Liquid Medication Dosing Errors by Hispanic Parents: Role of Health Literacy and English Proficiency

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ABSTRACT

OBJECTIVE: Hispanic parents in the United States are disproportionately affected by low health literacy and limited English proficiency (LEP). We examined associations between health literacy, LEP, and liquid medication dosing errors in Hispanic parents.

METHODS: Cross-sectional analysis of data from a multisite randomized controlled experiment to identify best practices for the labeling/dosing of pediatric liquid medications (SAFE Rx for Kids study); 3 urban pediatric clinics. Analyses were limited to Hispanic parents of children aged ≤8 years with health literacy and LEP data (n = 1126). Parents were randomized to 1 of 5 groups that varied by pairing of units of measurement on the label/dosing tool. Each parent measured 9 doses (3 amounts [2.5, 5, 7.5 mL] using 3 tools [2 syringes in 0.2 or 0.5 mL increments, and 1 cup]) in random order. Dependent variable was a dosing error of >20% dose deviation. Predictor variables included health literacy (Newest Vital Sign) (limited = 0–3; adequate = 4–6) and LEP (speaks English less than "very well").

RESULTS: A total of 83.1% made dosing errors (mean [SD] errors per parent = 2.2 [1.9]). Parents with limited health literacy and LEP had the greatest odds of making a dosing error compared to parents with adequate health literacy who were English proficient (trials with errors per parent = 28.8 vs 12.9%; adjusted odds ratio = 2.2 [95% confidence interval 1.7–2.8]). Parents with limited health literacy who were English proficient were also more likely to make errors (trials with errors per parent = 18.8%; adjusted odds ratio = 1.4 [95% confidence interval 1.1–1.9]).

CONCLUSIONS: Dosing errors are common among Hispanic parents; those with both LEP and limited health literacy are at particular risk. Further study is needed to examine how the redesign of medication labels and dosing tools could reduce literacy- and language-associated disparities in dosing errors.

KEYWORDS: health literacy; limited English proficiency; medication administration errors; patient safety

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WHAT'S NEW

Limited health literacy and limited English proficiency (LEP) are independently associated with more medication dosing errors in Hispanic parents. Hispanic parents with both low health literacy and LEP are at greatest risk.

IN THE UNITED States, parents frequently make errors in dosing medications for their children;[1–3] studies have documented that more than half of parents make errors when dosing liquid medication for their children.[4,5] Factors that contribute to the complexity of the task of dosing include units of measurement (eg, mL, teaspoon), dosing tools (eg, dosing cups, syringes, droppers), and the wide range of recommended dose amounts.[1,6]

One group thought to be at risk for dosing errors are Hispanics. More than 50 million adults in the United States identify as Hispanic or Latino, and this population is growing rapidly.[7] Results of limited studies involving Hispanics have shown that medication errors and poor adherence are common with adult medication regimens.[8,9]

Few studies, however, have focused on dosing errors by Hispanic parents and the underlying factors involved.[1,2,10] Two likely contributors are low health literacy and limited English proficiency (LEP).

In the United States, approximately 1 in 3 parents has low health literacy,[11] limiting their ability to obtain, process, and understand the information necessary to make appropriate health-related decisions.[12] Hispanic parents have twice the odds of having low health literacy compared to white parents.[11] Prior studies have documented that low health literacy is associated with poorer understanding of medication labels,[13] dosing errors,[1] and nonadherence[14] but have not focused on Hispanics.

LEP affects nearly 1 in 10 adults in the United States, with over two-thirds being Spanish speakers.[7] LEP has been associated with misunderstanding of medication labels,[10,15] higher prevalence of dosing errors,[10] and adverse drug events.[16] To date, the few studies of LEP and parent dosing of liquid medications have found that those with LEP are at risk for error. These existing studies have involved single sites and did not look at the combined effects of LEP and health literacy.[10,17]

In this study, we sought to examine associations between health literacy and English proficiency and liquid medication dosing errors among Hispanic parents, looking at these risk factors independently and in combination.

PATIENTS AND METHODS

PARTICIPANTS AND SETTING

This was a cross-sectional analysis of data collected as part of a randomized, controlled experiment focused on identifying specific attributes of medication labels and dosing tools that can be optimized to reduce parent dosing errors (SAFE Rx for Kids study). Subjects were enrolled from 3 university-affiliated pediatric outpatient clinics that serve largely low-income populations (New York University, Stanford, Emory). Northwestern University served as the data management site and enrolled no participants.

Study enrollment was conducted by research assistants (RAs) who approached consecutive adults with children with clinic appointments to determine eligibility. Parents were told that the study was focused on learning the best way to help parents understand instructions for children's medicines. They were told that they would be asked to look at instructions like those they might see on a prescription label and show how they would measure out medicines. Inclusion criteria included: parent/legal guardian ≥18 years of age of a child ≤8 years of age, English or Spanish speaking, usually gives medications to child, and no previous participation in a dosing study. Caregivers were excluded if they had visual acuity worse than 20/50 (Rosenbaum Pocket Screener) or uncorrectable hearing impairment, or if the child was presenting for emergency care. At the Emory site, only English speakers were enrolled, as this site predominantly serves African American families, and few Spanish-speaking families are seen.

Caregivers provided informed consent. For this cross-sectional analysis of data, we only included caregivers who self-identified as Hispanic or Latino and who completed the dosing and health literacy assessments. We focused on Hispanic parents because, as in our study,[18] these families had a 1.5 times increased odds of error compared to non-Hispanic parents, and we were interested in examining the individual and combined effects of health literacy and English proficiency in this at-risk group. For the remainder of this article, parents who identified as either Hispanic or Latino are referred to as Hispanic. A $20 gift card was given to parents as an incentive after completion of the study measurements. Institutional review board approval was obtained from each site. This study was registered at ClinicalTrials.gov (NCT01854151).

MEASURES

Trained RAs conducted study measures in person on the day of the clinic visit before or after the child's appointment. One senior research coordinator per site oversaw the activities of all RAs at their site (about 2 or 3 per site). Senior coordinators at each site were individually trained by the head project coordinator (JJ) and the primary investigator at the lead (New York University) site. Randomization groups were assigned by the project coordinator (JJ) using a random number generator blocked by site, in sets of 100; RAs were blinded to group until after participant enrollment. All assessments were performed in English or Spanish, according to parent preference. The primary outcome of interest was medication dosing error. Primary predictor variables included parent health literacy and English proficiency.

STUDY PROCEDURES

Eligible parents were randomly assigned to 1 of 5 groups, which differed by the unit of measurement shown on the medication bottle label and dosing tool. *Label-dosing tool:* mL-mL (mL-only) (group 1), mL/tsp-mL/tsp (group 2), mL/teaspoon-mL/tsp (group 3), mL/ml-tsp (group 4), tsp-mL/tsp (group 5).[18] Labels were written in English or Spanish (eg, "teaspoon" translated as *cucharadita* and "tsp" as *cdta*); parents were given labels in their language of preference. Translation of the label involved a team-based group consensus review; pilot testing was also conducted. Dosing tools were marked in English only, as is standard practice in the United States.

Parents in each group were each asked to measure a total of 9 times (3 dose amounts [2.5, 5, 7.5 mL] using 3 tool types); the order was randomized using a random number generator, blocked by site, in sets of 100. The 3 dosing tools were: 1) oral syringe (10 mL capacity, 0.2 mL increment markings), 2) oral syringe (10 mL capacity, 0.5 mL increment markings), and 3) dosing cup (1 oz capacity, 2.5 mL or ½ tsp increment markings). Parents looked at labels in their language of preference (English or Spanish) to determine how much medicine to measure