatin | Phenytoin Sodium | 11 | 72 |
| <i>Omacor</i> | <i>Amicar</i> | 10 | 0 |
| <i>Pyridium</i> | <i>Pyridoxine</i> | 10 | 0 |
| Avandia | Avandamet | 9 | 18 |
| <i>Natru Vent</i> | <i>Atrovent</i> | 9 | 0 |
| Phytonadione | Phenytoin Sodium | 9 | 5 |
| <i>Tigan</i> | <i>Ticlid</i> | 9 | 0 |
| Levaquin | Warfarin | 8 | 52 |
| Azithromycin | Azathioprine | 7 | 63 |
| Nexium | Norvasc | 7 | 69 |
| <i>Pyridoxine</i> | <i>Pyridostigmine</i> | 7 | 0 |
| Singulair | Sinequan | 7 | 94 |
| Foltx | Folex | 6 | 1 |
| <i>Kaopectate</i> | <i>Kayexalate</i> | 5 | 0 |
| <i>Materna</i> | <i>Matulane</i> | 5 | 0 |
| <i>Pyridoxine</i> | <i>Primidone</i> | 5 | 0 |
| <i>Thiamine</i> | <i>Thalomid</i> | 3 | 0 |
| <i>Lactinex</i> | <i>Lamictal</i> | 2 | 0 |

* Delivered Drug: The drug patient received in error

† Intended Drug: The drug patient was supposed to receive

‡ Average Harm Score: Represents the average of Round 3 evaluations of the estimated harm that might occur from this substitution, where patient received the delivered drug instead of the intended drug

§ Number of Subjects: Represents the number of subjects in the 2000-2009 data who received both drugs in the respective LASA pair within a six month period, regardless of whether this was intended or in error

BOLD typeface indicates that the LASA pair is in the highest decile for potential harm for receiving the delivered drug in error and the highest decile for potential harm of not receiving the intended drug

Italic typeface indicates that no subjects appeared to experience a substitution error of this LASA pair

Table 2: 608 LASA pairs, Ranked by Potential Harm of NOT Receiving the Intended Drug as Assessed by Delphi Panel Participants

| Intended Drug* | Delivered Drug† | Average Harm Score‡ | Number of Subjects§ |
|-------------------------|----------------------|---------------------|---------------------|
| Warfarin | Levaquin | 95 | 52 |
| <i>Ethmozine</i> | <i>Ethambutol</i> | 93 | 0 |
| Cyclophosphamide | Cyclosporine | 92 | 5 |
| Prograf | Prozac | 92 | 8 |
| <i>Dantrium</i> | <i>Danocrine</i> | 91 | 0 |
| <i>Cordarone</i> | <i>Cardene</i> | 89 | 0 |
| Coumadin | Avandia | 89 | 2 |
| Folex | Foltx | 89 | 1 |
| Norvir | Norvasc | 88 | 1 |
| Oxcarbazepine | Oxaprozin | 88 | 11 |
| Coumadin | Cardura | 87 | 5 |
| <i>Leukeran</i> | <i>Leucovorin</i> | 87 | 0 |
| Phenytoin Sodium | Nystatin | 87 | 72 |
| Topamax | Tofranil | 87 | 59 |
| Azathioprine | Azithromycin | 86 | 63 |
| Coumadin | Phytonadione | 86 | 5 |
| Neoral | Inderal | 86 | 9 |
| Carbamazepine | Carisoprodol | 85 | 17 |
| Kayexalate | K Dur | 85 | 0 |
| Levetiracetam | Levocarnitine | 85 | 123 |
| Plavix | Paxil | 85 | 6 |
| <i>Tambocor</i> | <i>Tamoxifen</i> | 85 | 0 |
| Zyvox | Zyflo | 85 | 0 |
| Epivir | Elavil | 84 | 1 |
| Isordil | Inderal | 84 | 2 |
| Keppra | Keflex | 84 | 419 |
| Lamotrigine | Lamivudine | 84 | 1 |
| <i>Procaïnamide</i> | <i>Probenecid</i> | 84 | 0 |
| <i>Quinine</i> | <i>Quinidine</i> | 84 | 0 |
| Trileptal | Tegretol | 84 | 259 |
| Digoxin | Levothyroxine | 83 | 8 |
| <i>Femara</i> | <i>Famvir</i> | 83 | 0 |
| Furosemide | Fosinopril | 83 | 5 |
| <i>Gabitril</i> | <i>Glucotrol</i> | 83 | 0 |
| Imdur | Inderal | 83 | 2 |
| Jantoven | Janumet | 83 | 0 |
| <i>Kaletra</i> | <i>Levitra</i> | 83 | 0 |
| Tambocor | Temodar | 83 | 0 |
| <i>Tikosyn</i> | <i>Ticlopidine</i> | 83 | 0 |
| Clozapine | Clomipramine | 82 | 1 |
| Lanoxin | Levothyroxine | 82 | 15 |
| <i>Matulane</i> | <i>Materna</i> | 82 | 0 |
| <i>Nevirapine</i> | <i>Nefazodone</i> | 82 | 0 |
| <i>Penicillin</i> | <i>Penicillamine</i> | 82 | 0 |
| Phenytoin Sodium | Feldene | 82 | 3 |
| <i>Thalomid</i> | <i>Thiamine</i> | 82 | 0 |
| Vancomycin | Valacyclovir | 82 | 1 |

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|----------------------|---------------------------|----|-----|
| <i>Amiodarone</i> | <i>Amantadine</i> | 81 | 0 |
| <i>Hydroxyurea</i> | <i>Hydroxychloroquine</i> | 81 | 0 |
| <i>Kaletra</i> | <i>Keppra</i> | 81 | 0 |
| Lamotrigine | Levothyroxine | 81 | 58 |
| Leucovorin | Leukeran | 81 | 0 |
| <i>Leucovorin</i> | <i>Leukeran</i> | 81 | 0 |
| Limbitrol | Librium | 81 | 2 |
| Lithium | Chlordiazepoxide | 81 | 38 |
| Topamax | Protonix | 81 | 48 |
| Zyvox | Zithromax | 81 | 93 |
| Carbatrol | Labetalol | 80 | 4 |
| Cyclosporine | Cyclophosphamide | 80 | 5 |
| Dilantin | Dilaudid | 80 | 3 |
| Effexor | Eskalith | 80 | 99 |
| Lamictal | Lamisil | 80 | 26 |
| <i>Nexavar</i> | <i>Nexium</i> | 80 | 0 |
| <i>Nitroglycerin</i> | <i>Nicotine</i> | 80 | 0 |
| Pacerone | Pancrease | 80 | 3 |
| <i>Reserpine</i> | <i>Ropinirole</i> | 80 | 0 |
| <i>Anastrozole</i> | <i>Anagrelide</i> | 79 | 0 |
| <i>Atrovent</i> | <i>Natru Vent</i> | 79 | 0 |
| <i>Kayexalate</i> | <i>Kaopectate</i> | 79 | 0 |
| Lamivudine | Lamotrigine | 79 | 1 |
| <i>Methotrexate</i> | <i>Metolazone</i> | 79 | 0 |
| <i>Nitroglycerin</i> | <i>Neo-Syneprine</i> | 79 | 0 |
| Purinethol | Propylthiouracil | 79 | 1 |
| <i>Quinidine</i> | <i>Quinine</i> | 79 | 0 |
| <i>Tamoxifen</i> | <i>Tambocor</i> | 79 | 0 |
| Topamax | Tegretol | 79 | 301 |
| Topiramate | Toprol | 79 | 38 |
| <i>Xeloda</i> | <i>Xenical</i> | 79 | 0 |
| <i>Anafranil</i> | <i>Enalapril</i> | 78 | 0 |
| <i>Apresoline</i> | <i>Atropine</i> | 78 | 0 |
| Coumadin | Mephyton | 78 | 5 |
| <i>Dantrium</i> | <i>Danazol</i> | 78 | 0 |
| Jantoven | Orvaten | 78 | 1 |
| Levothyroxine | Levofloxacin | 78 | 113 |
| Neoral | Neurontin | 78 | 8 |
| Nitroglycerin | Nitrofurantoin | 78 | 5 |
| <i>Revia</i> | <i>Revatio</i> | 78 | 0 |
| Topamax | Trazodone | 78 | 330 |
| Albuterol | Labetalol | 77 | 40 |
| Atrovent | Azmacort | 77 | 40 |
| Combivir | Combivent | 77 | 47 |
| <i>Evista</i> | <i>Avandia</i> | 77 | 0 |
| <i>Haloperidol</i> | <i>Hydromorphone</i> | 77 | 0 |
| Lisinopril | Lovastatin | 77 | 8 |
| Mephyton | Methadone | 77 | 1 |
| <i>Slow K</i> | <i>Slow Bid</i> | 77 | 0 |
| <i>Ticlid</i> | <i>Tigan</i> | 77 | 0 |

| | | | |
|----------------------|---------------------|----|------|
| Trandate | Trazodone | 77 | 3 |
| <i>Trientine</i> | <i>Triamterene</i> | 77 | 0 |
| Acetylcysteine | Acetazolamide | 76 | 0 |
| Aripiprazole | Omeprazole | 76 | 61 |
| <i>Atropine</i> | <i>Apresoline</i> | 76 | 0 |
| <i>Casodex</i> | <i>Kapidex</i> | 76 | 0 |
| Clindamycin | Clinoril | 76 | 25 |
| Lanoxin | Levoxyl | 76 | 15 |
| Levaquin | Levothyroxine | 76 | 113 |
| <i>Mexitil</i> | <i>Mestinon</i> | 76 | 0 |
| Neurontin | Motrin | 76 | 511 |
| Olanzapine | Clonazepam | 76 | 254 |
| Prednisone | Prilosec | 76 | 719 |
| Serentil | Sertraline | 76 | 3 |
| <i>Topiramate</i> | <i>Torseamide</i> | 76 | 0 |
| <i>Amicar</i> | <i>Omacor</i> | 75 | 0 |
| <i>Haloperidol</i> | <i>Nadolol</i> | 75 | 0 |
| <i>Keppra</i> | <i>Kaletra</i> | 75 | 0 |
| Lanoxin | Lotensin | 75 | 18 |
| Lanoxin | Levaquin | 75 | 24 |
| <i>Plavix</i> | <i>Plendil</i> | 75 | 0 |
| <i>Pletal</i> | <i>Clozaril</i> | 75 | 0 |
| Acetazolamide | Acetohexamide | 74 | 0 |
| Amiodarone | Amlodipine | 74 | 3 |
| Lamictal | Geocillin | 74 | 1 |
| Levetiracetam | Lamotrigine | 74 | 388 |
| <i>Lexiva</i> | <i>Levitra</i> | 74 | 0 |
| Methimazole | Metaxalone | 74 | 6 |
| <i>Minoxidil</i> | <i>Methotrexate</i> | 74 | 0 |
| <i>Nolvadex</i> | <i>Norvasc</i> | 74 | 0 |
| <i>Primidone</i> | <i>Primaquine</i> | 74 | 0 |
| Procardia | Prevacid | 74 | 34 |
| Solu Medrol | Salmeterol | 74 | 145 |
| <i>Sorbitrate</i> | <i>Sorbitol</i> | 74 | 0 |
| Tapazole | Topamax | 74 | 3 |
| <i>Zyprexa</i> | <i>Zelapar</i> | 74 | 0 |
| Accupril | Amaryl | 73 | 4 |
| <i>Cyclosporine</i> | <i>Cycloserine</i> | 73 | 0 |
| <i>Florinef</i> | <i>Fioricet</i> | 73 | 0 |
| Folinic Acid | Folic Acid | 73 | 8 |
| <i>Isordil</i> | <i>Isoptin</i> | 73 | 0 |
| Lanoxin | Levsin | 73 | 24 |
| Pediapred | Pediazole | 73 | 2101 |
| <i>Penicillamine</i> | <i>Penicillin</i> | 73 | 0 |
| <i>Probenecid</i> | <i>Procanbid</i> | 73 | 0 |
| <i>Procanbid</i> | <i>Probenecid</i> | 73 | 0 |
| <i>Ritodrine</i> | <i>Ritalin</i> | 73 | 0 |
| Sodium Chloride | Potassium Chloride | 73 | 57 |
| <i>Tambocor</i> | <i>Pamelor</i> | 73 | 0 |
| <i>Ticlopidine</i> | <i>Tolterodine</i> | 73 | 0 |

| | | | |
|-----------------------|-----------------------|----|------|
| Zoloft | Zocor | 73 | 24 |
| <i>Amaryl</i> | <i>Reminyl</i> | 72 | 0 |
| <i>Chlorpromazine</i> | <i>Chlorthalidone</i> | 72 | 0 |
| Chlorpromazine | Clomipramine | 72 | 2 |
| <i>Clozapine</i> | <i>Clofazimine</i> | 72 | 0 |
| <i>Desipramine</i> | <i>Disopyramide</i> | 72 | 0 |
| <i>Femara</i> | <i>Femhrt</i> | 72 | 0 |
| <i>Levothyroxine</i> | <i>Levorphanol</i> | 72 | 0 |
| <i>Pyrimethamine</i> | <i>Pyrazinamide</i> | 72 | 0 |
| <i>Revatio</i> | <i>Revia</i> | 72 | 0 |
| <i>Rifabutin</i> | <i>Rifadin</i> | 72 | 0 |
| Sinequan | Singulair | 72 | 94 |
| Benazepril | Benzotropine | 71 | 2 |
| Chlordiazepoxide | Chlorpromazine | 71 | 11 |
| <i>Disopyramide</i> | <i>Desipramine</i> | 71 | 0 |
| Doxepin | Doxycycline | 71 | 65 |
| Gabapentin | Gatifloxacin | 71 | 14 |
| <i>Haldol</i> | <i>Stadol</i> | 71 | 0 |
| <i>Isonorbide</i> | <i>Isoniazid</i> | 71 | 0 |
| Lanoxin | Lasix | 71 | 447 |
| Mephyton | Coumadin | 71 | 5 |
| <i>Mucomyst</i> | <i>Mucinex</i> | 71 | 0 |
| <i>Nadolol</i> | <i>Nateglinide</i> | 71 | 0 |
| Pancrease | Pacerone | 71 | 3 |
| Retrovir | Acyclovir | 71 | 2 |
| Serevent | Zoloft | 71 | 97 |
| Tegretol | Tylenol | 71 | 510 |
| Tofranil | Topamax | 71 | 59 |
| Toprol | Tegretol | 71 | 11 |
| Valsartan | Simvastatin | 71 | 10 |
| Vicodin | Valium | 71 | 3330 |
| <i>Aromasin</i> | <i>Arimidex</i> | 70 | 0 |
| Azithromycin | Azathioprine | 70 | 63 |
| <i>Diamox</i> | <i>Diazoxide</i> | 70 | 0 |
| <i>Imuran</i> | <i>Imdur</i> | 70 | 0 |
| <i>Levofloxacin</i> | <i>Levodopa</i> | 70 | 0 |
| <i>Loxitane</i> | <i>Soriatane</i> | 70 | 0 |
| <i>Methimazole</i> | <i>Metolazone</i> | 70 | 0 |
| <i>Metyrapone</i> | <i>Metyrosine</i> | 70 | 0 |
| <i>Minipress</i> | <i>Minoxidil</i> | 70 | 0 |
| <i>Navane</i> | <i>Artane</i> | 70 | 0 |
| Nelfinavir | Nefazodone | 70 | 1 |
| <i>Nolvadex</i> | <i>Flomax</i> | 70 | 0 |
| <i>Penicillamine</i> | <i>Penicillin</i> | 70 | 0 |
| Zaroxolyn | Zyprexa | 70 | 1 |
| Accupril | Accutane | 69 | 2 |
| Avelox | Avapro | 69 | 1 |
| Ciprofloxacin | Cephalexin | 69 | 3266 |
| <i>Clomid</i> | <i>Clomipramine</i> | 69 | 0 |
| <i>Cycloserine</i> | <i>Cyclosporine</i> | 69 | 0 |

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|---------------------------|--------------------------|----|------|
| Doxepin | Diazepam | 69 | 22 |
| Elavil | Enalapril | 69 | 24 |
| Isordil | Zestril | 69 | 1 |
| <i>Isosorbide</i> | <i>Indapamide</i> | 69 | 0 |
| Jantoven | Januvia | 69 | 1 |
| Nifedipine | Nortriptyline | 69 | 1 |
| Nitro Bid | Macrobid | 69 | 5 |
| Norvasc | Nexium | 69 | 69 |
| Prednisone | Prazosin | 69 | 4 |
| <i>Saquinavir</i> | <i>Sinequan</i> | 69 | 0 |
| Tenormin | Imuran | 69 | 6 |
| <i>Thiethylperazine</i> | <i>Brethine</i> | 69 | 0 |
| Xanax | Tenex | 69 | 45 |
| Zoloft | Zyrtec | 69 | 2710 |
| <i>Zyprexa</i> | <i>Zebeta</i> | 69 | 0 |
| <i>Aromasin</i> | <i>Aygestin</i> | 68 | 0 |
| Asacol | Visicol | 68 | 6 |
| Azmacort | Nasacort | 68 | 87 |
| <i>Bromocriptine</i> | <i>Proamatine</i> | 68 | 0 |
| Divalproex | Valtrex | 68 | 84 |
| <i>Effexor</i> | <i>Exelon</i> | 68 | 0 |
| Enalapril | Elavil | 68 | 24 |
| Evista | Avinza | 68 | 1 |
| Flovent | Atrovent | 68 | 1214 |
| <i>Hydroxychloroquine</i> | <i>Hydroxyurea</i> | 68 | 0 |
| Inderal | Neoral | 68 | 9 |
| <i>Lamictal</i> | <i>Lactinex</i> | 68 | 0 |
| <i>Methadone</i> | <i>Dexmethylphenidat</i> | 68 | 0 |
| <i>Minoxidil</i> | <i>Minipress</i> | 68 | 0 |
| Olanzapine | Olsalazine | 68 | 1 |
| Orvaten | Jantoven | 68 | 1 |
| <i>Risperidone</i> | <i>Rosiglitazone</i> | 68 | 0 |
| Spironolactone | Simethicone | 68 | 5 |
| <i>Tacrolimus</i> | <i>Tamsulosin</i> | 68 | 0 |
| Advair | Atrovent | 67 | 869 |
| <i>Amitriptyline</i> | <i>Aminophylline</i> | 67 | 0 |
| Avandia | Coumadin | 67 | 2 |
| Chlordiazepoxide | Lithium | 67 | 38 |
| Clonazepam | Clozapine | 67 | 4 |
| Clonidine | Clonazepam | 67 | 569 |
| Diamox | Amoxil | 67 | 107 |
| <i>Indapamide</i> | <i>Isradipine</i> | 67 | 0 |
| Levaquin | Warfarin | 67 | 52 |
| Methylergonovine | Methylprednisolon | 67 | 37 |
| Metolazone | Metoclopramide | 67 | 8 |
| <i>Misoprostol</i> | <i>Methimazole</i> | 67 | 0 |
| Neurontin | Noroxin | 67 | 1 |
| Proventil | Provigil | 67 | 68 |
| <i>Pyridostigmine</i> | <i>Pyridoxine</i> | 67 | 0 |
| Toradol | Tofranil | 67 | 14 |

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|---------------------|-------------------------|----|------|
| <i>Trandolapril</i> | <i>Tenofovir</i> | 67 | 0 |
| <i>Anzemet</i> | <i>Avandamet</i> | 66 | 0 |
| Atenolol | Albuterol | 66 | 196 |
| Benadryl | Bentyl | 66 | 114 |
| <i>Carvedilol</i> | <i>Carbidopa</i> | 66 | 0 |
| <i>Isosorbide</i> | <i>Isotretinoin</i> | 66 | 0 |
| Lamotrigine | Levetiracetam | 66 | 388 |
| <i>Molindone</i> | <i>Meloxicam</i> | 66 | 0 |
| <i>Nefazodone</i> | <i>Nevirapine</i> | 66 | 0 |
| Neurontin | Nitrofurantoin | 66 | 125 |
| Nitrofurantoin | Nitroglycerin | 66 | 5 |
| <i>Prosom</i> | <i>Prazosin</i> | 66 | 0 |
| Zovirax | Zyloprim | 66 | 6 |
| Actigall | Actiq | 65 | 2 |
| Advair | Advil | 65 | 3295 |
| Amaryl | Avandia | 65 | 4 |
| <i>Demadex</i> | <i>Diamox</i> | 65 | 0 |
| Demerol | Demadex | 65 | 1 |
| <i>Enalapril</i> | <i>Anafranil</i> | 65 | 0 |
| Fluoxetine | Fosinopril | 65 | 2 |
| Lipitor | Labetalol | 65 | 6 |
| Nitrofurantoin | Neurontin | 65 | 125 |
| Nitroglycerin | Nystatin | 65 | 6 |
| <i>Plavix</i> | <i>Mavik</i> | 65 | 0 |
| Reserpine | Risperdal | 65 | 1 |
| Risperdal | Rocaltrol | 65 | 9 |
| Sertraline | Olanzapine | 65 | 616 |
| Toprol | Tramadol | 65 | 87 |
| <i>Tretinoin</i> | <i>Tenormin</i> | 65 | 0 |
| <i>Vancomycin</i> | <i>Vibramycin</i> | 65 | 0 |
| <i>Agenerase</i> | <i>Aggrenox</i> | 64 | 0 |
| <i>Arimidex</i> | <i>Aromasin</i> | 64 | 0 |
| <i>Diabinese</i> | <i>Diamox</i> | 64 | 0 |
| <i>Felodipine</i> | <i>Selegiline</i> | 64 | 0 |
| Hydrochlorothiazide | Hydroxychloroquine | 64 | 13 |
| Levaquin | Lariam | 64 | 1 |
| Levoxyl | Lanoxin | 64 | 15 |
| Lotensin | Lioresal | 64 | 3 |
| Methylprednisolone | Medroxyprogesterone | 64 | 191 |
| <i>Methysergide</i> | <i>Methylergonovine</i> | 64 | 0 |
| <i>Navane</i> | <i>Norvasc</i> | 64 | 0 |
| Oxandrin | Oxycontin | 64 | 9 |
| <i>Primidone</i> | <i>Pyridoxine</i> | 64 | 0 |
| Prozac | Prelone | 64 | 347 |
| Remeron | Premarin | 64 | 17 |
| Seroquel | Sinequan | 64 | 58 |
| Verapamil | Lisinopril | 64 | 14 |
| <i>Zebeta</i> | <i>Zyprexa</i> | 64 | 0 |
| Zerit | Zyrtec | 64 | 23 |
| Zestril | Zerit | 64 | 2 |

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|----------------------|----------------------|----|------|
| Zithromax | Fosamax | 64 | 61 |
| <i>Aminophylline</i> | <i>Amitriptyline</i> | 63 | 0 |
| Combivent | Combipres | 63 | 3198 |
| Dexamethasone | Methadone | 63 | 8 |
| <i>Fioricet</i> | <i>Florinef</i> | 63 | 0 |
| <i>Labetalol</i> | <i>Felbatol</i> | 63 | 0 |
| Lamictal | Loxitane | 63 | 1 |
| <i>Levodopa</i> | <i>Levofloxacin</i> | 63 | 0 |
| Lyrica | Lopressor | 63 | 5 |
| Mesalamine | Megestrol | 63 | 1 |
| Metronidazole | Methocarbamol | 63 | 135 |
| Prinivil | Pravachol | 63 | 28 |
| Provigil | Seroquel | 63 | 27 |
| <i>Ribavirin</i> | <i>Robaxin</i> | 63 | 0 |
| <i>Trilafon</i> | <i>Aceon</i> | 63 | 0 |
| <i>Vibramycin</i> | <i>Vancomycin</i> | 63 | 0 |
| Ziprasidone | Zonisamide | 63 | 10 |
| Advair | Altacor | 62 | 2 |
| <i>Fosamax</i> | <i>Fosinopril</i> | 62 | 0 |
| Fosinopril | Fluoxetine | 62 | 2 |
| Hydralazine | Hydrocortisone | 62 | 3 |
| Lisinopril | Losartan | 62 | 26 |
| Lorazepam | Clonazepam | 62 | 486 |
| Methadone | Mephyton | 62 | 1 |
| <i>Metyrosine</i> | <i>Metyrapone</i> | 62 | 0 |
| Microzide | Micronase | 62 | 12 |
| Nortriptyline | Nifedipine | 62 | 1 |
| Paroxetine | Feldene | 62 | 22 |
| Xopenex | Xanax | 62 | 81 |
| Zinacef | Zithromax | 62 | 9099 |
| Zoloft | Zithromax | 62 | 4784 |
| Amlodipine | Amiodarone | 61 | 3 |
| Atenolol | Actonel | 61 | 1 |
| Chlorothiazide | Chloral Hydrate | 61 | 3 |
| Diamox | Diuril | 61 | 2 |
| Diltiazem | Diazepam | 61 | 6 |
| <i>Famvir</i> | <i>Femara</i> | 61 | 0 |
| <i>Gabapentin</i> | <i>Gemfibrozil</i> | 61 | 0 |
| Hydralazine | Hydrochlorothiazide | 61 | 16 |
| Lariam | Levaquin | 61 | 1 |
| <i>Metolazone</i> | <i>Methotrexate</i> | 61 | 0 |
| Micro K | Macrobid | 61 | 76 |
| Propylthiouracil | Purinethol | 61 | 1 |
| <i>Rifampin</i> | <i>Rifaximin</i> | 61 | 0 |
| Tacrolimus | Tolterodine | 61 | 2 |
| <i>Temodar</i> | <i>Tambocor</i> | 61 | 0 |
| Ziprasidone | Zyprexa | 61 | 353 |
| <i>Zonegran</i> | <i>Sinequan</i> | 61 | 0 |
| Acetazolamide | Acetaminophen | 60 | 68 |
| Avandia | Cardura | 60 | 1 |

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|---------------------|----------------------|----|------|
| <i>Clofazimine</i> | <i>Clozapine</i> | 60 | 0 |
| Clomipramine | Chlorpromazine | 60 | 2 |
| <i>Kayexalate</i> | <i>Carafate</i> | 60 | 0 |
| Lisinopril | Risperdal | 60 | 31 |
| Seroquel | Desyrel | 60 | 935 |
| Atrovent | Advair | 59 | 869 |
| Ketorolac | Methadone | 59 | 3 |
| Lorazepam | Loperamide | 59 | 21 |
| Phenytoin Sodium | Phytonadione | 59 | 5 |
| Phytonadione | Phenytoin Sodium | 59 | 5 |
| <i>Tamsulosin</i> | <i>Tacrolimus</i> | 59 | 0 |
| Trazodone | Tramadol | 59 | 376 |
| Atenolol | Allopurinol | 58 | 6 |
| Bisoprolol | Risperdal | 58 | 5 |
| Clonazepam | Olanzapine | 58 | 254 |
| <i>Hydrea</i> | <i>Hytrin</i> | 58 | 0 |
| Levaquin | Lanoxin | 58 | 24 |
| <i>Mavik</i> | <i>Plavix</i> | 58 | 0 |
| Metronidazole | Metoclopramide | 58 | 1381 |
| Neurontin | Zarontin | 58 | 11 |
| Paxil | Pravachol | 58 | 11 |
| Phenobarbital | Phenergan | 58 | 310 |
| Procardia | Provera | 58 | 43 |
| <i>Reserpine</i> | <i>Risperidone</i> | 58 | 0 |
| Risperidone | Buspirone | 58 | 23 |
| <i>Selegiline</i> | <i>Felodipine</i> | 58 | 0 |
| Actos | Altace | 57 | 9 |
| <i>Ampicillin</i> | <i>Aminophylline</i> | 57 | 0 |
| Hydrochlorothiazide | Hydrocortisone | 57 | 53 |
| <i>Imdur</i> | <i>Imuran</i> | 57 | 0 |
| <i>Lanthanum</i> | <i>Lithium</i> | 57 | 0 |
| Lasix | Lanoxin | 57 | 447 |
| <i>Norpramin</i> | <i>Normodyne</i> | 57 | 0 |
| Promethazine | Perphenazine | 57 | 7 |
| <i>Vitamin K</i> | <i>Urocit</i> | 57 | 0 |
| Clinoril | Elavil | 56 | 14 |
| <i>Midodrine</i> | <i>Midamor</i> | 56 | 0 |
| Oxazepam | Lorazepam | 56 | 5 |
| Restoril | Lisinopril | 56 | 13 |
| Rifamate | Rifadin | 56 | 1 |
| Bicitra | Polycitra | 55 | 1 |
| Levothyroxine | Lanoxin | 55 | 15 |
| <i>Risedronate</i> | <i>Risperidone</i> | 55 | 0 |
| Tegretol | Trental | 55 | 2 |
| Zyprexa | Reprexain | 55 | 16 |
| Cipro | Cleocin | 54 | 402 |
| Elavil | Epivir | 54 | 1 |
| <i>Janumet</i> | <i>Sinemet</i> | 54 | 0 |
| Levaquin | Levoxyl | 54 | 113 |
| Luvox | Lasix | 54 | 1 |

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|--------------------|-----------------|----|-----|
| Nexium | Norvasc | 54 | 69 |
| Norvasc | Navane | 54 | 0 |
| Oxandrin | Prandin | 54 | 0 |
| Rifadin | Rifabutin | 54 | 0 |
| Risperdal | Reserpine | 54 | 1 |
| Serevent | Sertraline | 54 | 97 |
| Inderal | Adderall | 53 | 207 |
| Isoniazid | Isosorbide | 53 | 0 |
| Microzide | Maxzide | 53 | 0 |
| Midodrine | Minoxidil | 53 | 0 |
| Moban | Mobic | 53 | 0 |
| Neutra Phos | Nephrocaps | 53 | 6 |
| Spiriva | Inspra | 53 | 0 |
| Chlorpromazine | Chlorpropamide | 52 | 0 |
| Clomipramine | Clomiphene | 52 | 0 |
| Lasix | Luvox | 52 | 1 |
| Propranolol | Prednisone | 52 | 303 |
| Avandia | Avelox | 51 | 6 |
| Dexamethasone | Doxazosin | 51 | 1 |
| Kerlone | Ketorolac | 51 | 0 |
| Lomotil | Lanoxin | 51 | 7 |
| Misoprostol | Mifepristone | 51 | 0 |
| Septra | Semprex | 51 | 44 |
| Albuterol | Atenolol | 50 | 196 |
| Allopurinol | Atenolol | 50 | 6 |
| Artane | Altace | 50 | 0 |
| Danazol | Dapsone | 50 | 0 |
| Demadex | Demerol | 50 | 1 |
| Halcion | Haldol | 50 | 0 |
| Nexium | Nexavar | 50 | 0 |
| Pyridoxine | Pyridostigmine | 50 | 0 |
| Sertraline | Spironolactone | 50 | 10 |
| Trazodone | Tapazole | 50 | 6 |
| Chlorpropamide | Chlorpromazine | 49 | 0 |
| Cortone | Coreg | 49 | 0 |
| Losartan | Lovastatin | 49 | 1 |
| Mesalamine | Memantine | 49 | 0 |
| Metaxalone | Methimazole | 49 | 6 |
| Phytonadione | Coumadin | 49 | 5 |
| Potassium Chloride | Sodium Chloride | 49 | 57 |
| Vicodin | Vytorin | 49 | 20 |
| Zomig | Zonegran | 49 | 3 |
| Benzonatate | Benzotropine | 48 | 19 |
| Clonazepam | Lorazepam | 48 | 486 |
| Cozaar | Corgard | 48 | 0 |
| Diazepam | Temazepam | 48 | 62 |
| Diazepam | Alprazolam | 48 | 201 |
| Feldene | Felodipine | 48 | 0 |
| Sinemet | Janumet | 48 | 0 |
| Vistaril | Versed | 48 | 42 |

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|----------------------------|--------------------------|----|------|
| Ziac | Zebeta | 48 | 128 |
| Zithromax | Zinacef | 48 | 9099 |
| Aldactone | Trazodone | 47 | 4 |
| Alprazolam | Ativan | 47 | 255 |
| Altace | Atacand | 47 | 1 |
| <i>Hydrochlorothiazide</i> | <i>Maxzide</i> | 47 | 0 |
| <i>Isotretinoin</i> | <i>Isosorbide</i> | 47 | 0 |
| Lipitor | Lortab | 47 | 189 |
| Pantoprazole | Propranolol | 47 | 21 |
| <i>Proamatine</i> | <i>Loniten</i> | 47 | 0 |
| <i>Ramipril</i> | <i>Trihexyphenidyl</i> | 47 | 0 |
| Zestril | Isordil | 47 | 1 |
| <i>Brethine</i> | <i>Thiethylperazine</i> | 46 | 0 |
| Cardura | Coumadin | 46 | 5 |
| Chlorpromazine | Cyclobenzaprine | 46 | 5 |
| Diazepam | Diabeta | 46 | 4 |
| Foltx | Folex | 46 | 1 |
| Mesalamine | Metaxalone | 46 | 6 |
| Mirtazapine | Metoprolol | 46 | 29 |
| <i>Potassium Phosphate</i> | <i>Sodium Phosphate</i> | 46 | 0 |
| Requip | Risperdal | 46 | 16 |
| Triazolam | Temazepam | 46 | 1 |
| <i>Avandia</i> | <i>Evista</i> | 45 | 0 |
| Ceftin | Cipro | 45 | 275 |
| Medroxyprogesterone | Methylprednisolon | 45 | 191 |
| <i>Phenazopyridine</i> | <i>Phenoxybenzamine</i> | 45 | 0 |
| Amiloride | Amlodipine | 44 | 8 |
| <i>Aricept</i> | <i>Azilect</i> | 44 | 0 |
| Bethanechol | Baclofen | 44 | 9 |
| <i>Memantine</i> | <i>Methimazole</i> | 44 | 0 |
| Methylphenidate | Methadone | 44 | 9 |
| <i>Parlodol</i> | <i>Pindolol</i> | 44 | 0 |
| <i>Amantadine</i> | <i>Amiodarone</i> | 43 | 0 |
| Atarax | Xanax | 43 | 430 |
| Cozaar | Coreg | 43 | 7 |
| Hydrocortisone | Hydrochlorothiazide | 43 | 80 |
| Librium | Limbitrol | 43 | 2 |
| Trazodone | Triazolam | 43 | 4 |
| <i>Trimethoprim</i> | <i>Trimethobenzamide</i> | 43 | 0 |
| Amantadine | Flumadine | 42 | 9 |
| Diphenhydramine | Dicyclomine | 42 | 114 |
| Lotensin | Lanoxin | 42 | 18 |
| <i>Magnesium Sulfate</i> | <i>Morphine</i> | 42 | 0 |
| Omeprazole | Aripiprazole | 42 | 61 |
| <i>Soriatane</i> | <i>Loxitane</i> | 42 | 0 |
| Sporanox | Topamax | 42 | 6 |
| Zyrtec | Zerit | 42 | 23 |
| <i>Blocadren</i> | <i>Baclofen</i> | 41 | 0 |
| Indapamide | Indomethacin | 41 | 1 |
| <i>Pyridoxine</i> | <i>Pyridium</i> | 41 | 0 |

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|----------------------------|----------------------------|----|------|
| <i>Ropinirole</i> | <i>Reserpine</i> | 41 | 0 |
| Benadryl | Benicar | 40 | 3 |
| <i>Donepezil</i> | <i>Rabeprazole</i> | 40 | 0 |
| Renal Caps | Renagel | 40 | 1 |
| Bupropion | Buspirone | 39 | 179 |
| Meperidine | Morphine | 39 | 22 |
| <i>Repaglinide</i> | <i>Ropinirole</i> | 39 | 0 |
| <i>Sonata</i> | <i>Soriatane</i> | 39 | 0 |
| Januvia | Jantoven | 38 | 1 |
| <i>Kapidex</i> | <i>Kadian</i> | 38 | 0 |
| <i>Materna</i> | <i>Matulane</i> | 38 | 0 |
| <i>Maxzide</i> | <i>Minizide</i> | 38 | 0 |
| Methylin | Methadone | 38 | 9 |
| Pancrease | Pentasa | 38 | 5 |
| Temazepam | Mirtazapine | 38 | 78 |
| <i>Flomax</i> | <i>Nolvadex</i> | 37 | 0 |
| Flomax | Flovent | 37 | 7 |
| <i>Gemfibrozil</i> | <i>Gabapentin</i> | 37 | 0 |
| Prilosec | Prednisone | 37 | 719 |
| Trazodone | Deltasone | 37 | 12 |
| <i>Chlorthalidone</i> | <i>Chlorpromazine</i> | 36 | 0 |
| <i>Lovastatin</i> | <i>Lotensin</i> | 36 | 0 |
| Metronidazole | Potassium Chloride | 36 | 148 |
| <i>Mifeprex</i> | <i>Mirapex</i> | 36 | 0 |
| Pepcid | Prinivil | 36 | 50 |
| Cetirizine | Cyclobenzaprine | 35 | 2379 |
| Meperidine | Methadone | 35 | 4 |
| Relafen | Robaxin | 35 | 48 |
| <i>Sodium Phosphate</i> | <i>Potassium Phosphate</i> | 35 | 0 |
| <i>Tretinoin</i> | <i>Isotretinoin</i> | 35 | 0 |
| Trimethoprim | Triamterene | 35 | 1 |
| Visicol | Asacol | 35 | 6 |
| <i>Vivarin</i> | <i>Viravan</i> | 35 | 0 |
| Azithromycin | Zaroxolyn | 34 | 19 |
| Ferro Sequels | Seroquel | 34 | 70 |
| <i>Hydrochlorothiazide</i> | <i>Hydroxyurea</i> | 34 | 0 |
| Hydrocodone | Hydrocortisone | 34 | 1490 |
| <i>Janumet</i> | <i>Januvia</i> | 34 | 0 |
| Sumatriptan | Sitagliptin | 34 | 1 |
| Atrovent | Flovent | 33 | 1214 |
| Cetirizine | Clonidine | 33 | 4222 |
| <i>Kapidex</i> | <i>Casodex</i> | 33 | 0 |
| <i>Rabeprazole</i> | <i>Raloxifene</i> | 33 | 0 |
| <i>Terazosin</i> | <i>Terbutaline</i> | 33 | 0 |
| Urispas | Urised | 33 | 4 |
| Zestril | Zegerid | 33 | 15 |
| <i>Flavoxate</i> | <i>Fluvoxamine</i> | 32 | 0 |
| <i>Janumet</i> | <i>Jantoven</i> | 32 | 0 |
| Reglan | Regonol | 32 | 4 |
| Loperamide | Furosemide | 31 | 9 |

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| Macrobid | Nitro Bid | 31 | 5 |
| Methocarbamol | Metformin | 31 | 17 |
| <i>Mobic</i> | <i>Moban</i> | 31 | 0 |
| Valacyclovir | Vancomycin | 31 | 1 |
| Vytorin | Vicodin | 31 | 20 |
| Zyrtec | Ziac | 31 | 16 |
| Lopid | Lipitor | 30 | 4 |
| Lortab | Lomotil | 30 | 1326 |
| Metronidazole | Fluconazole | 30 | 7133 |
| <i>Nicotine</i> | <i>Nitroglycerin</i> | 30 | 0 |
| Nystatin | Hmg Coa Reductase | 30 | 62 |
| <i>Zetia</i> | <i>Zebeta</i> | 30 | 0 |
| Avandamet | Avandia | 29 | 18 |
| Detrol | Glucotrol | 29 | 1 |
| Guaifenesin | Guanfacine | 29 | 122 |
| Nystatin | Phenytoin Sodium | 29 | 72 |
| Provera | Procardia | 29 | 43 |
| Lortab | Lipitor | 28 | 189 |
| Tenex | Xanax | 28 | 45 |
| Ambien | Ativan | 27 | 342 |
| Hydrogesic | Hydroxyzine | 27 | 85 |
| <i>Ketorolac</i> | <i>Kerlone</i> | 27 | 0 |
| <i>Marinol</i> | <i>Maxzide</i> | 27 | 0 |
| Prevacid | Prednisone | 27 | 2146 |
| Carisoprodol | Carbamazepine | 26 | 17 |
| Nystatin | Dilantin | 26 | 101 |
| Oxycontin | Oxybutynin | 26 | 149 |
| Reglan | Requip | 26 | 5 |
| Ambien | Abilify | 25 | 165 |
| <i>Carafate</i> | <i>Kayexalate</i> | 25 | 0 |
| Levsin | Lanoxin | 25 | 24 |
| <i>Monurol</i> | <i>Monopril</i> | 25 | 0 |
| Imitrex | Imipramine | 24 | 50 |
| Lortab | Lotrel | 24 | 86 |
| Metadate | Methadone | 24 | 9 |
| <i>Proscar</i> | <i>Prosom</i> | 24 | 0 |
| Zyrtec | Norvasc | 24 | 233 |
| Voltaren | Ultram | 23 | 747 |
| <i>Colace</i> | <i>Calan</i> | 22 | 0 |
| <i>Thiamine</i> | <i>Thorazine</i> | 22 | 0 |
| Toradol | Stadol | 21 | 1 |
| <i>Salagen</i> | <i>Selegiline</i> | 20 | 0 |
| <i>Xenical</i> | <i>Xeloda</i> | 20 | 0 |
| Diphenhydramine | Dipyridamole | 19 | 1 |
| Hydroxyzine | Hydrogesic | 19 | 85 |
| Lipitor | Loniten | 19 | 3 |
| Phenazopyridine | Promethazine | 19 | 3344 |
| Sudafed | Sotalol | 19 | 1 |
| Zyban | Diovan | 19 | 6 |
| Niferex | Norflex | 18 | 3 |

| | | | |
|-----------------------|----------------------|----|------|
| <i>Levitra</i> | <i>Lexiva</i> | 17 | 0 |
| Prevacid | Procardia | 17 | 34 |
| <i>Zemplar</i> | <i>Zelapar</i> | 17 | 0 |
| <i>Glutamine</i> | <i>Galantamine</i> | 16 | 0 |
| Calcitriol | Calcium | 14 | 66 |
| Profen | Parafon | 14 | 346 |
| Zyrtec | Zyprexa | 14 | 547 |
| Loratadine | Lorazepam | 12 | 523 |
| Periactin | Perphenazine | 12 | 1 |
| Loratadine | Lortab | 9 | 8259 |
| <i>Neo-Synephrine</i> | <i>Nitroglycerin</i> | 8 | 0 |

* Intended Drug: The drug patient was supposed to receive

† Delivered Drug: The drug patient received in error

‡ Average Harm Score: Represents the average of Round 3 evaluations of the estimated harm that might occur from this substitution, where patient did not receive the intended drug

§ Number of Subjects: Represents the number of subjects in the 2000-2009 data who received both drugs in the respective LASA pair within a six month period, regardless of whether this was intended or in error

BOLD typeface indicates that the LASA pair is in the highest decile for potential harm for receiving the delivered drug in error and the highest decile for potential harm of not receiving the intended drug

Italic typeface indicates that no subjects appeared to experience a substitution error of this LASA pair.