Evaluating the Potential Severity of Look-Alike, Sound-Alike Drug Substitution Errors in Children

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Abstract

Objective: Look-alike, sound-alike (LASA) drug name substitution errors in children may pose potentially severe consequences. Our objective was to determine the degree of potential harm pediatricians ascribe to specific ambulatory LASA drug substitution errors.

Methods: We developed a unified list of LASA pairs from published sources, removing selected drugs on the basis of preparation type (eg, injectable drugs). Using a modified Delphi method over 3 rounds, 38 practicing pediatricians estimated degree of potential harm that might occur should a patient receive the delivered drug in error and the degree of potential harm that might occur from not receiving the intended drug.

Results: We identified 3550 published LASA drug pairs. A total of 1834 pairs were retained for the Delphi surveys, and 608 drug pairs were retained for round 3. Final scoring demonstrated that participants were able to identify pairs where the substitutions represented high risk of harm for receiving the delivered drug in error (eg, did not receive methylphenidate/received methadone), high risk of harm for not receiving the intended drug (eg, did not receive furosemide/received fosinopril), and pairs where the potential harm was high from not receiving the intended drug and from erroneously receiving the delivered drug (eg, did not receive albuterol/received labetalol).

Conclusions: Pediatricians have identified LASA drug substitutions that pose a high potential risk of harm to children. These results will allow future efforts to prioritize pediatric LASA errors that can be screened prospectively in outpatient pharmacies.

Keywords: children; medication error; patient safety; prescription error

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What's New

This study establishes the opinion-generated clinical value of pediatric drug substitution errors among a group of drugs confused by name and prioritizes drug names for inclusion in future efforts to curb substitution errors that affect children.

Look-alike, sound-alike medication errors occur when the names of 2 drugs have orthographic similarity (eg, nitroglycerin/nitrofurantoin) or phonetic similarity (eg, albuterol/atenolol), forming a look-alike, sound-alike pair.[1–5] In previous research, we estimated how often look-alike, sound-alike (LASA) medication errors occur in ambulatory pediatric prescriptions using 11 selected LASA pairs from a list published by the Institute for Safe Medication Practices.[2] That study demonstrated that prescription dispensing patterns can be used to screen for potential LASA errors in pediatrics, but the frequencies of these errors appear to be much lower than other types of pediatric medication errors, occurring in fewer than 1 per 1000 prescriptions dispensed.[2] The relatively low frequency of these errors and the large number of medications that are part of LASA pairs suggest that the problem of LASA substitution errors may be best addressed using automated processes.

Although only a few studies have evaluated LASA errors in children,[2,6,7] we are not aware of investigation into the clinical value of these substitution errors. Establishing the clinical value of potential harm from any specific LASA substitution error is required in order to prioritize drug pairs in processes created to prevent these errors. Because drug error prevention may be best addressed by automated approaches (eg, computerized decision support that includes electronic alerts), processes designed to prevent these errors should prioritize errors that pose the most severe harm. Focusing on high potential harm errors allows systems to minimize adverse effects on provider or pharmacy work flow and minimize alert fatigue, whereby providers and pharmacists ignore decision support because of alert volume.[1,8–11] The expanding use of electronic health records has the potential to decrease LASA errors because of improvements in legibility and improved transmission of prescriptions, but computerized systems

can introduce new ways to produce LASA errors, particularly when medication selection is done using an alphabetized menu, termed a menu selection error.[1,12–14]

The objective of this study was to identify LASA substitution errors that providers thought posed a high degree of potential harm to children. As a preliminary evaluation of the frequency of these errors, we also utilized 10 years of prescription data to estimate the frequency of LASA errors in outpatient pediatric prescriptions. Ultimately, future efforts will combine the estimation of harm with additional analyses on the frequency of LASA substitution errors to permit investigators to prioritize pairs for inclusion in future efforts to prevent these errors in real time in clinical settings.

METHODS

OVERVIEW OF APPROACH

In part because of a relative lack of data on medication errors in pediatric outpatients,[15] we focused our investigation on drug pairs that are prescribed in outpatient pediatric practice. We also set a goal of identifying potential high-harm pairs that could be translated into future clinical interventions to reduce LASA errors. The concern of alert fatigue was a paramount concern in our approach, informing our decisions about pairs to exclude.

ESTABLISHING LIST OF LASA PAIRS

We identified 2 published lists of LASA pairs. One list was published by the Institute for Safe Medication Practices (668 pairs),[16] and the other was published by MEDMARX (3156 pairs), for a total of 3824 published pairs.[17] However, there were 274 pairs that appeared on both lists, leaving 3550 published LASA pairs. Those published pairs included reciprocals of the same pairs (drug A for drug B, and drug B for drug A in any pair), meaning that there were actually 1775 discrete pairs of 2 drugs that exhibited either look-alike or sound-alike name confusion. Our goal was to evaluate the opinion-generated estimate of the potential harm presented by these substitution errors in outpatient practice. Two investigators (WTB and SSG) independently reviewed the pairs in order to identify pairs to retain or remove from the list. After independent review, the 2 investigators met to come to consensus about pairs that should be retained. We removed pairs where at least one of the preparations in the pair was an intravenous, intramuscular, or other injectable product (including vaccines). In order to reduce the list to a manageable set for evaluation by panelists, we also removed pairs where both drugs were vitamins or nutritional supplements. We removed pairs where a topical, otic, ophthalmic, or nasal preparation was paired with an oral drug of the same name under the assumption that a different route of administration would be more likely to alert the parent or pharmacist to the LASA error and prevent the error before dispensing. Because listing an indication on a prescription is one method that pharmacists might use to detect a LASA error,[18] we elected to remove 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. Although these drugs may present potentially harmful substitutions, they generally would be indicated for the same condition, therefore making it very difficult for an automated process to detect a substitution error without introducing alert fatigue. We did not remove pairs that contained 2 drugs of the same drug class if the 2 drugs had potentially harmful differences in potency (eg, benzodiazepines, where "10 mg" of one drug may be of equal potency to "1 mg" of another). Finally, we removed pairs where one of the drug formulations was a long-acting version of the same drug. After exclusions, the merged list contained 917 discrete pairs (or 1834 error combinations with reciprocals).

DEVELOPMENT OF SURVEY INSTRUMENT

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 2 to 3 general pediatric faculty members to discuss how to conceptualize the Delphi approach and refine the terminology to be used in the survey. The pediatricians involved in these focus group discussions did not ultimately participate in the Delphi study. In those focus groups sessions, we came to consensus on the terminology to be used, including the approach to estimating "degree of potential harm" and the physical layout of the survey instrument, as well as determining what would be a reasonable time to complete the surveys. We utilized this process to refine the terminology and language of the questions to ensure that the participants were estimating the degree of potential harm and not the estimated probability that harm might occur.

Once the terminology and approach for the survey were developed, we conducted cognitive pretesting via in-person interviews with 5 practicing pediatricians who had not participated in the previous focus groups. In those sessions, we asked them to provide feedback on the clarity of the questions, specifically on the language of estimating degree of harm and not the probability of harm, and the ability of pediatricians to differentiate potential harm among the different LASA substitution errors. Cognitive pretesting revealed that the participants thought they could estimate degree of potential harm but not the probability of harm. We further refined the questions and the visual presentation of the survey on the basis of the input from these interviews. Through this process, we developed the consensus that each LASA substitution is actually a combination of 2 errors—the patient receiving the delivered drug in error, and the patient not receiving the intended drug. Each of those errors may have different degrees of estimated potential harm. Therefore, each LASA pair was broken into 2 questions, asking the participant to estimate the degree of potential harm represented by receiving the delivered drug in error as well as the degree of potential harm represented by not receiving the intended drug.

We utilized the REDCap online survey tool, and each question was answered on a continuous Likert-type scale