

USING VISUAL LANGUAGE TO REDUCE
PATIENT BARRIERS AND MEDICATION ERRORS

A Thesis

Presented to the School of Visual Communication Design,
College of Communication and Information,
Kent State University

In Partial Fulfillment
of the Requirements for the Degree
Master of Fine Arts

by

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October 2022

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ABSTRACT

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The prescription label remains a vital tool of written communication for the medical community to use to remind patients to take their medications and instruct them on how and when to do so. There is a need for patient-centered labels due to concerns that misinterpretations of instructions have been caused by current prescription labels. This study proposes a redesign of pharmaceutical labels that would provide patients with significantly more clarity than the current standard label. The proposed redesign would include improved font sizes, a hierarchy of streamlined label information, a shift in the label's direction, and improved typography. This study shows that, compared to the current standard prescription label, the redesigned, patient-centered prescription label performed significantly better in terms of patient understanding of the instructions and functional health literacy. Additionally, a straightforward label-focused educational intervention significantly outperformed current standard prescription labels in improving both outcomes. Therefore, I assert that a redesigned, patient-centered label be combined with verbal and visual label-focused educational interventions to improve patient adherence to medication regimens prescribed by their healthcare provider.

Keywords: Functional Health Literacy, Educational Intervention, Visual Language

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ACKNOWLEDGEMENTS

First and foremost, I am incredibly grateful to my thesis advisor, Associate Professor Aoife Mooney, and my thesis committee, Associate Professor Sanda Katila, and Associate Professor David Roll, for their invaluable advice, continuous support, and patience during my graduate school study. Their immense knowledge and plentiful experience have encouraged me throughout my academic research and daily life.

I would also like to thank Daniel Alenquer, Director of the School of Visual Communication Design, and his excellent support staff, Anita Francisco, and Chris Campbell, for their technical support and encouragement.

I thank all the full and part-time educators in the School of Visual Communication Design. Their kind help and support have made my study and work life at Kent State University a wonderful time.

Finally, I would like to express my gratitude to my father, Bobby Haller; my mother, Joan Carey-Haller; my sister Elizabeth Haller, Ph.D.; and my nephew Samuel Tucker. Without their tremendous understanding, encouragement, and financial support over the past few years, it would be nearly impossible for me to complete my study. But, most importantly, I want to thank my mother for her love and support; a single grain of sand—she will know what this means.

CHAPTER 1

INTRODUCTION

It's Just a Label ... Right?

Prescription labels are an integral part of our life, and like millions of other individuals, I took them for granted. In 2019, an estimated 5.3 million Americans filled their prescriptions at retail prescription pharmacies.¹ Like many Americans, I never paid much attention to the label other than looking at what medicine I was taking and how often I should take it. I never even looked to see if the medication had my name on it to verify that it was prescribed to me. However, all of that changed during the late summer of 2007.

I recently moved from Michigan to Ohio and was offered a full-time position as a customer service representative at the centralized call center of a national trucking company. Every call was recorded, every keystroke was analyzed for notetaking efficiency, and every key performance indicator was reviewed and analyzed by a team of quality assurance personnel. Not a moment of an employee's paid time on the clock was wasted, lest one be written up for theft of company time. Employees were only allowed one 7-minute bathroom break outside of the two allotted 15-minutes breaks per 8-hour shift and a 30-minute lunch. All this is to say that when my supervisor stood by my desk

¹ "Number of Retail Prescription Drugs Filled at Pharmacies by Payer," Number of Retail Prescription Drugs Filled at Pharmacies by Payer, March 5, 2020, <https://www.kff.org/health-costs/state-indicator/total-retail-rx-drugs/>.

and asked me to log out after I completed my call and meet with her in her office, I was reasonably certain it wasn't going to be good news. Turns out that I was right, but not in any way that I may have expected.

Upon entering my supervisor's office, I was asked to sit down, and the door was closed behind me. My supervisor told me that I had a personal phone call, and after she reminded me that personal phone calls are not acceptable at work, she indicated that the caller insisted on speaking with me and said that it was an emergency. My supervisor took the call off hold and handed the receiver to me. On the other end of the line was my mother. Her voice was audibly very distraught, and she asked how soon I could get back to Michigan. I let her know it was at least a four-hour drive, but I wouldn't be able to leave until I finished my shift. My 74-year-old mother held back tears as she explained that just a few moments prior her doctor informed her that she had stage-three or four cancer of her thyroid, and because of its acute nature, she was being prepped for surgery to have her thyroid removed.

The next 24 hours of my family's life were complete chaos. Cancer would rule my mother's life for the unforeseeable future, as she would go on to fight four different types of cancer over the next fifteen years. From that moment on, my mother's days have been ruled by a steady flow of prescription drugs to keep her alive.

Piece by piece, my mother put her life back together so that it would have some semblance of the "normal" life she led before cancer became part of her everyday vocabulary. Then, in 2017, my mother began losing her eyesight to macular degeneration (an eye disease that causes central vision loss), drusen (tiny yellow or white cellular material that builds up around the retina), and a fractured retina that was torn during

surgery to remove a cataract. As a result, to see, my mother must move her head up and down and side to side in such a way that she can catch a glimpse of a person or object in her peripheral vision. No longer able to look at or see anything directly, my mother, a professional artist specializing in acrylics, was forced to give up the one thing in her life that gave her so much joy – to capture the essence of a person through portraiture. For several years, my mother visited an ophthalmologist each month who specialized in low vision and macular degeneration to receive injections directly into her eye to arrest her failing eyesight. At one of these lengthy appointments, my mother wasn't sure if she had taken one of her medications that morning, and she became frustrated trying to read the label on the prescription bottle through her peripheral vision. A gentleman on the other side of the waiting room, one of two waiting areas at this large clinic, saw her frustration and, to lighten the mood, said, "Isn't getting old a bitch?" Several people in the room chuckled, and each began to share personal stories of the challenges they face with low vision and macular degeneration. I asked my mother if I could help her, and she handed her prescription bottle to me. Looking at the label, I struggled to pronounce the drug's name and find the dosage. In that instant, I felt an overwhelming empathy for my mother and those around us in that room who were losing or had lost their eyesight. If I, an able-bodied person with regular vision, had such difficulty locating significant information like dosage on the prescription label then I could only imagine what my mother and these individuals were going through each time they received a prescription.

During this brief conversation at the doctor's office, I looked around me and realized that at each monthly visit both waiting rooms and several examination rooms were always filled with patients throughout the day. All of these patients were diagnosed

with macular degeneration or low vision and struggled daily to see and read everything around them. It suddenly struck me that there must be millions of people in the world who cannot read the significant details on their prescription labels like dosage, relevant time intervals, directions regarding food consumption, the name of the medication, temperature restrictions, and the number of refills. What if a person confused “one-half tablet twice a day” with “one and a half tablets twice a day”? Depending on the medication, it could lead to serious complications and even death. Did you ever stop to think that the label on your prescription bottle could kill you? I know that I never did, but I was beginning to think it could. I recalled how I have sat and watched several times as my mother brought a prescription bottle close to her eyes and moved her head to see while she rolled the bottle back and forth to read the entirety of the label. My mother and I have worked through medication errors (she was once mistakenly given someone else’s medication), and she has struggled with missed doses, wrong dosage forms, wrong time intervals, and the like. I would later find out through the research that contributed to my wanting to pursue this study that medication errors are responsible for significant morbidity, mortality, and cost every year. This brief instant of time in a doctor’s waiting room was a seminal moment in my life. I wondered if and how a newly designed prescription label could make it easier for low-vision individuals to see, comprehend, and adhere to their prescriptions more readily.

The Problem

The World Health Organization (WHO) estimates that there are over 200 barriers that limit a patient's ability to take their medication correctly.² Of these, prescription drug barriers range in complexity from confusing clinical phrasing on the prescription label to the patient failing to remember to refrigerate temperature-sensitive medications.

The present research shows that there has been a longstanding need to reexamine the design and effectiveness of prescription labels to be more patient friendly. A 2011 study of prescription labels reaffirmed the need for a patient-centered approach to prescription drug labels that examines font size and the use of white space on labels.³ In ten Brazilian capital cities, 6,255 medication users, 18 years or older, were evaluated for their ability to comprehend or read prescription labels; more than half found it difficult or very difficult to read (50.8%) or understand (52.0%) the prescription label.⁴ The United States Food and Drug Administration (FDA), per Title 21 of the Code of Federal Regulations, Chapter 1, Subchapter C, Subpart B, §201.56, discusses federal requirements for prescription drug labeling and yet, confoundedly, makes no provision at all for the label's readability.⁵

² Eduardo Sabaté and World Health Organization, eds., *Adherence to Long-Term Therapies: Evidence for Action* (Geneva: World Health Organization, 2003).

³ Amir H Zargarzadeh and Anandi V Law, "Design and Test of Preference for a New Prescription Medication Label," *International Journal of Clinical Pharmacy* 33, no. 2 (April 2011): 252–59, <https://doi.org/10.1007/s11096-011-9488-z>.

⁴ Emilia da Silva Pons et al., "Users' Preferences and Perceptions of the Comprehensibility and Readability of Medication Labels," *PloS One* 14, no. 2 (February 22, 2019): e0212173, <https://doi.org/10.1371/journal.pone.0212173>.

⁵ "Code of Federal Regulations Title 21," Pub. L. No. Title 21—Food and Drugs, § Subpart B—Labeling Requirements for Prescription Drug and/or Insulin, 201.1 to 201.328 201, accessed March 7, 2020, <https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=201.56>.

In 2012, the National Association of Boards of Pharmacy “passed a resolution supporting state boards in requiring a standardized prescription container label.”⁶ In 2013, the United States Pharmacopeia (USP), released a set of prescription label standards that included a patient-centered design. However, according to the USP, enforcement of the standards is up to individual state boards of pharmacy. Sadly, as of the writing of this study, Utah is the only state to have adopted these standards.⁷

Given the numerous barriers that the WHO recognizes as limiting a person’s ability to take prescription medications correctly, the goal of this study is to create a patient-centered prescription label (a label designed from the patient’s perspective) that employs visual language to reduce the main causes of medication errors. Visual language is a type of communication that conveys meaning or an idea using visual features rather than traditional written language. This study also seeks to work with currently available, affordable methods and products to achieve a wider acceptance of the patient-centered design approach so that patient outcomes are not dependent on market whims. Poor construction of prescription labels can adversely affect patient safety and adherence to instructions by inhibiting the patients’ ability to recognize and understand essential messages about their medications. Such research highlights the need to examine further how prescription labels can better convey drug information to patients.

⁶ Michael J Romano et al., “Report of the Task Force on Uniform Prescription Labeling Requirements,” National Association of Boards of Pharmacy, December 2008, <https://nabp.pharmacy/wp-content/uploads/2021/07/2008-2009-Uniform-Prescription-Labeling-Requirements.pdf>.

⁷ Roger Williams et al., *USP 36-NF 31: The United States Pharmacopeia, The National Formulary*, vol. 1, 3 vols. (Rockville, Md.: United States Pharmacopeial Convention, 2013).

Visual Communication of a Prescription Label

According to a report published by the National Academy of Medicine in 2006, there are approximately 1.5 million preventable medication errors that occur each year. Approximately one-third of those errors occurred outside of hospitals, where patients are responsible for their own care and must rely on their own ability to read and follow the directions on the labels of their medication containers.⁸ It is essential to reiterate, for the sake of emphasis, that studies have found that close to half a million adults in outpatient settings misunderstand at least some of the instructions that are printed on the labels of their medication bottles. For instance, a study published in 2007 in the journal *Patient Education and Counseling* discovered that one-third of patients were unaware that the instruction to “take two tablets by mouth twice daily” meant to consume a total of four pills within a period of twenty-four hours.⁹ Patients are, instead, better able to understand more specific dosing instructions such as “Take one tablet in the morning, and one at 5 p.m.” as opposed to the more general “Take two tablets by mouth twice daily.”

This thesis posits that in a population with limited reading skills, either through low-vision or low-literacy, the inclusion of visual language on prescription labels, improved typography, and label orientation on the bottle should produce a positive influence upon a patient’s understanding of instructions and their adherence to prescription drug therapy. This influence would be favorable because the inclusion of visual language on prescription labels should yield the best influence upon a patient’s

⁸ Philip Aspden et al., *Preventing Medication Errors* (Washington, DC: National Academies Press, 2007), <http://docs.bib.umontreal.ca/monos/preventingmedication.pdf>.

⁹ Michael S. Wolf et al., “To Err Is Human: Patient Misinterpretations of Prescription Drug Label Instructions,” *Patient Education and Counseling*, 2007, <https://doi.org/10.1016/j.pec.2007.03.024>.

understanding of instructions and their adherence to prescription drug therapy. The research conducted for this thesis study focused on and investigated only one specific barrier of the multifaceted issue of inadequate adherence to prescribed medication, which is the inability to read or comprehend a prescription label. In addition, this research did not consider the influence that could be exerted by any other potential factors. However, the inclusion of visual language on prescription labels should have a considerably positive influence on understanding of instructions and on adherence to prescription drug therapy.

In this thesis I analyze patient prescription labels and consider the efficacy of their visual language (typography, hierarchy, etc.). I also look at case studies of patients' ability to read and understand dosing instructions and visual language to help build upon a patient-centered label. I concentrated my approach on paper prototyping to test and observe human interaction with patient-centered prescription labels. Paper prototyping is the process of creating concepts and designs using hand-drawn labels that resemble, in this case, labels on prescription bottles. Instead of testing a practical label on a real prescription bottle, paper prototypes focus on a high-level user experience. Paper prototyping also allows for rapid evaluation and testing to quickly introduce patient refinements that address usability. Through the critical practice of paper prototyping, I produced a prescription label artifact that incorporated visual language through a patient-centered approach.

I incorporated a two-phase paper prototype approach to look at how prescription labels can better convey information to the consumer (i.e., patient). Previous prescription label studies have shown that patients want improved arrangement of label information,

the use of relatively large font sizes, color schemes, and the inclusion of warnings and safeguards on the label. In the first phase of my approach, I designed a patient-centered label prototype that incorporates visual language and meets the USP's recommendations on labeling. In the second phase, based on response to the earlier prototype, the redesigned label prototype was used to test patient understanding and functional health literacy (FHL), defined as an individual's ability to read, understand, and act on health information.

CHAPTER 2

LITERATURE REVIEW

Prescription Labels and Health Literacy

Prescription labels are vital because they are a point of communication for users of the medication. The efficacy of a prescription label depends on several patient and label variables for safe drug use. User variables include the ability of the user to read, comprehend, and apply label instructions relevant to their FHL. Label variables include the quality and intelligibility of information that should be readily accessible and understandable and require the user's minimal cognitive effort.

FHL is crucial in making informed health decisions. It is reported that about 90 million adults (over a third of English-speaking adults in the United States) have a limited FHL. Limited FHL has been linked to poor health habits and outcomes, with a yearly financial impact of \$73 billion.¹⁰ The design of labels to improve usability has inherent limitations. Among those limitations is the use of small font size, which decreases readability; avoiding a high-level FHL to understand difficulty levels of text while still getting the point across; avoiding a lack of message clarity; hierarchical simplification of confusing formats; and the goal to prevent the use of auxiliary labels. Misunderstanding prescription label instructions has resulted in accidental patient-initiated medication use

¹⁰ Mark Kutner et al., *The Health Literacy of America's Adults: Results from the 2003 National Assessment of Adult Literacy*. NCES 2006-483, National Center for Education Statistics (ED Pubs, P, 2006), <https://eric.ed.gov/?id=ED493284>.

errors such as under or overdose resulting in preventable patient harm, hospital visits, and hospitalizations. The National Academy of Medicine has cited this as the cause of a significant percentage of outpatient prescription failures and adverse drug incidents.¹¹ Independently and collectively, these two factors can affect the understanding, utility, and appropriate use of prescription medication, which is of particular concern given the increasing dependence of older adults on multiple prescription medications to manage their chronic health issues. An attempt to enhance label understanding and use must then address label clarity and understanding as well as the FHL of patients.

Previous attempts to develop FHL have recorded mixed results. Although educational achievement is generally stable after adulthood, Von Wagner et al. suggested that a person's health literacy may increase, for example, through experiences with peers or medical professionals.¹² In addition, improving medical counseling by improved communication techniques focused on literacy is also likely to minimize health-related problems.¹³ In 2010, the Health Literacy Universal Precautions were commissioned and designed by the Agency for Healthcare Research and Quality (AHRQ) to continue improving healthcare services for individuals with reduced health literacy; however, further testing is needed to document outcomes.

¹¹ Aspden et al., *Preventing Medication Errors*.

¹² Christian Von Wagner et al., "Health Literacy and Health Actions: A Review and a Framework from Health Psychology," *Health Education & Behavior* 36, no. 5 (2009): 860–77, <https://doi.org/10.1177/1090198108322819>.

¹³ Nithushi R. Samaranayake, Wasana GRSK Bandara, and Chinthana MGA Manchanayake, "A Narrative Review on Do's and Don'ts in Prescription Label Writing—Lessons for Pharmacists," *Integrated Pharmacy Research and Practice* 7 (June 13, 2018): 53–66, <https://doi.org/10.2147/IPRP.S163968>.

Additionally, efforts have been made to improve the comprehension of the prescription label by focusing primarily on modifying the label, with minimal success in low FHL populations. Studies performed with the use of teach-back methods (checking comprehension by asking patients to indicate in their own words what they must know or do about their health) in other medical data were difficult for low-literacy individuals. Attempts have also been made to help patients better understand prescription labels, including labeling information in plain words using lack of jargon. Nevertheless, none of these attempts have empirically been shown to demonstrate an increase in patients' FHL. The two-phased approach I incorporated in this thesis study responds to these concerns.

Short Test of Functional Health Literacy

The National Adult Literacy Survey found in 1993 that over 40 million adult Americans were functionally illiterate, indicating that they were unable to perform the fundamental reading tasks needed to function in society. Another 50 million had marginal reading skills.¹⁴ These individuals are likely to have significant difficulties with regular reading criteria as they encounter the health care system, such as reading prescription labels, appointment slips, self-care instructions, and brochures for health education. It is necessary to identify individuals with reduced reading abilities so that they can obtain special medication and chronic disease management instructions (e.g., glucose monitoring information for patients with diabetes).

¹⁴ "National Adult Literacy Center Established at Harvard Graduate School of Education," Harvard Graduate School of Education, accessed November 12, 2022, <https://www.gse.harvard.edu/news/national-adult-literacy-center-established-harvard-graduate-school-education>.

The Test of Functional Health Literacy in Adults (TOFHLA) was developed in 1995 to assess a patient's ability to read and comprehend the items they often face in the health care system.¹⁵ The test used samples of authentic materials such as medicine bottles and appointment reminder slips (i.e., health literacy). Previous readability tests, like the Rapid Estimate of Adult Literacy in Medicine (REALM), evaluated just the capacity to read and say a set of words correctly. The TOFHLA is a more precise measurement of a patient's reading capacity since it tests comprehension, along with the ability to read and interpret both narrative/prose passages and numerical details. In a study conducted at two public hospitals using the TOFHLA, it was found that one-third of English-speaking patients could not read the most basic health-related materials.¹⁶ This study also noted that a prevalence of low literacy was significantly greater among senior citizens.

Other research has also shown that, as measured by TOFHLA, patients with low FHL have a decreased understanding of chronic illnesses and self-management.¹⁷ Low FHL indicates that existing educational interventions for this community are less effective. Patients with insufficient practical health literacy were less likely to know the necessary information about their condition (e.g., the range for normal blood glucose levels, low blood sugar symptoms). They were also less likely to know aspects of their

¹⁵ Ruth M. Parker and David W. Baker, et. al. (1995). "The Test of Functional Health Literacy in Adults: A new instrument for measuring patients' literacy skills". *Journal of General Internal Medicine*, 10, 537-541.

¹⁶ David W Baker et al., "Development of a Brief Test to Measure Functional Health Literacy," *Patient Education and Counseling* 38, no. 1 (September 1, 1999): 33-42, [https://doi.org/10.1016/S0738-3991\(98\)00116-5](https://doi.org/10.1016/S0738-3991(98)00116-5).

¹⁷ Baker et al.

treatment plan, despite attending an additional set of diabetes education courses (e.g., what to do if they developed symptoms of hypoglycemia). Likewise, people with hypertension and low FHL are much less likely to know simple facts about hypertension (e.g., normal blood pressure) and much less likely to understand what foods have high sodium levels. Those with insufficient FHL may be detected by screening patients with a chronic illness before educational services. Providing these patients with special assistance can improve their capacity to manage their medical conditions. While the original TOFHLA is an important method for identifying people with insufficient FHL, its administration takes up to twenty-two minutes.

The simplified TOFHLA (S-TOFHLA) created in 1999, however, takes less time to administer, tends to be just as reliably consistent, and is just as good a predictor of a patients' ability to read the items they are likely to encounter in a healthcare setting (i.e., health literacy). However, Baker et al. established that more research is required in a broader, more diverse population to confirm this high reliability.¹⁸ Comparing S-TOFHLA and REALM (0.80%) in the initial research analysis was marginally lower than the correlation between TOFHLA and REALM (0.84 %). The S-TOFHLA, therefore, has comparable validity and reliability to the complete TOFHLA. It is more practical as well since it takes a maximum of twelve minutes instead of twenty-two to complete. While the average administration time can vary depending on the population's ability to read, the average administration time for most groups should be significantly less than ten minutes. It is also easier to administer the numeracy items chosen for the S-TOFHLA than the full

¹⁸ Baker et al.

battery of questions in the TOFHLA, because it is less subjective when scoring correct answers.

LaRue Medical Literacy Exercises

The LaRue Medical Literacy Exercises were developed by Charles LaRue in 2004, under the direction of the Minnesota Literacy Council through a grant from the Minnesota Department of Children, Families, and Learning. LaRue developed this and several other learning assessment tools for an English as a Second Language (ESL) class that he taught in Minnesota (see Appendix A). These exercises were not meant to test the functional health literacy of an individual but rather to teach students in the class whose native language was not English how to read their prescription labels, showing the medical literacy skills and level of knowledge in ESL that the students possessed. The original LaRue Medical Literacy Exercises consisted of four sections that included pre-test and post-test quizzes (see Appendices B, C, and D). The sections included: prescription labels, over-the-counter labels, special warning labels, and side effects. The original LaRue Medical Literacy Exercises tested the understanding of prescription labels before and after an educational intervention (see Appendix E).

Since its creation, the LaRue Medical Literacy Exercise has been modified significantly and is now called the Modified LaRue Tool (MLT). It is conducted to test the understanding of prescription labels by participants and consists of 25 open-ended and multiple-choice questions in total. These questions evaluate critical components of prescription literacy such as the name of the medication, dosage direction, indication, prescription refill number, expiration date, and drug quantity. For the MLT, prescription bottles with labels for five frequently prescribed drugs simulate real-life environments.

CHAPTER 3

BACKGROUND

The Theft of Vision Among an Aging Population

Macular degeneration is the degeneration of the macula (an oval shaped area near the center of the retina at the back of the eye) that is categorized as being either wet or dry. Dry macular degeneration does not involve the secretion of blood or serum into the interior of the eye, while wet macular degeneration does; in either case, a person's vision is affected. The American Macular Degeneration Foundation estimates that 85-90% of macular degeneration is of the dry variety.¹⁹ As parts of the macula begin to die or degrade, a person is robbed of the vision at the center of their eye, leaving a blank black spot in the center of their vision. More and more, a person with macular degeneration will rely on their peripheral vision, which is seldom affected.

At present, there is no cure for macular degeneration, only the possibility of slowing its progression. In America, macular degeneration is now the leading cause of vision-loss for people aged 60 and older.²⁰ In 2009 it was estimated that in the United States 11 million people had age-related macular degeneration, and this number was

¹⁹ "Dry Age-Related Macular Degeneration - AMDF," *American Macular Degeneration Foundation* (blog), accessed June 19, 2021, <https://www.macular.org/dry-amd>.

²⁰ National Eye Institute, "Age-Related Macular Degeneration (AMD) Data and Statistics," July 2019, <https://www.nei.nih.gov/learn-about-eye-health/resources-for-health-educators/eye-health-data-and-statistics/age-related-macular-degeneration-amd-data-and-statistics>.

expected to double to nearly 22 million by the year 2050.²¹ However, these numbers are on the rise, as evidenced in a 2014 study by Wan Ling Wong, et al. that estimated 196 million people worldwide would be living with macular degeneration by the year 2020 and 288 million by 2050.²²

The ClearRx Medication System

When my mother was diagnosed in 2017 with dry age-related macular degeneration (AMD), we consulted with a vision specialist at the Akron Blind Center in Akron, Ohio, who worked with the blind and legally blind. Through this specialist we learned of graphic designer Deborah Adler's contributions to redesigning prescription labels and prescription bottles for the Target Corporation.

The familiar amber pill bottle we receive from a pharmacy has changed little since World War II, sans the addition of a childproof cap in the 1970s and a few attempts to improve upon the prescription label itself.²³ Historically, for the most part, prescription labels have a very poor hierarchy, making it difficult for patients to find critical information (see Figure 1). Most labels have the patient's name at the top followed by their address and then the dosage instructions. Most prominent on prescription labels is the pharmacy logo, making it the most important feature of the label. These poorly designed labels make it appear as if all the information aside from the logo is equally

²¹ David B. Rein et al., "Forecasting Age-Related Macular Degeneration Through the Year 2050: The Potential Impact of New Treatments," *Archives of Ophthalmology* 127, no. 4 (April 1, 2009): 533, <https://doi.org/10.1001/archophthalmol.2009.58>.

²² Wan Ling Wong et al., "Global Prevalence of Age-Related Macular Degeneration and Disease Burden Projection for 2020 and 2040: A Systematic Review and Meta-Analysis," *The Lancet Global Health* 2, no. 2 (February 1, 2014): e106–16, [https://doi.org/10.1016/S2214-109X\(13\)70145-1](https://doi.org/10.1016/S2214-109X(13)70145-1).

²³ Sarah Bernard, "A School of Visual Arts Grad Remakes the Pill Bottle - Nymag," *New York Magazine*, April 7, 2005, <https://nymag.com/nymetro/health/features/11700/>.

important, and it is not. There is no intuition to understanding the label without taking a moment to reason with its hierarchy. There must be instinctual intuitiveness to the prescription label, or it is difficult for people to understand it clearly.



Figure 1. Examples of poorly designed prescription labels.
(Davis + Star. In “The Perfect Prescription.” *New York Magazine*. 2005. Accessed October 13, 2020. <https://nymag.com/nymetro/health/features/11700/>.)

In the summer of 2001, Adler, who would go on to receive her MFA from the School of Visual Arts (SVA) in New York in 2002, studying with Milton Glaser in the Designer as Author degree program, became aware that her grandmother had mistakenly taken her grandfather’s medication. Both of Adler’s grandparents shared the same initials, H. Adler, and both of their prescriptions and prescription labels appeared to be identical except for the dosages. As a granddaughter, Adler was rightfully concerned about her grandparents’ health and safety. At the same time, as a designer, Adler saw a problem in need of a solution.

The National Coordinating Council for Medication Error Reporting and Prevention defines a medication error as “any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the

healthcare professional, patient, or consumer”.²⁴ Death, life-threatening situations, hospitalization, disability, and congenital disabilities are only a few of the incredibly harmful results from more than 100,000 U.S. reports each year associated with a suspected medication error.²⁵ Inspired by her grandmother taking the wrong prescription medicine, Adler began developing a new medication system that would make it easy for people to know how to take their medications safely.

While at SVA, she undertook a monumental thesis project to redesign the system and container for prescription medicinal products. The SVA Design as Author program requires students to create an idea that can be effectively launched in the marketplace. Adler developed the SafeRX prescription system, which eventually became the ClearRx Medication System when the Target Corporation adopted it into all their pharmacies.

Adler identified a crucial problem inherent in prescription drug therapy and eventually brought the ClearRx Medication System to the market. In an interview with Lilly Smith for the American Institute of Graphic Arts (AIGA) Women Lead, Adler explains how she,

... turned to the situation that my grandmother was facing. She had accidentally taken my grandfather’s medication. When I dug a bit deeper, I quickly realized that she was not alone when it comes to making medication errors, and that as a designer, I could address this issue in ways that doctors and pharmacists could not. So I decided to rethink the prescription pill bottle and label for my thesis and

²⁴ “Working to Reduce Medication Errors,” Government, U.S. Food and Drug Administration (FDA, August 23, 2019), <https://www.fda.gov/drugs/drug-information-consumers/working-reduce-medication-errors>.

²⁵ “Working to Reduce Medication Errors.”

developed a new system for prescription medicine that made it easier for people to understand.²⁶

The look and feel are crucial to any successful design and are equally important as functionality and aesthetics. Adler is a designer and an inventor, and she found a problem that a pharmacist or healthcare worker could not fix, but a design solution could.

Adler brought prototypes from her SafeRX System to the FDA with the ambitious hope of making it a federal standard. The FDA was supportive of the approach, but their hands were bound because each state has its own pharmacy board that can either choose to accept or reject standards. Additionally, the FDA does not regulate the layout of prescription labels. To overcome this federal obstacle, Adler believed the best way to bring this system to market would be through a nationally trusted pharmacy; that is when she contacted the Target Corporation.

Working together, Adler and the Target Corporation (with refinements by designer Klaus Rosburg of Industrial Design) released in 2005 the ClearRx Medication System for use in all their in-store pharmacies. The ClearRx Medication System included an entire packaging system with a new shape for the prescription bottle, the label's redesign, and color-coded rings to identify family members. It also included the optional addition of a plastic magnifying lens for low-vision people that could slide in and out of a pocket on the bottle.

²⁶ Lilly Smith, "Women Lead Supporter Interview Series: Deborah Adler," AIGA: The Professional Association for Design, accessed October 13, 2020, <https://www.aiga.org/women-lead-supporter-interview-series-deborah-adler>.



Figure 2. ClearRx Medication System

(Adler, Deborah, and Klaus Rosburg. *ClearRx Medication System*. In *Communication Arts*. 2005. Accessed on October 14, 2020. <https://www.commarts.com/project/6024/target-clear-rx.>)

The ClearRx Medication System in Figure 2 highlights the inclusion of a much better hierarchy of information on the prescription label. The bottle's top and front makes the name of the medication the primary hierarchical focus, the purpose of the prescription and how to administer it is now secondary, and the patient's name is tertiary. The logo is moved out of the way to the bottom of the label because it is more important to know how to take the medication and not where the prescription was filled.

What began as a graduate thesis project and prototypes turned into something much more than Adler ever expected. Her work received many accolades as Target pharmacists on the front lines began to dispense the new ClearRx Medication System. She and the Target Corporation received a thank you letter from the U.S. Surgeon General for their enormous contribution toward improving Americans' health. In 2004, Adler and Rosburg received an installation showing in the Museum of Modern Art

entitled the Target ClearRx Prescription System.²⁷ Adler believed that design mattered, and the public and the design community widely accepted the new system.

In an interview with Microsoft's Bill Buxton at Microsoft's MIX09 in Las Vegas, Nevada, on March 19, 2009, Adler said that when she set out to redesign the label,

My goal was to give the consumer more confidence and security when taking their medications, and I did this by understanding information architecture and combining it with my own intuition as well as pre-existing cognitive schemas. And that is to say that if I were to give all of you in the room five points on how to take your drugs – what the name of the drug is, how to take it, the quantity, the doctor's name, etc. – probably about 60 percent of you would put the first three in the same order. It's just a cognitive schema that you're already used to and that is pretty intuitive.²⁸

Adler's prescription label, see Figure 3, was intentionally created to help patients process the information on the label efficiently and with greater accuracy. Adler's label removed distracting information and transformed the cognitive reflective task (a task requiring great thought and effort) of reading poorly designed and problematic labels into an easier experiential task (a perceptive reaction to the items and events around us that is performed with ease). The redesigned label is much more intuitive in its patient-centered design. The label now takes on the patient's perspective instead of that of a pharmacist or physician. The new label divides into primary, secondary, and tertiary levels of information. The primary information of most importance to a patient is the medication's name, its purpose, dosage, and how it is taken. Of secondary importance to the patient is

²⁷ "Deborah Adler, Klaus Rosburg. Target ClearRx Prescription System. 2004 | MoMA," The Museum of Modern Art, accessed October 15, 2020, <https://www.moma.org/collection/works/94534>.

²⁸ Bill Buxton, "Deborah Adler: MIX09," Corporate, Microsoft Stories, March 19, 2009, <https://news.microsoft.com/2009/03/19/deborah-adler-mix09/>.

the quantity of medication included, if the prescription is refillable, the prescribing physician's name, the date the prescription was filled, the manufacturer, and the National Drug Code (NDC) refill number. Of tertiary importance to the patient are the pharmacy contact phone number, RX number, and the dispensing pharmacy's name.

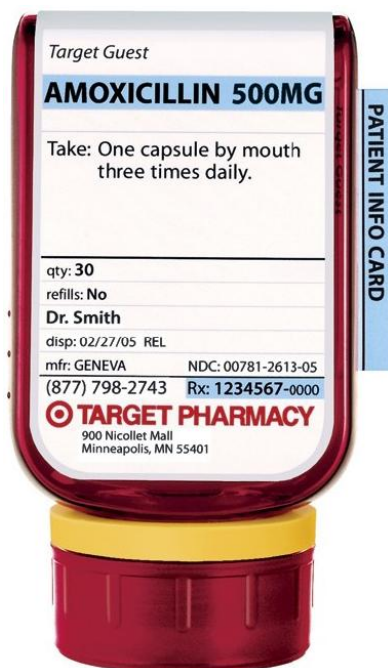


Figure 3. ClearRx Medication System (close-up)
(Adler, Deborah, and Klaus Rosburg. *ClearRx Medication System*. In *Communication Arts*. 2005.
Accessed on October 14, 2020. <https://www.commart.com/project/6024/target-clear-rx>)

Most of the bothersome issues with the typical amber prescription bottle and label were resolved by Target's 2005 roll out of the ClearRx Medication System. However, in 2012, when CVS Health acquired the Target pharmacies, the ClearRx Medication System, consisting of the newly created prescription labels and the distinctively shaped red prescription container, was discontinued. CVS spokesperson Carolyn Castel told Tom Murphy of the Associated Press, that "The company [CVS] stopped using Minneapolis-based Target Corp.'s bottles because it's more efficient to fill prescriptions with the same

bottle at all of its 9,600 pharmacies.”²⁹ Castel opted not to provide further information or comment on whether a new bottle design would replace the now beloved red pill bottle designed by Adler. In 2016, Target unveiled its rebranding of the new CVS Pharmacy within its stores, and in 2018, they revealed their new prescription bottle and label, which brought back the familiar amber prescription bottle and a redesigned label.

Cognitive Artifacts and Alternative Representations

As human beings, we have invented various artifacts to aid us in cognitively processing information. The prescription label is a physical artifact that aids approximately 131 million people in the United States to manage their healthcare.³⁰ Upon its inception in the early 1800s, printed labels for products became widely used. The same prescription information that is present on pharmacy labels today was frequently included on them, including how often and how much of the medication to take. Even as early as the 1800s prescription labels improved the thought or action tied to the artifact. However, as technology has developed, the prescription label artifact has not; it has remained fundamentally unchanged for decades. It wasn’t until 2005, with Adler’s design initiative and invention, that the prescription label moved toward a patient-centered artifact instead of an industry-centered artifact (a label designed from the perspective of physicians and pharmacists).

Professor Ruth S. Day of Duke University conducted a research study in 1988 that examined the cognitive accessibility of drug information. In an experiment that looked at

²⁹ Tom Murphy, “Unhappy Target Customers Send Strong Message on Pill Bottles,” AP News, September 27, 2016, <https://apnews.com/article/e4df7308887842359143aa111effec29>.

³⁰ Emily Ihara, “Prescription Drugs,” Academic, Health Policy Institute, 2003, <https://hpi.georgetown.edu/rxdrugs/>.

the alternative representations of medication schedules, Day reflected on the medication schedule of a patient hospitalized for a mild stroke. Table 1 is the patient's medication schedule written in a list format by the patient's physician.

LIST FORMAT
Inderal — 1 tablet 3 times a day
Lanoxin — 1 tablet every a.m.
Carafate — 1 tablet before meals and at bedtime
Zantac — 1 tablet every 12 hours (twice a day)
Quinaglute — 1 tablet 4 times a day
Coumadin — 1 tablet a day

Table 1. Medication schedule for an actual patient. It is displayed in the list format, exactly as written by the physician.
(Day 1988)

This list of medications is written from a physician's perspective and not from a patient-centered perspective; it is not a clear set of instructions to follow. After speaking with the patient, Day reported that over the previous few days:

... he had difficulty remembering what pills to take, as well as what pills he had already taken. It would be easy to blame the patient; after all, he was 81 years old and had just had a stroke. However, he was highly intelligent, was still working full time (and had even begun a new and demanding career a few years earlier), was not otherwise disoriented, and was highly motivated to return to work and an active lifestyle.³¹

The wording on this list of prescription medications is like the format used on most prescription labels in the United States. While it is seemingly straightforward in its reading, including precise information for all medications, it is written from a physician's

³¹ Ruth S. Day, *The Psychology of Learning and Motivation: Advances in Research and Theory*, ed. Gordon H Bower, First, vol. 22 (Academic Press, 1988), <http://site.ebrary.com/id/10235997>.

and pharmacist's industry-centered perspective. This cognitive artifact is a representative written list of medications for a patient, including the name of the medicine, the dosage, and the time intervals, making it easy for a physician and pharmacist to meet the patient's basic prescription needs. However, there is no clear structure, no logical hierarchical organization to the listing. This artifact does not represent the patient's needs, who could better understand and follow a list of medications organized by time, as in the matrix format in Table 2.

MATRIX FORMAT				
	BREAKFAST	LUNCH	DINNER	BEDTIME
Inderal	✓	✓	✓	
Lanoxin	✓			
Carafate	✓	✓	✓	✓
Zantac		✓		✓
Quinaglute	✓	✓	✓	✓
Coumadin				✓

Table 2. Matrix representation for the same medication schedule shown in Table 1. (Day 1988)

Day tested the usability between the list format and the matrix format by asking participants in her research study to answer two questions:

1. It is lunchtime (noon). Which pills should you take?
2. If you leave home in the afternoon and will not be back until breakfast time the next day, how many pills of each type should you take along?

It is not easy to answer these questions from the list format in Table 1 because each requires a patient to perform a reflective cognitive task. However, the matrix format in Table 2 makes it much easier to answer both questions because the matrix list requires a

patient to perform an experiential task that is more focused and freer from distracting interruptions of cognition.

A matrix is a much more elegant solution for organizing medications by name and time of day rather than by a rigid list organized by a single factor – in this case, the medication's name. A matrix is likely to be superior if many different needs must be met. The matrix format allows users to easily scan the list using whichever starting point they prefer. This simple change in the artifact's representation transforms it from a problematic reflective task to an easier experiential task. Day's experiment confirmed that a matrix was easier to understand cognitively and allowed for a much more accurate interpretation and execution of the prescription. Day also consulted with the doctor who prepared the original list, and he confirmed that the matrix satisfied his original intentions.³² Once again, by translating the task from reflective to experiential, the more effective cognitive artifact helps simplify the operations that must be performed to achieve the desired response and shifts the balance from an industry-centered perspective to a patient-centered perspective.

³² Day.

CHAPTER 4

BUILDING THE PRESCRIPTION LABEL

Issues With Hierarchical Structure

To identify the proper hierarchical structure of elements on a prescription label to ensure its patient-centered viability, the following factors must be considered: styling and location, priority of information, figure necessity and ambiguity, text positioning, and typography.

The styling and location of information on a prescription label varies from pharmacy to pharmacy. The way patients perceive user information on over the counter and prescription medications is key to successfully following a medical treatment plan and achieving suitable health outcomes. Pharmacists can help patients achieve better health outcomes by describing differences between medications and reiterating dosage instructions when a prescription is filled. Still, the patient must be able to eventually access and obtain the information on their own once they leave the pharmacy.

On a prescription label, the pieces of information that are frequently the simplest to view and the most easily recognizable, generally due to its position at the top of the label along with its larger font size and distinctive branding, are the pharmacy's logo and contact information. This location and distinctive characteristics give the impression that this information is a priority. Because of this seeming prioritization, the name of the drug, the dosage, the way that patients should take the medication, and the name of the patient

for whom the prescription is intended become secondary or even tertiary factors on the label.

Prescription labels often contain unnecessary figures that have no bearing on the medication's effectiveness. One example of this is the code ICX0821, which is printed in blue in the lower left-hand corner of the label of Walmart prescription bottles. After consulting with a Walmart pharmacy technician and their fellow staff members, they acknowledged that they do not know what that number represents but noted that it is probably the manufacturer's code to identify that brand of waterproof label or perhaps even to identify the region to which the brand of label was shipped. This information, which is in a relatively accessible region of the label itself, is not essential to adherence of taking the medication and takes up space on what is already a limited area to begin with.

In addition, those who have impaired vision or low literacy levels may have difficulty distinguishing between letters and numerals that appear to be visually identical. The most obvious example of this type of figure ambiguity is the inability of many people to differentiate between the digit 0 and the Roman capital letter O, which is a regular source of misunderstanding, as well as the digit 1 and the Roman lower-case letter l or the Roman capital letter I.

For decades, the horizontal language on the label of a prescription bottle has been positioned in a manner that corresponds to that of a bottle that is standing on its end with the cap on top. However, as the lettering travels around the curved sides of the bottle, the entirety of the language eventually moves out of the line of sight for the patient to read. To fully read each line of text, the patient must turn the bottle from left to right for each

line of text. Refer to Figure 1 to get a better idea of how challenging it is to read an entire line of text at one time on the prescription bottle due to the horizontal positioning of the text.

The user's initial engagement with a prescription medication is typically with the prescription label. It is possible for users to have trouble reading and comprehending prescription labels if certain typographical elements are present. These elements include a font size that is too small, insufficient spacing between words, and a font color that does not contrast with the background. These typographical elements make it more difficult for users to properly identify the key information that is required to ensure the safe use of medications.

Rationale and Style of Prescription Label

Prescription labels with a patient-centered hierarchy of consistent style and location of information would effectively educate, reinforce the experiential task, and improve the cognitive accessibility involved in medication compliance. Consequentially, one of the primary objectives of the label I designed for this thesis was to correctly arrange the information that is presented on a prescription label in such a way that it is simple to interpret and straightforward in its implementation.

Atkinson Hyperlegible, a typeface created by the Braille Institute in 2019 and named after its founder J. Robert Atkinson, was used for this study.³³ Because it emphasizes letterform distinctiveness to promote character recognition and ultimately

³³ Braille Institute Staff. "Braille Institute Launches New Award-Winning Typeface Designed to Improve Legibility for Readers with Low Vision." *Braille Institute*. February 27, 2020. <https://brailleinstitute.org/blog/press-releases/braille-institute-launches-new-award-winning-typeface-designed-fo-improve-legibility-for-readers-with-low-vision>

improve readability, it varies from standard typographic design. As seen in Figure 4, the Atkinson Hyperlegible type specimen highlights that the recognizable footprints of the characters' boundaries are clearly defined, ensuring understanding across the visual-ability spectrum. In addition, similar letter pairs are differentiated from each other to increase legibility dramatically. Unambiguous characters and figures increase legibility for people with low vision or poor reading comprehension. Exaggerated forms clarify potential misreading, and opened counter spaces define open spaces better.



Figure 4. Atkinson Hyperlegible Type Specimen. A section from the type specimen of the Braille Institute's typeface, Atkinson Hyperlegible.
(Braille Institute Staff. "Atkinson Hyperlegible Font." Braille Institute. Accessed February 27, 2020. <https://brailleinstitute.org/freetfont>)

During my research, I had the privilege of meeting and working with several individuals with low vision. Through their candid conversations with me, I was inspired to create a prescription label that met their needs. In designing the label for this study, I placed a high value on the label's clarity and provided that all superfluous material be removed. Most low-vision users I spoke with said that the advertisements on the prescription label reminding them to obtain their flu vaccines distracted them. Random numbers on the label that didn't seem connected to anything of relevance and "stock" information like the label's model number for reordering purposes were other distracting elements. The patient's name, the name of the medication they are taking, dose recommendations, and frequency of use are the only four items that must be listed on a prescription label in most states. Therefore, I decided to align my label more closely with what a doctor must include when writing a prescription, which provides for the patient's full name, address, drug name, strength, dosage, and quantity selected, as well as usage instructions and the name of the prescriber. The study participants requested further details such as the drug's generic name, the manufacturer, the date the pharmacy filled the prescription, the prescription number, and the pharmacy name and address be included on the label.

Through this thesis study, one of the contributions I have made to graphic design research is to develop a cost-effective label that sits horizontally on a standard prescription bottle (with the cap on top). The text on the label that I designed for this thesis is vertical to the position of the upright bottle. This design choice allows the reader to have the ability to turn the bottle to the side and "scroll" down, reading through entire lines of text at one time. The text on the prescription bottle is then positioned in such a

way that it is possible for the user to read multiple sentences despite the limited amount of space available. This makes it much simpler to read the information provided on the prescription label now that all text is within the line of sight. Additionally, the reader can then comfortably control the speed at which to scroll the text, which will allow the patient to process the information in a manner that is comparable to their normal reading cognition and comprehension.

This change in direction of the label was inspired by observing individuals with low vision slowly turning the bottle from left to right so that they could view the label with their peripheral vision. Providing them with a horizontal label, they could take in more information at one time. An additional benefit is that the patient can retain their place on the label as they scroll down through the information. The natural scrolling action allowed the viewer to take in the information naturally, letting their eye naturally find the beginning of the text on the following line instead of having to rediscover it as the vanishing point came back into view.

Another of the contributions that I have made to graphic design research through this study is the choice of using Atkinson Hyperlegible typeface on the prescription label. Previous research regarding prescription labels did not test with a hyperlegible typeface. Due to its precision and readability, the label I designed for my study is written in this typeface, which features a slashed-zero glyph, often used in encoding systems, scientific and engineering applications, computer programming, and telecommunications. This change in typeface makes the prescription label free of any superfluous digits that would interfere with a patient's cognitive assessment of the information provided.

CHAPTER 5

TESTING THE PRESCRIPTION LABEL (METHODS)

Design Study

The study was completed at multiple sites, in a controlled environment, at facilities across Northeast Ohio. Each participant partook in a timed survey that utilized present day prescription labels and the redesigned label. The study was approved by the Institutional Review Board at Kent State University (KSU), Kent, Ohio.

Sampling and Setting

From August 2022 to October 2022, this community-based investigation was carried out. Because my target sample was older adults, ophthalmology and retina center offices were asked for permission to function as study locations; however, most adults who wanted to participate were allowed to participate regardless of age or location. Adults older than 18 who were currently taking prescription medications regularly and who can read, speak, and understand English were considered to have met the study's inclusion criteria. The participants were excluded if they had a serious vision, hearing, or cognitive disability that would affect their capacity to communicate. Digital informed consent was obtained from every participant after they were educated about the study's methods.

Haller Modified LaRue Tool

The original LaRue Medical Literacy Exercises and the subsequent MLT were chosen for this thesis because of their reliable use by medical healthcare providers and low vision educators. In December of 2020, I reached out to Charles LaRue via email to inquire about his methodology for these exercises (Appendix A). I was also curious to know about the origin of the exercises and LaRue's involvement with the Minnesota Department of Children, Families and Learning. LaRue replied with a brief email that included cursory information about the exercises and indicating that he had previously granted permission to have them used by a researcher but that he had lost the reference and could not recall the name of the researcher.

The original LaRue Medical Literacy Exercises consisted of printed worksheets that included a generic prescription label set off from the other text on the page by placing a black border around it (see Appendices B and C). Below this label were a series of five questions, each with four multiple choice options. The participant would circle the correct answer on the worksheet with a pen or pencil, and it was later graded by the tester (see Appendix D). The tester then provided the participant with a printed handout that included another prescription label with a border around it and numbers that corresponded with lines of text on the page. Together, the tester and the participant reviewed the handout. After a review of the handout, the first part of the test was repeated with a different prescription label.

The only reference I found for access to LaRue's Medical Literacy Exercises was from an internet archive search of the Multi-Cultural Educational Services website. Using

the Internet Archive Wayback Machine,³⁴ I downloaded an archived page from 2011 that included links to his online Medical Literacy Learning Activities and his printable Medical Literacy Learning Activities (see Appendix F). I have seen several studies that reference modified versions of the MLT. With this knowledge, I was able to edit and adapt these exercises to incorporate into my research, developing my version of these exercises, which I refer to as the Haller Modified LaRue Tool (HMLT).

The first step I took was to dispense with the out-of-date pen-and-paper data collection method and instead opted to use the survey platform of Qualtrics CoreXM. The use of Qualtrics CoreXM allowed me to collect and analyze data. My goal was to gain further insight into the readability of the redesigned prescription label and how long it took the participant to answer a question. The quicker a participant could answer a survey question correctly, the more patient-centered the redesigned prescription label was for the participant. The test compared the disparity in comprehension between the current standard prescription labels and the revamped patient-centered label designed for this study and FHL.

I then focused on an educational intervention, which consisted of a captioned, narrated, and label-focused educational video for the participants, highlighting where critical elements on a label can be found and how each label component can be interpreted, as in Figure 5. Following the educational intervention video, participants were provided two self-assessment questions to assess the learning process after the educational intervention.

³⁴ “LaRue Literacy Exercises,” accessed November 20, 2020, <http://www.mcdservices.com/medex/medex.htm>.

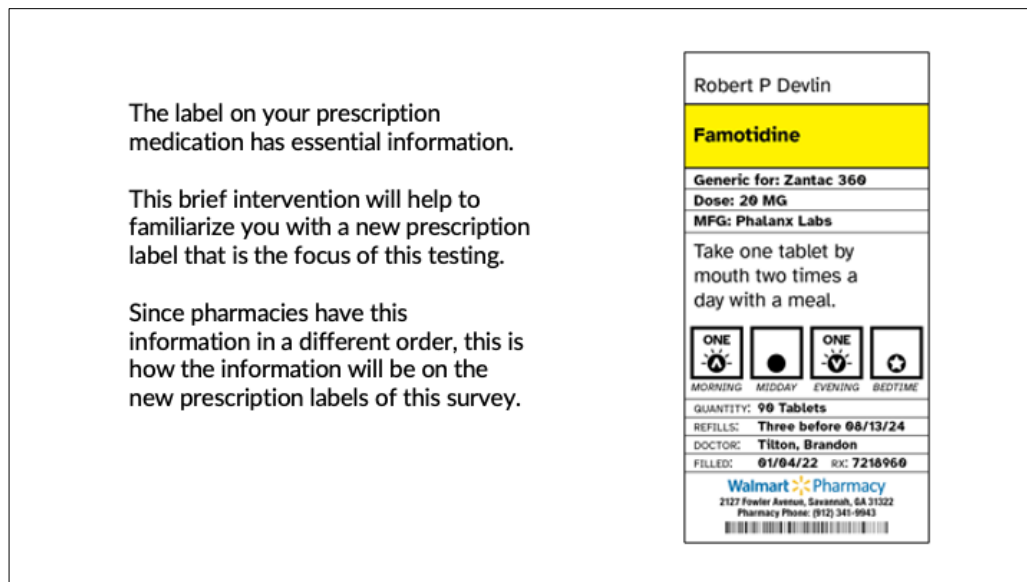


Figure 5. Sample image from the educational intervention video that explains the new prescription label used in the survey. A narrator voiced all text on the screen.
(Haller, John. 2022. *Sample Image from Intervention Video*. Created for this thesis.)

Procedure/Data Collection

Implementing the recognized REALM health literacy test was a crucial step in the procedure I followed to validate my findings. The foundation of health literacy is reading and comprehending printed materials. Participants in the REALM test were told to read written words from a list and pronounce them correctly. In this study, I hypothesized that a participant's REALM score was an indicator of their health literacy rather than a grade equivalent. Therefore, any change in the prescription label survey's scoring would correspond to a high or low REALM estimate. Longer response times for survey items would indicate a lower REALM score and vice versa. The response time to a question would, therefore, determine the validity of whether the revised prescription label was simpler to read and understand or not.

Participants in the study were required to complete a straightforward, computerized prescription label comprehension test using the HMLT that included 32 survey items, administered using Qualtrics CoreXM software, watch a video, and participate in a question-answer session. All surveys were conducted in a quiet, private setting with a laptop or desktop computer and four physical prescription bottles—two current standard labels and two visual language patient-centered labels designed for this study.

I used the FauxID: Fake Name Generator website to generate all proper names, addresses, and phone number used on each label to ensure that the information would not match any existing individuals or companies (see Appendix G). I chose to represent four frequently prescribed drugs on the labels used and designed for this study: gabapentin for treating seizures and convulsions, metronidazole for infections, penicillin V for strep throat, and methocarbamol for muscle spasms and pain. The participants' identification and understanding of key information on these prescription labels were assessed using the HMLT. To replicate actual medication-taking behavior, sample physical prescription bottles with similar-looking tablets (zinc tablets) inside each bottle and prescription label templates attached to each bottle were given to each participant.

During parts one and three (the identification sections of the survey), for each of the four labels provided (two labels in part one, and two labels in part two), participants were asked to identify the following eight areas central to safe medication use:

1. Who is the prescription for?
2. Where is the pharmacy located?
3. How many pills should they take each day?

4. How many times can they refill this prescription?
5. How many pills are in this prescription?
6. What is the prescription number?
7. Who is the pharmaceutical manufacturer?
8. Who is the prescribing physician?

Each identification section consisted of responding to these questions regarding information provided on a current standard label and a new visual language prescription label and took about twenty minutes to complete. Responses were assigned a score, either incorrect (0 points) or correct (1 point). The HMLT for each identification section had a total score range of 0 to 16. Part one of the survey was the baseline assessment section.

After the first part of the survey was completed (see Appendix H), participants moved to part two that required watching a 4-minute educational intervention video in which they learned how to recognize and comprehend each essential component of a visual language patient-centered prescription label (Figure 6) (see Appendix I). To reduce the risk of contamination bias in the study, participants were instructed not to divulge any information they learned during the video intervention to any other participants.

Robert P Devlin			
Famotidine			
Generic for: Zantac 360			
Dose: 20 MG			
MFG: Phalanx Labs			
Take one tablet by mouth two times a day with a meal.			
			
MORNING	MIDDAY	EVENING	BEDTIME
QUANTITY: 90 Tablets			
REFILLS: Three before 08/13/24			
DOCTOR: Tilton, Brandon			
FILLED: 01/04/22 RX: 7218960			
 2127 Fowler Avenue, Savannah, GA 31322 Pharmacy Phone: (912) 341-9943 			

Figure 6. Sample visual language prescription label that utilizes visual language to lessen patient barriers and medication errors.
 (Haller, John. 2022. *Sample Visual Language Prescription Label*. Created for this thesis.)

Once participants finished the video, they moved on to the third part of the survey consisting of participants responding to the same eight questions using two sample prescription labels with differing information from the labels in the first part but still a current standard label and a new visual language prescription label (see Appendix J). On a five-point Likert scale, participants were also asked to rate the video session and the sample revised prescription labels for their level of usefulness in helping them comprehend a prescription label. After completing parts one through three, a brief and informal question and answer session followed in which the participants were each asked to discuss their individual impression of the new visual language patient-centered prescription label. This session required the participants to think out loud. The users were

asked to share what they were thinking and how they were processing the information. I gave additional prompts to users to encourage them to participate fully. Sample prompts included:

- Were you confused by the label?
- Why did you turn the bottle?
- What did you expect to find when you first looked at the label?

During the interview, users were allowed to ask questions about the survey and the visual language on the prescription label. After the informal and unstructured question-and-answer session, the survey ended.

Results

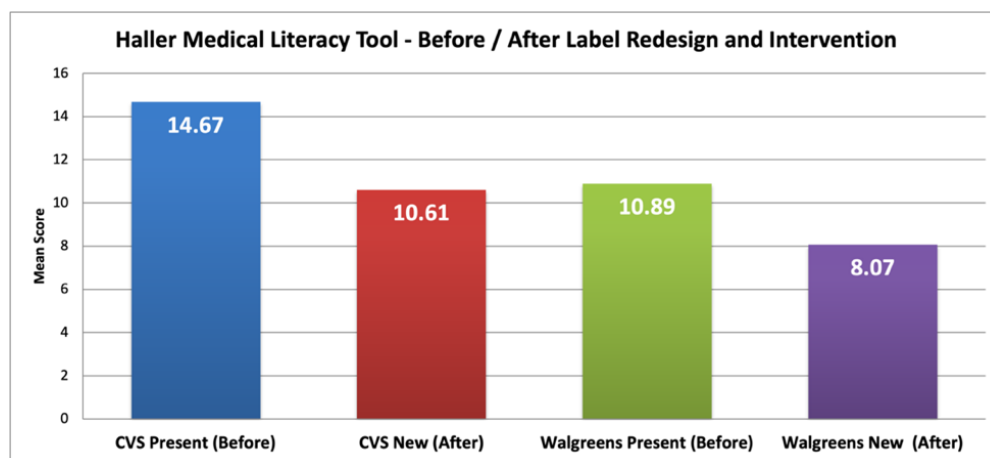


Table 3. Haller Modified LaRue Tool (HMLT) mean scores before and after label redesign and prescription intervention.
(Haller, John. 2022. *HMLT Mean Scores*. Created for this thesis.)

The modified prescription label group's HMLT mean scores for intervention participants rose by 1.2 points (Table 3). Participants in the educational intervention observed an overall rise in their FHL level. Patients utilizing the updated prescription label experienced a more noticeable shift in their FHL level than those using the current

standard label. During their Likert scale rating of the educational intervention session and the labels, participants concurred that the intervention video was somewhat useful (9.09%) or very useful (90.91%) in their comprehension of how to read the labels.

In the brief and informal question and answer session that completed the survey, participants expressed a preference for the new features of the visual language patient-centered prescription label. Approximately 25% of respondents said that the visual language boxes for medicine administration were a critical factor in the revised labeling. The other elements that all respondents found to be most appealing were the larger font size and ease of reading. After seeing the new prescription labels, a pharmacist—who did not take part in the testing but agreed to a brief interview—voiced similar opinions about the new label but expressed a concern about the lack of room for warning signs. A larger font size and a few formatting suggestions were among the test subjects' enhancements to the new label. Among these suggested enhancements was to remove the bounding box around the visual icons for medication administration.

CHAPTER 6

CONCLUSION

In this study, I assessed the outcomes of educational intervention and a simplified, hierarchically revised patient-centered prescription label that used visual language on the aged population's understanding of prescription labels. The sample of prescription labels consisting of the patient-centered visual language labels designed for this study, but not the sample consisting of current standard prescription labels, showed substantial improvements in both outcome measures. This could be explained by several factors including (but not limited to) the revised prescription label's patient-centered hierarchy of consistent style and location of information is more user-friendly compared to the current standard labels, and the more streamlined inclusion of vital components is more practical in terms of obtaining information than the current standard labels. All of which makes the revised label better at educating, reinforcing the experiential task, and improving the cognitive accessibility involved in medication compliance. These revised labels show a link to an improved FHL and baseline knowledge of the information on the pharmaceutical label.

As our population ages, medical technology improves, and healthcare laws change, so too must healthcare providers' need to actively support individuals in controlling their treatment. This increase in demand presents an opportunity for the healthcare sector to enhance patient outcomes and care quality while reducing inequities. Due to their role on the care team as the patient's last point of contact before beginning a

prescription regimen, pharmacists have a significant influence on how patients use and understand their medications. A pharmacist may greatly enhance how patients read their prescription labels by offering clarity, tailoring communication to the individual's literacy level, and presenting patients with a brief overview of prescription label elements.

My study has shown that a patient-centered visual language label and a basic label-focused educational intervention approach can improve label comprehension and FHL. Additionally, despite their familiarity with the formats of current standard prescription labels, the majority of participants in this study indicated a preference for the new label rather than the existing label. The improvements I made to the label's hierarchy of information, line of sight convenience, and cosmetic typographical look impacted consumers'/patients' preference for the new label.

Any language's core goal is to enable communication by developing a set of norms and meanings that all parties can agree on to reach a common understanding. Visual language's specific choices impose meaningful restrictions on how the message receiver will use the visual language in the future. The goal of this thesis to use patient-centered visual language on a prescription label to reduce patient barriers and medication errors has offered valuable insight into how a patient-centered prescription label enhances a patient's understanding of and adherence to their prescribed medication.

I am not among the first to measure the attention and behavior of a patient's interaction with a prescription label that incorporates visual language and uses a simplified prescription label with less information (e.g., no extraneous numbers, advertisements, flu shot reminders, warning labels). However, feedback from participants

of this study supports my label's ability to convey information quickly and accurately.

Additionally, I have shown that a quick four-minute prescription intervention with a healthcare professional or pharmacist can dramatically increase a patient's understanding of their medication.

These findings are significant because they reinforce the necessary communication between patients and their healthcare providers or pharmacists. The foundations of healthcare and pharmaceutical practice need to change and allow visual language to be used as a medium on prescription labels to convey information. This thesis has shown that visual language can lessen the root cause of medication errors by developing a patient-centered prescription label.

I want to take the findings of my research one step further. I want to evaluate the usefulness of the new label in a real-world environment by having patients use it for a set time, such as over three months, and reporting their thoughts and impressions after that period. However, a longer length of time is required to examine the label's influence on health outcomes like medication adherence and patient safety. In addition, since most of the research that has been published on the design and layout of medical labeling has focused on the labels of over-the-counter medications, I would like to extend the scope of my study to include the redesign of package inserts that come with prescriptions filled by a pharmacist.

APPENDICES

APPENDIX A

EMAIL CORRESPONDENCE: REQUEST FOR INFORMATION & REPLY



John Haller <jhaller4@kent.edu>

LaRue Medical Literacy Exercises

John Haller <jhaller4@kent.edu>
 To: LaRue@mcedservices.com

Sun, Dec 6, 2020 at 12:25 PM

Mr. LaRue — My name is John Haller, and I am a graduate student at Kent State University in Kent, Ohio. I am writing to inquire about the LaRue Medical Literacy Exercise that you developed. I am currently working on my thesis and investigating the use of visual language on prescription labels to increase patient adherence and decrease patient barriers. Several times during my research, I have found references to the modified version of your medical literacy exercise. But I would like more information about the original work you did through a grant from the Minnesota Department of Children Families and Learning.

I have come across your site at <http://www.mcedservices.com/medex/medex.htm> and would be interested to know how the test was conducted. Did participants learn the printed lesson and then take either quiz one or two? Or did quiz one work as a sort of pre-test before the lesson was introduced?

I thank you for your time and look forward to hearing from you soon.

Regards,

John Haller



John Haller, BFA
 Adjunct Instructor, Kent State University
 MFA Candidate | 330.541.6590 | jhaller4@kent.edu



Schedule time with me using Calendly

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<https://orcid.org/0000-0001-6368-2430>

Create your own [email signature](#)



John Haller <jhaller4@kent.edu>

LaRue Medical Literacy Exercises

Charles LaRue <larue@mcedservices.com>
To: John Haller <jhaller4@kent.edu>

Tue, Dec 8, 2020 at 3:49 PM

Hi John,

I wrote these exercises as drill and practice to be used by ESL instructors here in Minnesota. I never used them as a test, rather as a supplement to classroom lessons. A number of years ago, I gave permission to have them used by a researcher as pre and post test, but I've lost the reference. Sorry I can't be more helpful.

I hope they might still be useful.

Regards,

Charles

Charles LaRue
larue@mcedservices.com

[Quoted text hidden]

APPENDIX B

LARUE MEDICAL LITERACY EXERCISES – QUIZ ONE

Prescription Labels - Quiz 1

LaRue Medical Literacy Exercises

Main Street Pharmacy (612) 555-1234
1200 Main Street North, Minneapolis, MN

Dr. R. Wilson
Rx No: 300443 01/04/2005

JOHN JOHNSON

Dose: TAKE ONE TABLET BY MOUTH, DAILY.

Zocor Tabs Mfg Merck

Qty: 30
REFILLS: 3 BEFORE 12/08/05

1. Who is this prescription for?
 - A. Main Street Pharmacy
 - B. Dr. R Wilson
 - C. Zocor Tabs
 - D. John Johnson
2. What is the prescription number?
 - A. 30
 - B. 300443
 - C. 01/04/2005
 - D. (612) 555-1234
3. How many pills should John take each day?
 - A. 2
 - B. 1
 - C. 3
 - D. 30
4. Where did John get this prescription?
 - A. John Johnson
 - B. Mfg Merck
 - C. Dr. R Wilson
 - D. Main Street Pharmacy
5. How many pills came in this prescription?
 - A. 30
 - B. 3
 - C. one tablet
 - D. 01/04/2005

Central Avenue Pharmacy (763) 555-1234
7000 Central Avenue, Minneapolis, MN

Dr. S. Stevenes
Rx No: 454009 **01/11/2005**

Sue Chong

Dose: TAKE ONE TABLET BY MOUTH, TWICE DAILY.

Glucophage Tabs Mfg Bristol Myers Squibb

Qty: 60
 REFILLS: 2 BEFORE 7/27/05

6. Who is this prescription for?

- A. Dr. S Stevens
- B. Sue Chong
- C. Glucophage Tablets
- D. Central Avenue Pharmacy

9. When does this prescription expire?

- A. 01/11/2005
- B. 7/27/2005
- C. 7000 Central Avenue
- D. Twice Daily

7. What is the prescription number?

- A. 60
- B. one tablet
- C. 01/11/2005
- D. 454009

10. How many refills are available?

- A. one tablet
- B. 60
- C. 2
- D. 7/27/2005

8. How many pills should Sue take each day?

- A. 1
- B. 60
- C. 2
- D. 01/11/2005

APPENDIX C

LARUE MEDICAL LITERACY EXERCISES – QUIZ TWO

Prescription Labels - Quiz 2

LaRue Medical Literacy Exercises

University Pharmacy 7200 Univerity Avenue, Fridley, MN	(763) 888-1234
Dr. C. Chan Rx No: 882456	01/09/2005
Richard Barber	
Dose: TAKE ONE TABLET BY MOUTH THREE TIMES DAILY.	
Xanax Tabs Mfg Upjohn	
Qty: 90 REFILLS: 0 BEFORE	

- Who is this prescription for?
 - Dr. C Chan
 - Richard Barber
 - University Pharmacy
 - Xanax Tabs
- Where did he get this prescription?
 - Dr. C Chan
 - 01/09/2005
 - three times daily
 - University Pharmacy
- How many pills does he take every day?
 - 1
 - 3
 - 90
 - Richard Barber
- How many times can this be refilled?
 - one tablet
 - three times
 - 0
 - 90
- How many pills are in this prescription?
 - 01/09/2005
 - 882456
 - one tablet
 - 90

Northern Pharmacy
750 1st Street, Anoka, MN

(612) 555-1234

Dr. V Nguyen
Rx No: 565449

02/04/2005

Mary Smith

Dose: USE ONE DROP IN BOTH EYES TWICE DAILY.

Restatis Mfg Allergan

Qty: 32 single use vials
REFILLS: 1 BEFORE 3/09/05

6. Who is this prescription for?

- A. Mary Smith
- B. Restasis
- C. Dr. V Nguyen
- D. Northern Pharmacy

9. When does this prescription expire?

- A. 02/04/2005
- B. Northern Pharmacy
- C. 3/09/05
- D. Dr. V Nguyen

7. How many drops does she put in each eye every day?

- A. one drop
- B. two drops
- C. both eyes
- D. 32

10. What is the prescription number?

- A. 02/04/2005
- B. 750 1st Street
- C. 763 222-1234
- D. 565499

8. How many times can she refill this prescription?

- A. twice
- B. 565449
- C. one time
- D. 32

The LaRue Medical Literacy Exercises were created by Charles LaRue through a grant from the Minnesota Department of Education under the supervision of the Minnesota Literacy Council. © MN Dept of Education
Available online at www.mcedservices.com

APPENDIX D

LARUE MEDICAL LITERACY EXERCISES – ANSWER KEY

Answer Key

LaRue Medical Literacy Exercises

Prescription Labels

Quiz #1

1. D John Johnson
2. B 300443
3. B 1
4. D Main Street Pharmacy
5. A 30
6. B Sue Chong
7. D 454009
8. C 2
9. B 7/27/05
10. C 2

OTC Medicine

Quiz #3

1. C sneezing
2. B two tablets
3. D someone with glaucoma
4. D drowsiness
5. B not more than 6 tablets
6. B nasal congestion
7. C ask a doctor
8. D someone with thyroid disease
9. B 8 tablets
10. A dizziness

Warning Labels

Quiz#5

1. C
2. A
3. D
4. B
5. A
6. B
7. D
8. A
9. B
10. D

Side Effects

Quiz #7

1. B tired
2. A drowsiness
3. D emphysema
4. C diabetes
5. D you can't sleep
6. B it's hard to walk
7. A heart disease
8. C a skin rash
9. B you can't breathe
10. D your face gets bigger

Prescription Labels

Quiz #2

1. A Richard Barber
2. D University Pharmacy
3. B 3
4. C 0
5. D 90
6. A Mary Smith
7. B Two drops
8. C One time
9. C 3/09/05
10. D 565449

OTC medicine

Quiz #4

1. B diarrhea
2. D 2 caplets
3. A someone with a fever
4. C not more than 3
5. B after 3 days
6. B pain and fever
7. B stomach upset
8. D ask a doctor
9. D after 10 days
10. A. 6 tablets

Warning Labels

Quiz #6

1. A
2. D
3. B
4. C
5. D
6. B
7. C
8. B
9. D
10. C

Side Effects

Quiz #8

1. C dizziness
2. B heart medicine
3. D it's hard to eat
4. D sleeplessness
5. A you can't stay awake
6. C are breast-feeding
7. C have kidney problems
8. B an upset stomach
9. B sleepiness
10. B you are pregnant

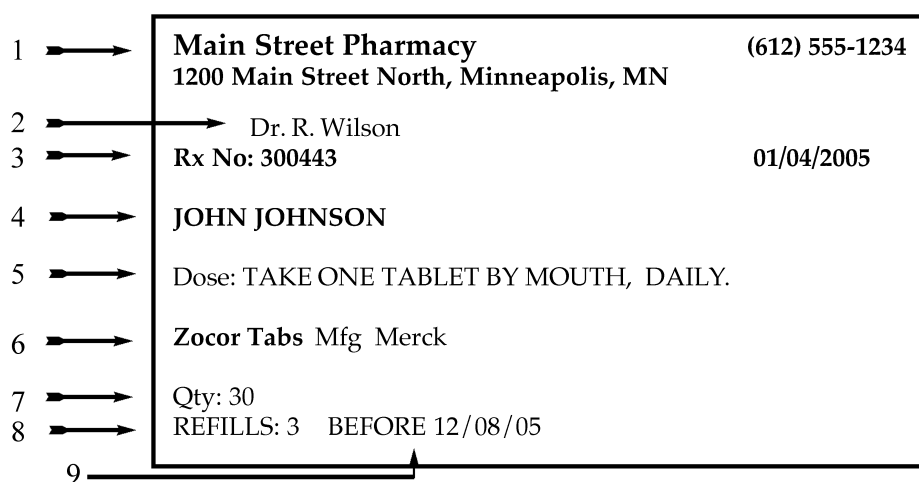
APPENDIX E

LARUE PRESCRIPTION LABEL INTERVENTION

Prescription Labels

When you go to a doctor, for a check-up, or because you are sick, the doctor may decide that you need prescription medicine.

The label on your prescription has important information. This information will be on the label. Some labels may have it in a different order.



Number 1 is the name, address and phone number of the pharmacy that filled the prescription. This is from "Main Street Pharmacy".

Number 2 is the name of the doctor. Doctor R. Wilson prescribed this medicine.

Number 3 is the prescription number, which begins with the abbreviation "Rx" or "No". This prescription number is 300443.

Number 4 is the name of the patient. This medicine is for John Johnson. No one else should take this medicine.

Number 5 tells how much medicine to take and when to take it. This may be written after the word "Dose". John should take 1 tablet once a day.

Number 6 is the name of medicine, and the name of the company that manufactured it. This medicine is called "Zocor", and Merck makes it.

Number 7 is the number of tablets. This may be written after the abbreviation "Qty" or the word "Quantity". This prescription is for 30 pills.

Number 8 is the number of refills available. When no refills are available the number will be "0".

Number 9 is the expiration date of the prescription. This may be written after "refill before" or the abbreviation "Exp". This is the last date the pharmacy can refill the prescription.

For more information about OTC medicine labels see **OTC Labels**.

For more information about warning labels see **Warning Labels**.

For more information about the side effects of medicine see **Side Effects**.

The LaRue Medical Literacy Exercises were created by Charles LaRue through a grant from the Minnesota Department of Education under the supervision of the Minnesota Literacy Council.
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APPENDIX F

INTERNET ARCHIVE / WAYBACK MACHINE – LARUE MEDICAL

LITERACY EXERCISES, ARCHIVE LINKS

LaRue Medical Literacy Exercises	
The LaRue Medical Literacy Exercises were created by Charles LaRue through a grant from the Minnesota Department of Children Families and Learning under the supervision of the Minnesota Literacy Council .	
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Online Medical Literacy Learning Activities

Online Lessons	Introductions				Practice	Practice
Prescription Labels	English	Arabic	Hmong	Somali	Quiz 1	Quiz 2
Over-the-counter Labels	English	Arabic	Hmong	Somali	Quiz 3	Quiz 4
Special Warning Labels	English	Arabic	Hmong	Somali	Quiz 5	Quiz 6
Side Effects	English	Arabic	Hmong	Somali	Quiz 7	Quiz 8

Printable Medical Literacy Learning Activities

Printable Lessons	Introductions				Practice	Practice
Prescription Labels	English	Arabic	Hmong	Somali	Quiz 1	Quiz 2
Over-the-counter Labels	English	Arabic	Hmong	Somali	Quiz 3	Quiz 4
Special Warning Labels	English	Arabic	Hmong	Somali	Quiz 5	Quiz 6
Side Effects	English	Arabic	Hmong	Somali	Quiz 7	Quiz 8
Answer Key					Other Online ESL Activities	Printable ESL Activities

APPENDIX G

FAUXID FAKE U.S. NAME GENERATOR DATA

The identities, addresses, and phone numbers offered by FauxID.com are all false and do not exist. None of the data produced violates any institutions or individual's rights. The identities used to create the primary research prescription labels are listed below.

CVS PHARMACY – QUIZ ONE

Dr. Sharon M. Finn, MD

Dr. Glen A. Zacharias, MD

Catherine B. Benedict (patient)
530 Ebony Tunnel, Apt. 663
Lawrence, KS 6606
(785) 842-9542

Tracy R. Faust (patient)
3597 Whaley Lane
Cleveland, OH 44101
(216) 221-2117

CVS Pharmacy
4977 Braxton Street
Olathe, KS 66051
(913) 768-7060

CVS Pharmacy
2522 Lake Avenue
Lakewood, OH 44107
(216) 228-5041

WALGREENS PHARMACY – QUIZ TWO

Dr. Savanna E. Jones, MD

Dr. Dion E. Miller, MD

Lynne M. Klein (patient)
2505 Glendale Avenue
Kalamazoo, MI 49003
(269) 372-0229

Diana R. Thornton (patient)
3864 Hawks Nest Lane
Havertown, PA 19083
(610) 446-9248

Walgreens Pharmacy
1878 Coburn Hollow Road
Portage, MI 49024
(269) 329-493

Walgreens Pharmacy
3667 Summit Street
Philadelphia, PA 44143
(215) 685-8413

WALMART PHARMACY - INTERVENTION

Dr. Brandon S. Tilton, DO

Walmart Pharmacy

Robert P Devlin (patient)
4418 Ashton Lane
Garden City, GA 31405
(912) 966-7175

2127 Fowler Avenue
Savannah, GA 31322
(912) 341-9943

APPENDIX H

HALLER MODIFIED LARUE TOOL – QUIZ ONE

<p>MAY CAUSE DROWSINESS. ALCOHOL INTENSIFIES EFFECT. USE CARE USING MACHINES.</p> <p>MAY CAUSE DIZZINESS</p> <p>CALL DR. BEFORE TAKING OTC DRUGS AS SOME MAY AFFECT THE ACTION OF THIS DRUG.</p> <p>RPG: BRANDON HILL Orig: 05/24/2020 Date filled: 05/24/2022 Discard After: 05/24/2023</p> <p>This is a WHITE, OVAL-shaped TABLET imprinted with SG 1 77 on the front.</p> <p><small>MFR: PFIZER CAUTION: FEDERAL LAW PROHIBITS THE TRANSFER OF THIS DRUG TO ANY PERSON OTHER THAN THE PATIENT FOR WHOM IT WAS PRESCRIBED</small></p>	<p>CVS/pharmacy # 3360</p> <p>2522 LAKE AVENUE, LAKEWOOD, OH 44107</p> <p>TRACY FAUST 3597 WHALEY LANE, CLEVELAND, OH 44101</p> <p>IC GABAPENTEN 600 MG TABLET SUBSTITUTED FOR: NEURONTIN 600 MG TABLET</p> <p>TAKE 1 TABLET THREE TIMES A DAY AS NEEDED</p> <p>Qty: 30 Refills require Authorization</p> <p>Store Phone: (216) 228-5041</p> <p>Rx # C1220304</p> <p>Prescriber: GLEN A ZACHARIAS, MD</p>
---	--

Modern Label.

- Who is this prescription for?
 - Tracey Faust**
 - Catherine B Benedict
 - Lynne M Klein
 - Diana R Thornton
- Where is this pharmacy located?
 - 2522 Lake Ave, Lakewood, OH 44107**
 - 3597 Whaley Ln, Cleveland, OH 44101
 - 4977 Braxton St, Olathe, KS 66044
 - 530 Ebony Tunnel, Lawrence, KS 66044
- How many pills should they take each day?
 - Up to three tablets a day, as needed**
 - Three tablets a day
 - One tablet
 - One tablet, three time in a day
- How many times can they refill this prescription?
 - Refills require authorization.**
 - Thirty required refills.
 - Required refills for thirty authorizations.
 - Authorized for thirty refills.
- How many pills are in this prescription?
 - 30**
 - 600
 - 3
 - 60
- What is the prescription number?
 - C1220304**
 - 21622121
 - 44107228
 - KS66051
- Who is the pharmaceutical manufacturer?
 - Pfizer**
 - Beximco Pharma Ltd
 - West Ward Pharm
 - Merck
- Who is the prescribing physician?
 - Glen A Zacharias, MD**
 - Sharon M Finn, MD
 - Dion E Miller, MD
 - Savanna E Jones, MD

Note: the correct response to the question appears in bold text. The choices are randomized via Qualtrics to display answers in a random order.

1. Who is this prescription for?
 - a. **Catherine B Benedict**
 - b. Tracey Faust
 - c. Lynne M Klein
 - d. Diana R Thornton
2. Where is this pharmacy located?
 - a. **4977 Braxton St, Olathe, KS 66044**
 - b. 2522 Lake Ave, Lakewood, OH 44107
 - c. 3597 Whaley Ln, Cleveland, OH 44101
 - d. 530 Ebony Tunnel, Lawrence, KS 66044
3. How many pills should they take each day?
 - a. **Take one tablet by mouth two times a day with a meal**
 - b. Take two tablets a day, by mouth, with every meal
 - c. Take one tablet by mouth after every meal
 - d. Take one tablet by mouth after your second meal
4. How many times can they refill this prescription?
 - a. **Three**
 - b. Thirty
 - c. Eight
 - d. Thirteen
5. How many pills are in this prescription?
 - a. **30 tablets**
 - b. 60 tablets
 - c. 90 tablets
 - d. 15 tablets
6. What is the prescription number?
 - a. **7218960**
 - b. 7216089
 - c. 081322
 - d. 010422
7. Who is the pharmaceutical manufacturer?
 - a. **Beximco Pharma Ltd**
 - b. Robin-750
 - c. Methocarbamol
 - d. Braxton
8. Who is the prescribing physician?
 - a. **Sharon M Finn, MD**
 - b. Glen A Zacharias, MD
 - c. Catherine Benedict, MD
 - d. Savanna E Jones, MD

Catherine Benedict			
Methocarbamol			
Generic for: Robaxin-750			
Dose: 750 MG			
MFG: Beximco Pharma Ltd			
Take one tablet by mouth two times a day with a meal.			
			
MORNING	MIDDAY	EVENING	BEDTIME
QUANTITY: 30 Tablets			
REFILLS: Three before 08/13/22			
DOCTOR: Finn, Sharon M			
FILLED: 01/04/22 RX: 7218960			
CVS/pharmacy 4977 Braxton Street, Olathe, KS 66044 Pharmacy Phone: (913) 768-7060 			

Visual Language Label.

Note: the correct response to the question appears in bold text. The choices are randomized via Qualtrics to display answers in a random order.

APPENDIX I

HALLER PRESCRIPTION LABEL AND INTERVENTION SCRIPT

1. When you go to a doctor for a check-up or because you're sick, the doctor may decide you need prescription medicine.
2. The label on your prescription medication has essential information. This brief intervention will help to familiarize you with a new prescription label that is the focus of this testing. Since pharmacies have this information in a different order, this is how the information will be on the new prescription labels of this survey.
3. This is the name of the patient. This medicine is for **Robert P Devlin**. No one else should take this medicine.
4. This is the name of the medicine that has been prescribed to the patient. In this example, the patient has been prescribed **Famotidine**.
5. A generic drug is a medication created to be the same as an already marketed brand-name drug. In this example, you can see that Famotidine is the generic form of the brand-name drug **Zantac 360**.
6. The measured portion of a medicine that must be taken is its dose. It does not refer to the frequency at which a medicine should be taken. In this example, the physician prescribed a **20 mg dose** of Famotidine.

Robert P Devlin			
Famotidine			
Generic for: Zantac 360			
Dose: 20 MG			
MFG: Phalanx Labs			
Take one tablet by mouth two times a day with a meal.			
ONE ▲	●	ONE ▼	★
MORNING	MIDDAY	EVENING	BEDTIME
QUANTITY: 90 Tablets			
REFILLS: Three before 08/13/24			
DOCTOR: Tilton, Brandon			
FILLED: 01/04/22 RX: 7218960			
Walmart Pharmacy 2127 Fowler Avenue, Savannah, GA 31322 Pharmacy Phone: (912) 341-9943 			

Visual Language Label.

7. This is the name of the company that manufactured the medicine. This medicine is manufactured by **Phalanx Labs**.
8. Dosage refers to the frequency at which the medicine must be taken or administered. How much medicine to take may be written after the word dosage. On this label, Robert should **take one tablet by mouth two times a day with a meal**.
9. This section is a visual representation of when the medicine needs to be taken by the patient. When you look at the boxes from left to right, the first box represents the **morning, with an arrow pointing up in the center of the circle**. The patient should take one of their tablets at this time in the morning.
10. The second box represents the **midday or late afternoon, with no arrow in the circle**. The patient should not take their tablets at this time of day.
11. The third box represents the **early evening, with an arrow pointing down in the center of the circle**. The patient should take one of their tablets at this time in the evening.
12. And the last box represents the **late evening or bedtime, with a star in the center of the circle**. The patient should not take their tablets at this time of day.
13. This is the quantity, or the number of tablets in this filled prescription. The number of tablets may be written after the abbreviation **Qty** or the word **Quantity**. This prescription is for **ninety tablets**.
14. This is the number of refills that are available for this prescription. When no refills are available, the number will be zero. This prescription may be **refilled three times before August 13, 2024**.

15. This is the name of Robert's doctor. In this example, **Dr Brandon Tilton** prescribed this medicine.
16. This is the date that the prescription was filled by the pharmacy. This prescription was filled on **January 4, 2022**.
17. This is the prescription number, which begins with the abbreviation **RX** or **No**. This prescription number is **7218960**.
18. This is the name, address, and phone number of the pharmacy that filled the prescription. In this example, the medication was filled at the **Walmart Pharmacy in Savannah, GA**.
19. This concludes this short prescription label intervention. Now that you are more familiar with the layout of this new prescription label, you will continue with the final portion of the testing. The examiner will give you a prescription vial. Please use the label on the vial to answer the next set of questions.
20. After you have received the vial, please click on the arrow in the lower right corner to proceed. Thank you.

Note: Bold words in the script indicate the text on the visual language label.

APPENDIX J

HALLER MODIFIED LARUE TOOL – QUIZ TWO

<p>OVAL WHITE TABLET Side 1: 227 Side 2: U</p> <p>This Drug May Impair The Ability To Drive Or Operate Machinery. Use Care Until You Become Familiar With Its Effects.</p> <p>Do Not Take Other Medicines Without Checking With Your Doctor Or Pharmacist.</p>	<p>DIANA R THORNTON 3864 HAWKS NEST LANE, HAVERTOWN, PA 19083</p> <p>DATE: 09/09/22</p> <p>METRONIDAZOLE 500 MG TABLETS MFG PFIZER - SUBSTITUTED FOR FLAGYL ER 500MG TABLETS TAKE 1 TABLET BY MOUTH UP TO 3 TIMES DAILY FOR 5 DAYS</p> <p>RX 331200-6590 EXPIRATION DATE 09/09/23</p> <p>QTY 15 NO REFILLS - DR. DION MILLER AUTH REQUIRED</p> <p>Walgreens 3667 SUMMIT STREET, PHILADELPHIA, PA 44143 (215) 685-8413</p> <p><small>CAUTION: FEDERAL LAW PROHIBITS THE TRANSFER OF THIS DRUG TO ANY PERSON OTHER THAN THE PATIENT OR WHOM IT WAS PRESCRIBED - RX ONLY</small></p>	 
--	--	---

Modern Label.

- Who is this prescription for?
 - Diana R Thornton**
 - Dion Miller
 - Lane Haverton
 - Sharon M Finn
- Where is this pharmacy located?
 - 3667 Summit St, Philadelphia, PA 44143**
 - 3864 Hawks Nest Ln, Havertown, PA 19083
 - 530 Ebony Tunnel, Unit 663, Lawrence, KS 66044
 - 3597 Whaley Ln, Cleveland, OH 44101
- How many pills should they take each day?
 - Take one tablet by mouth up to three times a day for five days**
 - Take three tablets by mouth up to one time a day for five days
 - Take one tablet by mouth up to five times a day for three days
 - Take one tablet by mouth up to one time a day for three days
- How many times can they refill this prescription?
 - No refills.**
 - 15 refills.
 - Dr. Dion Miller authorized 15 refills.
 - 3 refills.
- How many pills are in this prescription?
 - 15 tablets**
 - 90 tablets
 - 3 tablets
 - 33 tablets
- What is the prescription number?
 - 331200-6590**
 - 09-0923
 - 1:227 2:U
 - 215685-8413
- Who is the pharmaceutical manufacturer?
 - Pfizer**
 - Flagyl ER
 - Beximco Pharma Ltd.
 - Merck
- Who is the prescribing physician?
 - Dion Miller, MD**
 - Diana R Thornton, MD
 - Opal White, MD
 - Brandon S Tilton, DO

Note: the correct response to the question appears in bold text. The choices are randomized via Qualtrics to display answers in a random order.

1. Who is this prescription for?
 - a. **Lynne M Klein**
 - b. Savanna E Jones
 - c. Dion E Miller
 - d. Brandon S Tilton
2. Where is this pharmacy located?
 - a. **1878 Coburn Hollow Rd, Portage, MI 49024**
 - b. 2505 Glendale Ave, Kalamazoo, MI 49003
 - c. 3864 Hawks Nest Ln, Havertown, PA 19083
 - d. 3667 Summit St, Philadelphia, PA 44143
3. How many pills should they take each day?
 - a. **Take one tablet by mouth four times a day before a meal**
 - b. Take four tablets by mouth four times a day before a meal
 - c. Take four tablets by mouth one time during the day before a meal
 - d. Take one tablet by mouth during the day before one meal
4. How many times can they refill this prescription?
 - a. **Requires authorization**
 - b. 30 refills required
 - c. 9 refills authorized by Dr Jones
 - d. Savanna E Jones authorizes 30 tablets
5. How many pills are in this prescription?
 - a. **30 tablets**
 - b. 60 tablets
 - c. 50 tablets
 - d. 9 tablets
6. What is the prescription number?
 - a. **8960721**
 - b. 091122-30
 - c. 50301122
 - d. 493692-69
7. Who is the pharmaceutical manufacturer?
 - a. **West-Ward Pharm**
 - b. PC Pen VK
 - c. Merck
 - d. Klein Pen V
8. Who is the prescribing physician?
 - a. **Savanna E Jones, MD**
 - b. Diana R Thornton, MD
 - c. Opal White, MD
 - d. Brandon S Tilton, DO

Lynne M Klein
Penicillin V
Generic for: PC Pen VK
Dose: 50 MG
MFG: West-Ward Pharm
Take one tablet by mouth four times a day before a meal.
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>MORNING</p> </div> <div style="text-align: center;">  <p>MIDDAY</p> </div> <div style="text-align: center;">  <p>EVENING</p> </div> <div style="text-align: center;">  <p>BEDTIME</p> </div> </div>
QUANTITY: 30 Tablets
REFILLS: Requires authorization
DOCTOR: Jones, Savanna E
FILLED: 09/11/22 RX: 8960721
 1878 Coburn Hollow Road, Portage MI. 49024 Pharmacy Phone: (269) 329-4936 

Visual Language Label.

Note: the correct response to the question appears in bold text. The choices are randomized via Qualtrics to display answers in a random order.

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