Improving the usability of intravenous medication labels to support safe medication delivery

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ABSTRACT

Medication label design is frequently a contributing factor to medication errors. Design regulations and recommendations have been predominantly aimed at manufacturers’ product labels. Pharmacy-generated labels have received less scrutiny despite being an integral artifact throughout the medication use process. This article is an account of our efforts to improve the design of a hospital’s intravenous (IV) medication labels. Our analysis revealed a set of interrelated processes and stakeholders that restrict the range of feasible label designs. The technological and system constraints likely vary among hospitals and represent significant barriers to developing and implementing specific design standards. We propose both an ideal IV label design and one that adheres to the current constraints of the hospital under study. Relevance to industry: Hospitals are tasked with creating customized medication labels with minimal guidance. Our process, findings, and proposed labels provide insight for similar investigations at other institutions.

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1. Introduction

Poorly designed medication labels pose a threat to patient safety by contributing to medication errors. Nearly one-third of the medication errors reported to the United States Pharmacopeia (USP) from June 1996 to May 1997 cited labeling or packaging issues (United States Pharmacopeia, 1998). Clutter, poor readability, poor use of color, and lack of differentiation between similarly-named drugs are among the labeling concerns reported to USP. In a self-reported survey, anesthesiologists cited the misidentification of a syringe and the misidentification of a drug ampoule or vial as a contributing factor in 70.4% and 46.8% of medication errors they experienced, respectively (Orser et al., 2001).

Label design recommendations and research have been primarily focused on outpatient medication use and manufacturers’ labels and supplementary materials. In a comprehensive review of prescription drug label research, Shrank et al. (2007) included six types of patient-oriented labels: consumer medication information, container labels, direct-to-consumer advertising, package inserts, patient education materials, and over-the-counter labels. Cohen (2006) discussed the use of color, typeface, contrast, and expressions of concentration and strength with regard to provider interactions with labels, but the recommendations are primarily aimed at pharmaceutical companies and regulatory bodies.

Pharmacy-generated labels for inpatient care have a different user population and task structure. These labels support a variety of health care providers with diverse information requirements who work in often fast-paced, interruptive, and stressful environments. Furthermore, intravenous administration is error-prone and dangerous (Nicholas and Agius, 2005; Taxis and Barber, 2003). In a study of 10 hospital wards, Taxis and Barber (2003) identified 249 errors in 430 intravenous medication administrations. Little guidance is available for designing labels to best support this work. The applicability of recommendations from research on other types of labels is unclear due to the key differences in the context of use. Intravenous (IV) medications labels are particularly important because of the similar appearance of many drugs and doses.

We became involved in a project to redesign IV labels as a result of a patient safety officer wondering whether the IV labels at her hospital may be a contributing factor to reported adverse events. She therefore contacted the second author to determine if, from a human factors perspective, the labels could be improved. Several design issues were immediately apparent, and others emerged through a detailed analysis of the medication use system. In the course of this investigation we discovered that the label design was constrained by several interrelated processes. Stakeholders at each of the stages of medication ordering, preparation, distribution, and administration have different information needs and, as a result,