DISPENSING RELIEF: EVOLVING THE

PRESCRIPTION EXPERIENCE


THESIS


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by


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DISPENSING RELIEF: EVOLVING THE

PRESCRIPTION EXPERIENCE

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**DEDICATION**

This thesis is dedicated to three people who have walked every step of this mind-expanding journey with me; my parents, David and Joyce Anne Jackson and my daughter Grace. Their commitment to my graduate school process was parallel to my own, their sacrifices as strong, and their love for learning as deep.

**ACKNOWLEDGEMENTS**

I am thankful to my thesis committee—Claudia Roeschmann, Virgil Scott and William Ford—for their guidance and insight throughout this process. I would like to thank Christine Haney for her patience through the details. I am indebted to Jim Moffatt, who set me on this journey.

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# CHAPTER I

## INTRODUCTION

The sequence of the prescription process seems simple: an illness and a doctor's visit, followed by a quick prescription pickup. In reality, over three billion times a year (Rothman, 2011), miscommunications, repetitious phone calls, incorrect information and dosage errors have come to define the prescription experience.

This thesis will research the current prescription process used by three user groups—physicians, pharmacists and patients—who will document their needs and expectations. Research outcome will drive the authoring of a more efficient vehicle of communication to meet the needs of these three groups. The anticipated outcome will seek to incorporate typography, design thinking and principles with technology to produce a prescription vehicle that allows for ease and mobility of handwriting combined with information accuracy.

### The Current Prescription Experience

The prescription pipeline from physician to pharmacist to patient currently consists of a system plagued by inefficiency and repetitive tasks, reflecting weak communication ranging from illegible handwriting to incorrect or missing information. After a patient receives a prescribed medication in the physician's office, the prescription can take one of several routes to the pharmacist. Physicians currently have many options

for transmitting the prescription information to the pharmacy: a handwritten or computer-generated paper prescription form given to the patient, a contact with the pharmacy through fax, a direct phone call or one of the many types of electronic prescribing software packages, such as *Surescript* and *RxNT*.

Once a prescription is received at the pharmacy, all patient information, the prescription dosage and the directions are checked for accuracy, in addition to current insurance coverage. These steps are contingent on the readability and completeness of the prescription information. Any required data that is missing or in question requires a follow-up phone call to the physician or insurance company, all while the ill patient waits. The original inspiration for this research reflects a personal prescription experience.

A patient went to the pharmacy to pick up her prescription and experienced a thirty-minute wait. Once it was her turn at the pick-up counter, the patient was informed that the medicine prescribed did not fall under her insurance 10-dollar co-pay, that there was no equivalent generic option available, and that the cost would be $238. This information caused the patient to reassess the need for the medication. The patient opted to cancel the prescription.

The patient conveyed the situation to a family friend, a pharmacist. The pharmacist responded that similar situations happened daily, based on his 32 years of professional experience. His opinion of the reality of the route of a prescription is much more complex (see Figures 1-4). He deduced that one of the main problems was the level and frequency of incorrect or illegible prescription information initially provided to the pharmacy, causing delays in filling due to the number of required calls back to the

physician office as well as the insurance provider. Such delays, coupled with the number of prescriptions filled per shift, left little time for patient consultation, which he deemed a facet of his profession that was equal in importance to the filling of prescriptions.

Investigation of physicians' and pharmacists' experiences will highlight current prescription challenges and the evolving job responsibilities facing their professions. These new parameters for physicians and pharmacists influence the prescription experience for the patient.

The reality of the prescription's journey is more complex:

1. A patient becomes ill and visits a physician.

2. The physician diagnoses the problem; authors a prescription, having to make choices bewteen several brands and generic options; and calculates the proper amount and directions for dosage.

3. The physician chooses among writing, calling, faxing or e-prescribing the prescription to the pharmacy (see Figure 1).

4. The pharmacist receives the prescription and must often call the physician back because of incomplete or illegible information (see Figure 2).

5. The pharmacist researches the prescription, checking for possible drug conflicts, allergic reactions, etc.

6. The insurance company on the patient's records is contacted for a coverage check.

7. The prescription is filled.

8. The patient is notified that the prescription is filled (see Figure 3).

9. The patient presents insurance that in some cases is different from what the patient's information shows, prompting another insurance call pertaining to coverage. It is not unusual for patients to have two or more insurance company programs.

10. The patient confers with the pharmacist about presciption adherence.

11. The patient leaves with a prescription (see Figure 4).

The following diagrams show the routes the prescription process takes in each of the three user groups.
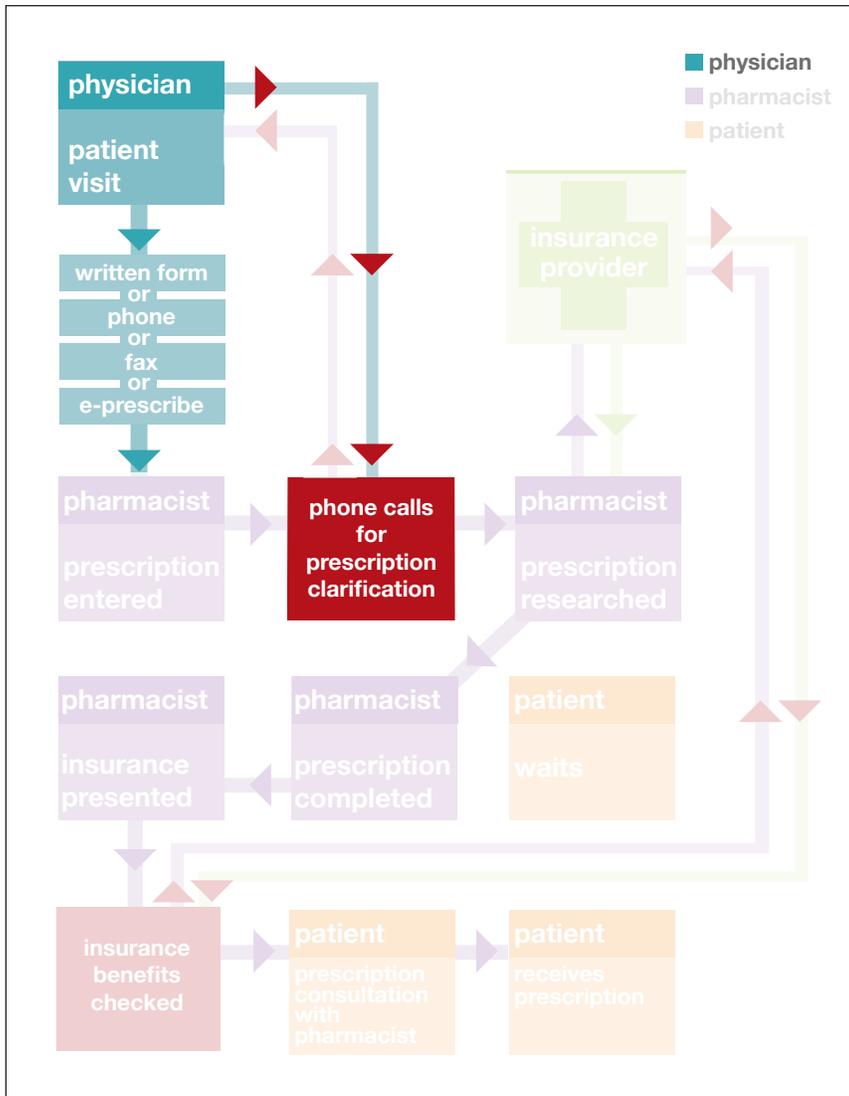
*Figure 1.* Physician role in the prescription process.
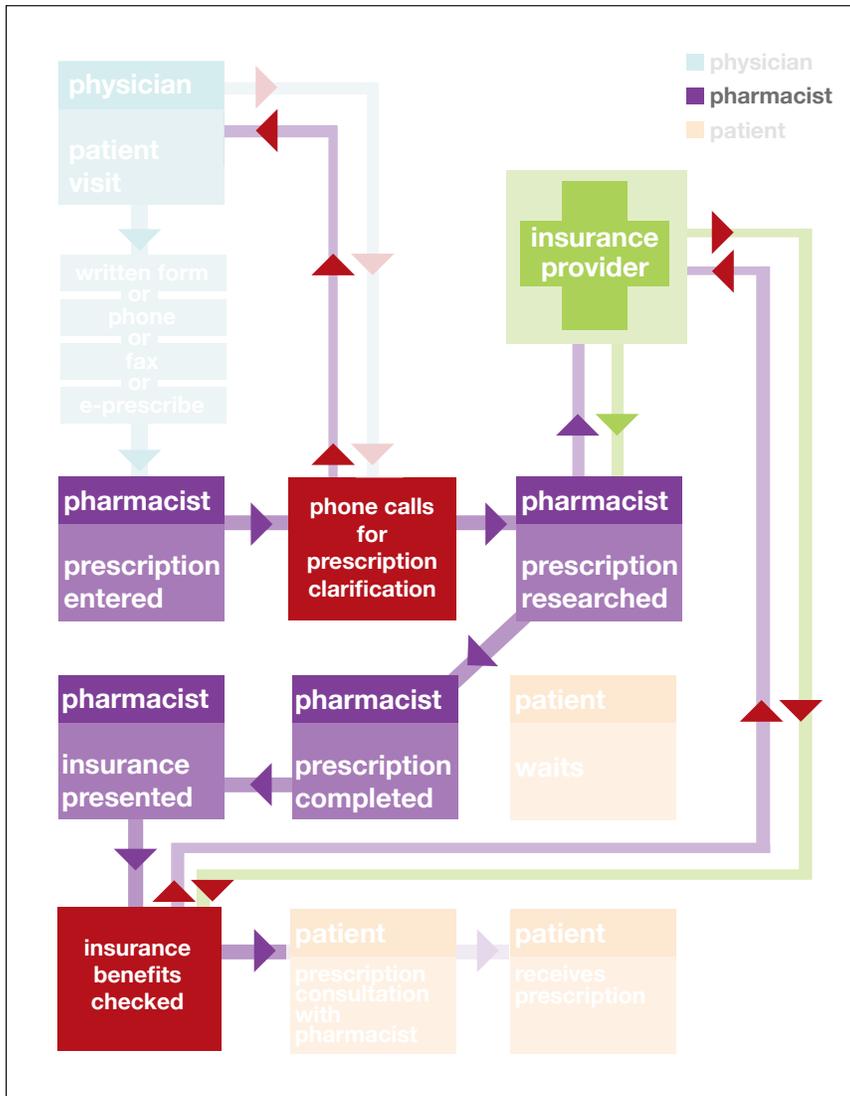
Figure 2. Pharmacist role in the prescription process.
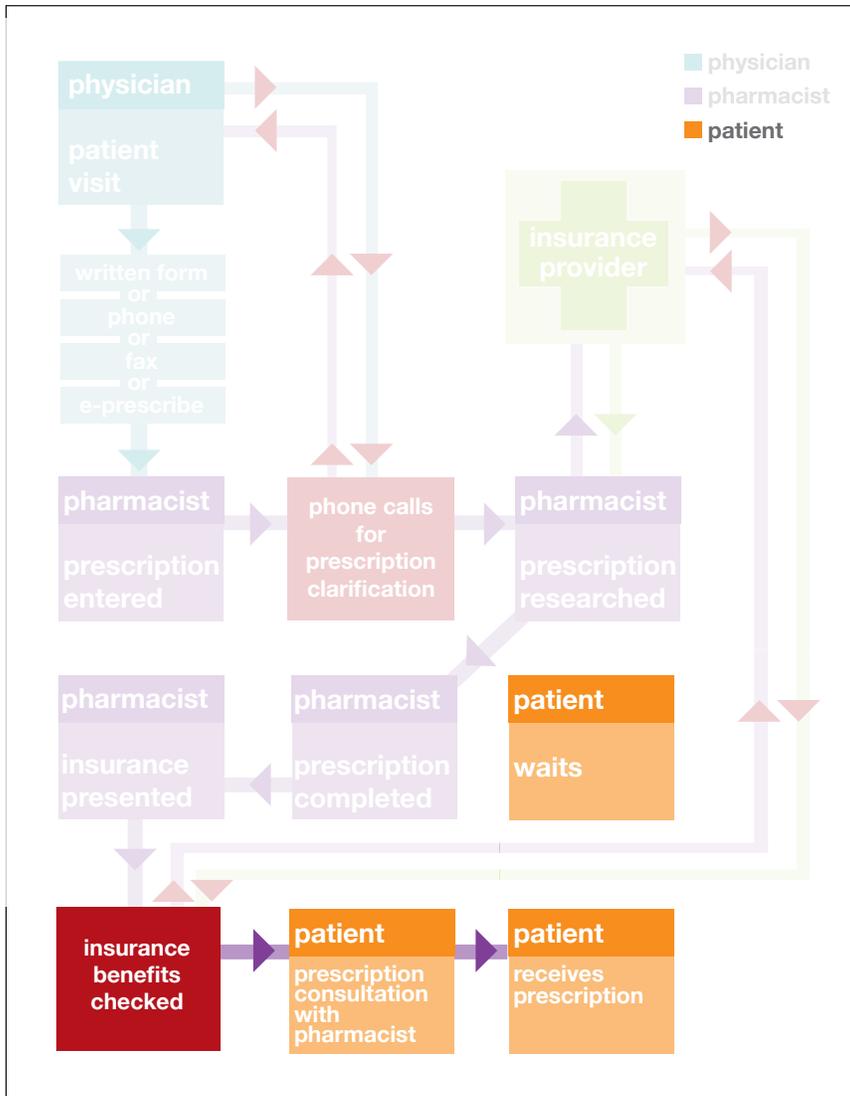
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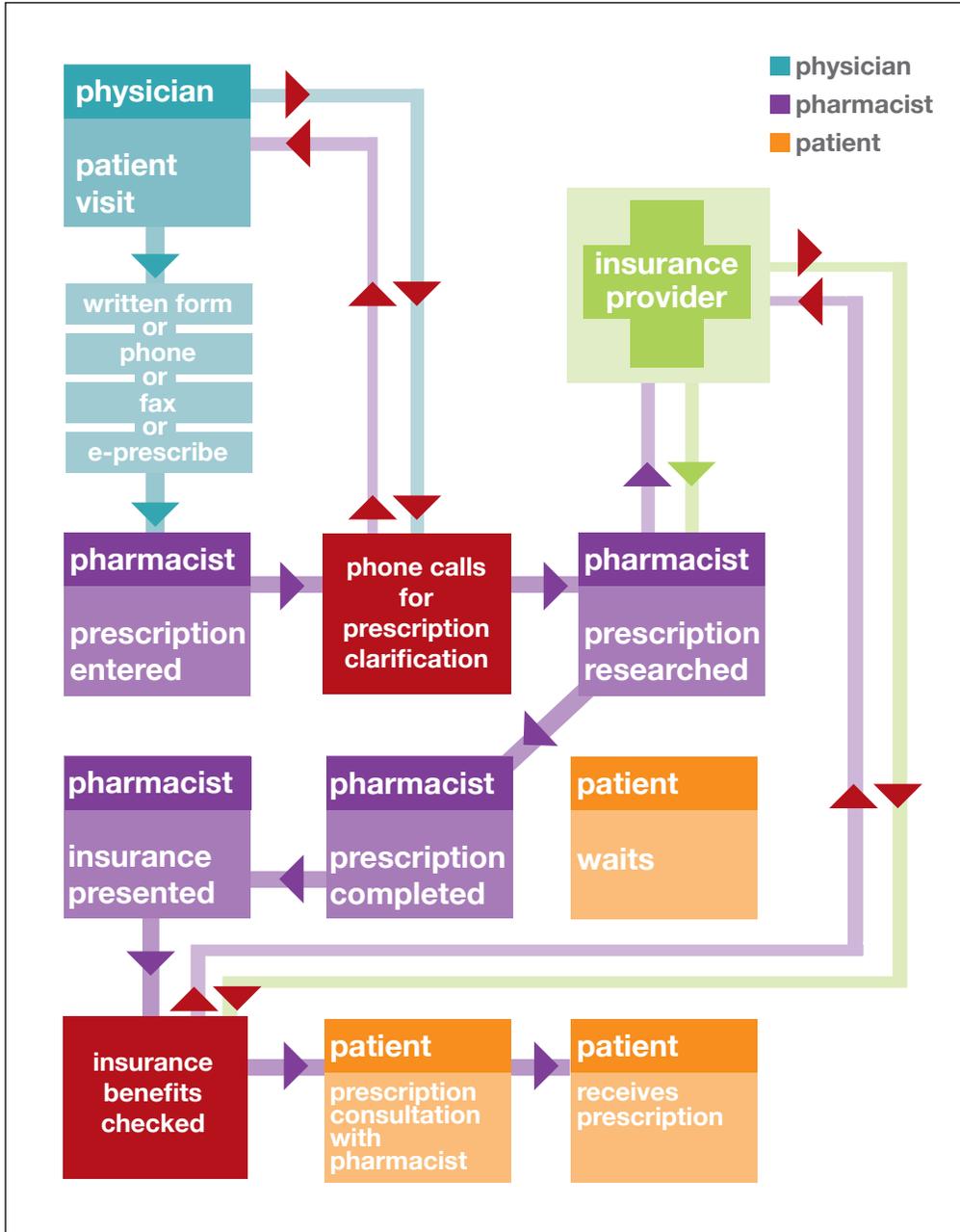
*Figure 4*. The current prescription reality.

What Are The Physician's Needs?

In addition to diagnosis, physicians must stay current on new drug offerings, their generic counterparts and potential co-medication conflicts. Although the technology is in place for patient database information and pharmaceutical references to combat drug conflicts, more than half of the physicians surveyed still use a paper prescription pad.

As part of its e-prescribing project, CareFirst, the largest health care insurer in the Mid-Atlantic region, has provided hand-held devices, software and training to 500 physicians. Currently, 350 continue their enrollment. Some of the remaining 150 doctors have graduated to more-sophisticated electronic medical records, but many simply returned to pen and pad (Connelly, 2008).

In the first round of surveys for this investigation, physicians said the use of the paper pad allowed for mobility in the examination room. Placing a complete computer workstation—computer, monitor and keyboard—in each examination room proves to be financially unfeasible. Physicians also stated that mobile access to key information would drive a change in their workflow.

Having a computer workstation in the exam room poses additional problems. The *NewYorkTimes.com* columnist for the Health section, Dr. Pauline Chen, recalls,

> The new computer was perched atop a desk in one corner of the room; the patient sat on the exam table on the other side of the room. In order to use the computer, I had to turn my back to the patient as I spoke to him. I tried to compensate by sitting on a rolling stool but soon found myself spending more time spinning and wheeling back and forth between patient and computer than I did sitting still and listening (Chen, 2010).

One physician-survey response included the comment that having patient information accessible at the point of care would reduce the need for repetitive communication with the pharmacy later about the prescription, decreasing the need for office staff to revisit patient records to answer pharmacy follow-up calls. How can the prescription communication vehicle give the physician information access at the point of care and allow for the ease and mobility of a handwritten prescription?

## What Are The Pharmacist's Needs?

Pharmacists represent the front line in detecting prescription overlap or dangerous interaction between drugs and in recommending cheaper options to expensive medicines. Their expertise and direct interaction with patients should allow for adequate time with patients for the explanation of proper prescription usage and effects. This evolving use of pharmacists also holds promise as a buffer against an anticipated shortage of primary care doctors (Rothman, 2011).

In the coming decades, states Ronald Jordan, former American Pharmacist Association president, the pharmacist's responsibility will grow to include the analytical, consultative, educational and monitoring services to help consumers get the best results from medications. By enhancing consumer understanding of medication therapy, increasing consumer adherence to medications, control of costs and prevention of drug complications, conflicts and interactions, pharmacists will value their cognitive services and remove themselves from being the sole filler of prescriptions (Jordan, 2010).

Prescription drugs are the fastest-growing component of health care, making pharmacists the most easily accessible health care workers. Now, more than ever, the health care industry depends on pharmacists to consult with patients and to oversee the

proper administration of patient prescriptions (Abelson, 2010). Surveys have found that a pharmacist fills 275 prescriptions on average during a 10-hour shift, or a prescription every 2.18 minutes, leaving little time for prescription consultation.

Pharmacist survey responses showed that receiving prescription information that was complete and accurate would eliminate the need for 90 percent of the follow-up phone calls to physicians, thus allowing more time for patient consultation. These facts pose this question: How does the pharmacist find time to conduct this new expectation of consultation and continued need for faster prescription delivery?

## What Are The Patient's Needs?

Today's patient faces several challenges when ill and seeking relief. The cost of healthcare and prescriptions, and unanswered questions about prescription dosage and their effects, can leave the patient holding the prescription, with few answers. A recent article in the *New York Times* stated that as many as half of the nation's patients do not take their medications as prescribed, costing nearly $330 billion a year in emergency room visits, hospital stays and other medical expenditures (Abelson, 2010). This figure equals almost 10 percent of the total United States healthcare budget based on research conducted by the New England Healthcare Institute (NEHI, 2009). How can patients receive the level of dosage direction they need to provide a level of comfort needed to complete the prescription?

A Medicare study published in 2005 reported that 90 percent of seniors taking prescription drugs were using five or more drugs, half had more than one physician, and one-third used more than one pharmacy. A Kaiser Foundation report published in

September 2008 stated that of the 3.8 billion prescriptions filled in 2007, only 50 percent were taken as directed (Lundy, 2008).

Aglaia Panos, president of the Marin County Pharmacists Association in Marin County, California, found that one out of three people never fill their prescriptions, more than one-third of medication-related hospital admissions are linked to poor adherence, nearly 45 percent of the population has one or more chronic conditions that require medication, and nearly three out of four Americans do not take their medications as directed (Panos, 2011).

The National Council on Patient Information and Education (NCPIE) defines medication nonadherence is defined as the number of doses not taken or taken incorrectly that jeopardize the patient's therapeutic outcome. NCPIE has noted that nonadherence can take a variety of forms, including not having a prescription filled, taking an incorrect dose, taking a medication at the wrong time, forgetting to take doses, or stopping therapy too soon (National Council on Patient Information and Education [NCPIE], (2007).

Patient responses to this investigation showed that the number one change they would make in the existing prescription flow is for their physician to completely handle the transfer of prescription information to the pharmacy. This patient group would ask prescription questions of their pharmacist in 9 out of 10 cases. An additional request was an email or text notification confirming the prescription. The largest responders to this investigation's survey felt very loyal to their pharmacies based on time spent consulting on prescription instructions with their pharmacist and knowledge of the patient's personal and family medical history. What change in the process would allow the patient more time with the pharmacist?

This investigation will seek existing patterns, positive and negative, from each user's perspective to provide the basis to redefine the prescription pad to reflect current technology and sustainability, along with potential changes. The result will be a prescription vehicle that allows physicians the ease and familiarity of handwriting and provides prompt and accurate information to the pharmacist, thus allowing more time for patient consultation and interaction.

Thesis Organization

This thesis will seek to incorporate typography, design thinking and principles, combined with technology through visual communication, for a successful prescription solution and aid in the progression of a more expeditious process. The Introduction outlines the characteristics and challenges of three groups: physicians, pharmacists and patients. Preliminary research will define the current prescription pad, its shortcomings and how the application of graphic design can create a stronger vehicle. The Methods section documents current required information for the prescription pad, based on research, surveys and interviews with physicians and pharmacists and followed by the design outcome. The Results chapter details the systematic process of using the research outcome, *TranscribeRx*. The Conclusion will suggest alternative uses for *TranscribeRx*.

**CHAPTER II**

PRELIMINARY RESEARCH

Prescriptions

By 2017, the Department of Health and Human Services forecast for the annual

spending on prescription drugs is $515 billion. On an average day, today's physician

writes 30 prescriptions and handles another 30 refill requests. Of these, 50 percent are

handwritten (Anderson, 2010). *The Clinician's Guide to e-Prescribing* states that due

largely to handwritten prescription-legibility problems, prescription orders require

confirmation callbacks at the pharmacy level in almost 40 percent of cases, and roughly

150 million calls for clarification from pharmacists to physicians. The typical pharmacy

callback costs physician practices up to $7 per prescription to pull and review the chart

before returning the call.

Handwriting

A study of prescription medication errors at primary-care doctors' offices found

that written and oral communication problems were the most common causes of the

errors. At least 1.5 million preventable adverse drug reactions a year occur, according to

the Institute of Medicine (Rothman, 2011). Many of these errors are due to doctors'

infamously illegible handwriting. Documentation of a general lack of legible handwriting

can be illustrated in the next examples:

A 1904 issue of the *British Medical Journal*, under the subheading *Illegible Prescriptions,* states,

> If we may judge from 'awful examples' which at one time or another have come under our notice, prescribers in this country do not, as a rule, cultivate the art of hieroglyphic writing with such success as many of their foreign brethren. But there are not a few among us who would seem to act on the popular theory that illegible handwriting is a proof of genius. Serious and even fatal accidents have been caused by the careless writing of symbols, or the misreading of the preparation of an active drug which the physician intended to order.

Vishwas Heathcliff of *Handwriting University International* writes, "On an average, a doctor does not write more than 40 words on a prescription. Doctors take about three minutes to write a prescription in illegible handwriting" (Heathcliff, 2008).

A Texas jury awarded a woman $450,000 after her husband died when his pharmacist misread "Plendil" (a medication for high blood pressure) for "Isordil," a medication for heart pain. The jury concluded that his physician's poor handwriting was responsible for the error (Scott, 1999).

Aware of the impact of medical errors, the American Medical Association has long cautioned physicians to take greater care with their handwriting. One approach to poor physician penmanship has been to send doctors back to school. In a handwriting class at Cedars-Sinai Medical Center in Los Angeles, physicians learn to write in an italic

style that is highly readable. Indiana University Medical School has added penmanship exercises to its curriculum on quality of care.
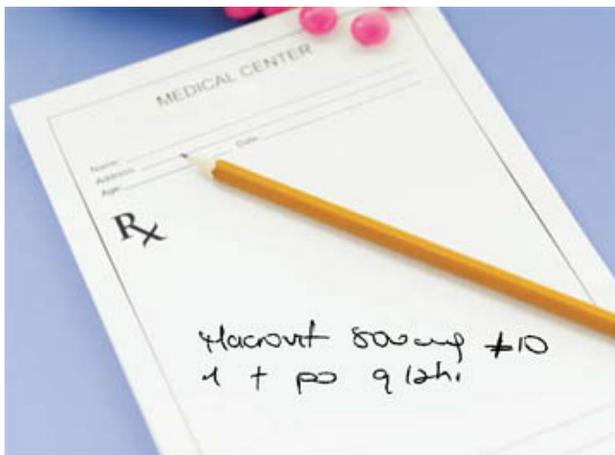


*Figure 5.* Example of bad prescription handwriting upload to *Pharmacytimes.com*.

The website *Pharmacytimes.com* has held online contests in which pharmacists upload examples of the worst prescription writing they receive. One prescription scrawl stated (see Figure 5), Motrin 800 mg, #10, 1 tablet by mouth every 12 hours.

### Prescription Pad Specifics

A recent Google search returned over 179,000 hits for paper prescription pads. Prescription pad dimensions, font choice and application, column widths, placement of information and paper color reflect little consistency. This variance creates problems for both physicians and pharmacists. If there is no area specified for needed prescription information on the paper pad, the physician must handwrite the information, causing the need for more interpretation and additional communication from the pharmacist to the physician. In one following example (see Figure 7), the physician is given a large blank space to write in all the information. The inconsistent location of information on the pad

causes readability challenges related to visual orientation; the pharmacist (see Figure 12) has to make a constant visual search for the required information. The prescription is one of the most important transactions between physicians and patients, but unlike the diagnosis, the prescription requires an interpreter: the pharmacist. The prescription pad has few consistent industry content requirements and nonadherence problems from the requirements that do exist.

Interviews with physicians and pharmacists and a search of current prescription vehicle offerings were compiled to create a complete list of needed prescription information. The list of requirements is followed by a brief description.

*Physician Name and Associated Numbers*

Physician or Physician Assistant names with their license, DEA and TxDPS numbers.

*DEA and TxDPS Numbers*

The Texas Department of Public Safety (TxDPS) requires that practitioners who are licensed in Texas now have to include their current and valid TxDPS registration numbers and Federal Drug Enforcement Administration (DEA) registration numbers on all prescriptions written for Schedule III-V Controlled Substances. If a practitioner's TxDPS and DEA registration numbers are not included on a prescription, it will not be considered a valid prescription and will not be filled. Furthermore, the TxDPS registration number must belong to the practitioner issuing the prescription.

According to the TxDPS, pharmacies are required to report prescriptions written for controlled substances, Schedules III-V. Previously prescription-information reporting was required only for Schedule II Controlled Substances. Schedule II drugs are

considered to have a strong potential for abuse or addiction but also have legitimate medical use (DeBeers, 2008).

Controlled drugs are drugs that come under the jurisdiction of the Controlled Substances Act and are divided into five schedules. Drugs can be scheduled, unscheduled or moved from one schedule to another as the need arises. Schedule definitions relative to prescription are as follows:

1. *Schedule I.* Drugs in this schedule have no accepted medical use in the United States and have a high abuse potential. Examples are heroin, marijuana, LSD, peyote, etc.

2. *Schedule II.* Drugs in this schedule have a high abuse potential with severe psychic- or physical-dependence liability. Included are certain narcotic analgesics, stimulants and depressant drugs. Examples are opium, morphine and codeine.

3. *Schedule III-V.* Drugs in these schedules have a declining abuse potential less than those in Schedules I and II.

*NPI Number*

National Provider Identifier (NPI) is a 10-position, intelligence-free numeric identifier (10-digit number). This means that the numbers do not carry other information about healthcare providers, such as the state in which they live or their medical specialty. Beginning May 23, 2007 (May 23, 2008, for small health plans), the NPI must be used in lieu of provider identification numbers.

The NPI is the only health-care-provider identifier that can be used for identification purposes in standard transactions. NPIs are also used to identify health care

providers on prescriptions, in coordination of benefits between health plans, in patient

medical record systems, in program integrity files, and in other ways. The Health

Insurance Portability and Accountability Act (HIPAA) requires that covered entities use

NPIs in standard transactions. The NPI must be used in lieu of legacy provider identifiers

in the HIPAA standards transactions (National Council for Prescription Drug Programs

[NCPDP], 2005).

*Patient Information*

The area contains the patient's name, address and phone number. In addition, the

person's date of birth (DOB), a commonly missed important piece of information, is used

for patient identity in the case of a similar name. Pharmacists must have this information

to complete the prescription successfully.

*Number of Prescriptions per Page*

The number of prescriptions per form should be limited to two for easier

readability and clarity.

*Prescription Name and Brand Necessary*

This section is the space for prescription name entry. Physicians usually have

several pharmaceutical choices for a diagnosis. The physician must decide whether the

brand name is required or a generic of the drug can appropriately be used to fill the

prescription. In cases in which a generic is an option, many insurance providers will

cover only the generic alternative unless the physician notes that the brand is necessary.

*Strength*

A common type of error involves the strength, which gives the pharmacist direction about the chosen dosage-strength option.

*Amount and Directions*

The amount and directions are instructions to the patient. Physicians may write "Sig" before this information. "Sig" is short for the Latin *signetur*, or "let it be labeled" (Bihari, 2010). Directions should be explicit and simple, and, when appropriate, figures are preferred to spelling out numbers. For example, "Take 2 tablets in the morning and 2 tablets in the evening" rather than "Take two tablets twice daily." The amount and directions should be stated in clear, simple terms (e.g., "for high blood pressure" rather than "for hypertension") in order to be easily understood by the patient.

*NO Refill and Refill Numbers*

The number of refills or the "no refills" designation is an important note to the pharmacist, especially concerning specific drugs. The Office of Diversion Control within the Department of Justice requires that pharmacists record every refill of certain drugs within a six-month period.

*Warning*

The warning area should provide information to patients about possible side effects, combinations to avoid, and what time of day to take the medication.

Applied Methods of Graphic Design

The following prescription examples show a wide range of visual presentations of important information. A more positive conveyance of the prescription information could be produced with the application of graphic design principles because of the way they play a part in helping the reader successfully complete a task. A more easily read form based on the understanding of how smaller pieces of information relate and work together to make up the larger whole will be partnered with an understanding of how information is read and processed in the pad redesign.

A study of this principle began in Germany in the 1920s. The word *Gestalt* is loosely translated from German to mean "whole." When defined in relationship to design, Gestalt is the investigation of the visual perception of parts and their relationship to a whole. Gestalt psychologists studied these relationships and authored a theory on their application (Bastoky, 2009).

The Gestalt principles of perception explain that the mind groups smaller pieces of visual puzzles to make a greater whole. The Gestalt principles of perception (Bastoky, 2009) include the following:

1. Proximity – How close elements are to each other. When objects are placed close together, they are perceived as a group.

2. Similarity – Items that look similar are grouped together. When similarity occurs, an object can be emphasized if it is dissimilar.

3. Closure – Elements are grouped together if they complete a pattern or form. An object might not be completely closed, but enough shape is indicated to present the perception of a whole, with the mind supplying the missing pieces.

4. Continuance – Items come together according to symmetry, regularity and smoothness. The eye moves through one object and continues to another.

Gestalt studied how people group and organize what they see—their visual perception. Many of the inefficiencies in the current prescription pad designs reflect that little thought had been given to the needs of physicians and pharmacists.

The arrangement of information using text, blank space, rows and columns influences the way readers see text. These spatial arrangements lead readers to see the text in specific ways. Placing prescription details in close proximity allows for the quick visual grouping of information. Leading physicians and pharmacists through the prescription and helping them to follow the order and importance of information easily and correctly are among the goals of this prescription redesign.

The figure-ground principle captures the idea that the visual field is comprised of two parts, figure and ground. In typography this relationship can affect the order in which text is read. Blank space and text can act as ground. Because figures are by definition the focus of attention, they tend to be examined first. If readers start with the "wrong" information, they may miss the information they need most. When all elements on the page carry the same visual weight, the reader can miss information because elements are perceived to have the same level of importance. Prescription D (see Figure 9) is an example of having too many elements of the same visual weight, and thus no one item or piece of information is perceived as more important.

Typography plays a part in giving one element priority over another. Choices of font, weight and size can give emphasis to specific text to make it contrast with text that surrounds it. A visual hierarchy of importance is established when these characteristics

are incorporated with intent. This hierarchy of elements is a gradual series arranged in order of importance, and its characteristics help the end user navigate through the prescription. Required prescription form information should be one font, providing a similar look so that the reader associates that font with a task. These applications are essential in guiding the physician through the entering of patient data and helping the pharmacist locate it.

When a visual field is perceived, the patterns that emerge depend on the unique characteristics of the elements of the field and their relationships to each other. Grouping information to form a pattern will aid the physician in successfully completing the required information.

Gestalt psychologists have carried out numerous studies in which they showed that the various parts of the visual field interacted with one another. For example, the perceived size, brightness and shape of a figure depend on other figures that surround it. A general Gestalt principle is that everything in the perceptual field influences everything else (Bastoky, 2009).

Good continuation is important in the design of forms, especially in the alignment of columns. The horizontal lines may interfere with the reader's ability to connect the column headings with the data. In effect, this strategy carves up the content into parts that are marked by the rule lines. Columns and rules are effective tools for the separation of information. Prescription C used multiple columns and rows to incorporate too much default information, making the layout visually busy, the text too small and the visual column too wide to be easily read.

Current Prescription Pad Examples

A pharmacist received the following prescriptions in one 10-hour shift. The forms are actual size, where permitted, for a complete illustration of their visual inconsistency. The method of prescription delivery is noted within the figure description to show the various delivery methods used. Specific information has been removed in adherence with HIPAA, the Health Insurance Portability and Accountability Act of 1996 (NCPDP, 2005) requirements.

Prescription Refill Request for: Dr.                    Fax Line
Phone:

DALLAS, TX

_____

This request is from:                                 Fax Date;
                                                      Fax Line:
                                                      Telephon

_____

Rx Number:                  Last Fill Date:           Original Fill Date:
Patient:                                              Date of Birth
Address:

Drug Prescribed: FOLIC ACID 1 MG TABLET
Drug Dispensed:                                       NDC: 00143-1248-10
Original Quantity Ordered: 100          Dispensed Quantity
SIG: TAKE 2 TABLETS BY MOUTH DAILY. (MAY TAKE 6 TABLETS ON THE DAY BEFORE
     AND DAY AFTER METHOTREXATE) TO REDUCE SIDE EFFECTS FROM MTS.
Original Refills Authorized:    0 refills
Authorized:                     ___Once___ plus additional refills authorized  0  1  2  3  4  5  (6+)
Denied:
Message to Patient:            _____
Physician Comments to Pharmacy: __1 yr PRN refills_____
Print Name if authorized by a different Prescriber: _____
DEA# if authorized by a different Prescriber: _Uslyn Aramwell N/A_
Authorized by:                  _____BF594803_____

Please note: Unless DAW is written on this prescription request, a generic drug may be used.

_____

Signature_____        Signature _____
         DAW                                      May Substitute

*Figure 6.* Prescription A, faxed to the pharmacy.

*Figure 7.* Prescription B, delivered by the patient to the pharmacy.

**children's** MEDICAL CENTER

1935 Medical District Drive
Dallas, Texas 75235
(214) 456-7000

Dermatology Clinic
(214) 456-5030
Fax (214) 456-2744

Name: _

Address:

DOB: *_____

*POF*

Date: _____                    Weight: _____                    RX-367

℞    Security Features Include Void Pantograph, Artificial Watermark, and a Thermochromic Rx on the Reverse of the Document.    ❑ Label in Spanish

| DRUG & STRENGTH | DIRECTIONS | QUANTITY | REFILLS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

| DRUG & STRENGTH ECZEMA/PSORIASIS | FREQUENCY | QUANTITY | REFILLS |
|---|---|---|---|
| ❑ AMMONIUM LACTATE (LAC-HYDRIN) 12%<br>Lotion ❑ 225 mL ❑ 400 mL / Cream ❑ 140 gm ❑ 385 gm | Apply to affected areas ❑ daily ❑ 2 times a day | | |
| ❑ CALCIPOTRIENE (DOVONEX) 0.005%<br>Cream ❑ 30 gm ❑ 60 gm / Ointment ❑ 100 gm ❑ 120 gm ❑ 60 mL solution | Apply to affected areas ❑ daily ❑ 2 times a day | | |
| ❑ HYDROCORTISONE 2.5%<br>❑ Ointment ❑ Cream ❑ 30 gm ❑ 60 gm | Apply to affected areas ❑ daily ❑ 2 times a day | | |
| ❑ TAZORAC<br>❑ GEL ❑ CREAM ❑ 0.05% ❑ 0.1% ❑ 15 gm ❑ 30 gm ❑ 60 gm ❑ 100 gm | Apply to affected areas ❑ daily in the morning ❑ 2 times a day<br>Discontinue use if pregnant. | | |
| ☑ DESONIDE (DESOWEN) 0.05%<br>~~❑ Cream~~ ☒ Ointment ❑ 15 gm ❑ 30 gm (15 gm x 2) ☒ 60 gm | Apply to affected areas ❑ daily ☑ 2 times a day<br>on _face /neck /groin /axilla_ | 60g | X 4 |
| ❑ DERMA-SMOOTHE OIL 120mL | Use as directed | | |
| ❑ LUXIQ FOAM 100 gm | Massage small amount into affected areas on scalp.<br>Apply two times a day. | | |
| ❑ FLUOCINOLONE (SYNALAR)<br>❑ 15 gm ❑ 60 gm / ❑ Ointment 0.025% ❑ Cream 0.025% ❑ 0.1% Solution, 60 mL | Apply to affected areas ❑ daily ❑ 2 times a day | | |
| TRIAMCINOLONE<br>~~❑ Cream~~ ☒ Ointment ❑ 15 gm ❑ 0.025% ☒ 80 gm ~~❑ 0.1%~~ ❑ 480 gm | Apply to affected areas ❑ daily ☒ 2 times a day | 80g | X 1 |
| ❑ CETIRIZINE (ZYRTEC) ❑ 5 mg ❑ 10 mg ❑ 5 mg/ 5 mL | Take _____ mg by mouth daily. | | |
| ☒ HYDROXYZINE HCL (ATARAX) ☒ 10 mg/5 mL syrup ❑ 10 mg tablet ❑ 25 mg tablet | Take _10-20_ mg by mouth ☒ at bedtime ❑ 2 times a day ❑ every 6 hours _as needed for itching_ | 300ml | X 1 |
| ❑ FLUOCINIDE (LIDEX) 0.05% ❑ Cream ❑ Ointment ❑ Solution, 60 mL ❑ 15 gm ❑ 30 gm ❑ 60 gm ❑ 120 gm | Apply to affected areas ❑ daily ❑ 2 times a day<br>Do NOT apply to face, neck, groin or underarms | | |
| CUTIVATE (FLUTICASONE) ❑ Cream ❑ Ointment | Apply to affected areas ❑ daily ❑ 2 times a day | | |
| WESTCORT (HYDROCORTISONE VALERATE) 0.2%<br>❑ Ointment ❑ Cream ❑ 45 gm ❑ 60 gm | Apply to affected areas ❑ daily ❑ 2 times a day | | |

Number of prescriptions authorized (spelled out)    _full_    Signature ~ ._____    Date _____

Figure 8. Prescription C, delivered by the patient to the pharmacy.

CareNOW

Patient:
Address:
Date:

DEA:
DEA:

Rx: avelox 400mg / levaquin 500mg / levaquin 750mg
Disp: #3 / #5 / #7 / #10 / 14
Sig: 1 PO qd x 3 / 5 / 7 / 10 / 14 days

Rx: Z-pack Disp: #1 Sig: 2 PO today, then 1 PO qd next 4 days

Rx: amoxil 875mg / amoxil 500mg / amox 200mg chews /
amoxil 400mg chews / augmentin 875mg / augmentin 500mg /
bactrim DS / ceftin 500mg / ceftin 250mg / cipro 750mg / floxin 400mg /
cipro 500mg / doxycycline 100mg / flagyl 500mg / floxin 400mg /
keflex 500mg / macrobid / mindcin 100mg / omnicef 300mg /
penVK 500mg Disp: #6 / #10 / #14 / #20 / #28
Sig: 1 PO bid x 3 / 5 / 7 / 10 / 14 days

Rx: bactrim DS Disp: #40 Sig: 2 PO bid x 10 days
Rx: cipro XR 1000mg / cipro XR 500mg Disp: #3 Sig: 1 PO qd x 3 days
Rx: zithromax 250mg Disp: #4 Sig: take all 4 tabs PO now as single dose
Rx: augmentin XR / biaxin XL 500mg / omnicef 300mg Disp: #14 / #20 / #28
Sig: 2 PO qd x 7 / 10 / 14 days
Rx: clindamycin 300mg / dicloxacillin 500mg / PenVK 500mg
Disp: #40 Sig: 1 PO q 6 hours x 10 days
Rx: diflucan 150mg Disp: # ___ Sig: 1 PO now,
then, 1 PO q 7 days x ___ additional doses
Rx: tamiflu 12mg/1ml Disp: 10 doses Sig: 1/2 tsp (30mg per dose) /
3/4 tsp (45mg per dose) / 1 tsp (60mg per dose) /
1.25 tsp (75mg per dose) PO bid x 5 days
Rx: tamiflu 75mg Disp: #10 Sig: 1 PO bid x 5 days
Rx: relenza 5mg Disp: #20 with Diskhal Sig: 2 inhalations bid x 5 days
Rx: amoxil 200/5, amoxil 400/5, augmentin 400/5, augmentin 400/5,
biaxin 125/5, biaxin 250/5, ceftin 125/5, ceftin 250/5,
cefzil 125/5, cefzil 250/5, keflex 125/5, keflex 250/5,
omnicef 125/5, vantin 50/5, vantin 100/5 Disp: 50ml / 75ml / 100ml
/ 125ml / 150ml / 175ml / 200ml / 250ml
Sig: 1/2 tsp / 3/4 tsp / 1 tsp / 1.25 tsp / 1.5 tsp / 1.75 tsp
/ 2 tsp / 2.5 tsp PO bid x 5 / 10 days
Rx: zithromax 100/5, zithromax 200/5
Disp: 15ml Sig:1 tsp PO today, then 1/2 tsp PO qd next 4 days
Rx: zithromax 200/5
Disp: 23ml Sig: 1 1/2 tsp PO today, then 3/4 tsp PO qd next 4 days
Disp: 30ml Sig: 2 tsp PO today, then 1 tsp PO qd next 4 days
Rx: bactrim susp Disp: 100ml / 150ml / 200ml / 250ml / 300ml
350ml / 400ml Sig: 1 tsp / 1.5 tsp / 2 tsp / 2.5 /
3 / 3.5 / 4 tsp PO bid x 10 days
Rx: tobrex ophth sol. / Disp: 5ml Sig: 1 gtt ___ eye(s) q 2h W/A x 2
days, then, q4h W/A x 5 / 7 days
Rx: vigamox Disp: 3ml Sig: 1 gtt ___ eye(s) tid x 7 days
Rx: patanol Disp: 5ml Sig: 1 gtt ou bid 6-8 hours between doses
Rx: cortisporin otic susp. Disp: 10ml Sig: 5 gtts ___ ear(s) qid x 7 days
Rx: ciprodex suspension Disp: 7.5ml Sig: 4 gtts ___ ear(s) bid x 7 days
Rx: bactroban oint. Disp: 15g / 30g Sig: AAA tid x 10 days
Rx: silvadene Disp: 50g / 85g / 400g Sig: apply bid to burned area(s)
Rx: mentax crm. Disp: 15g / 30g Sig: AAA qd / bid x ___ days
Rx: hytone crm. 2.5% / kenalog crm. 0.1% / lidex crm. 0.05%
D: 30g / 60g Sig: AAA sparingly tid-qid x 7 / 10 / 14 days

Rx: elimite Disp: 60g Sig: apply to entire body avoiding mouth, eyes, and
nose. Wash off in 12 hours; repeat in 7 days
Rx: rhinocort DPI / QVAR 40 / QVAR 80 Disp: #1
Rx: nasonex / flonase Disp: #1 Sig: 1 / 2 sprays each nostril qd
Rx: prednisolone syrup 5mg/5ml, 15mg/5ml Disp: ___ ml
Sig: starting ___ take ___ tsp PO bid x ___ days
Rx: prednisone 20mg Disp: # ___ Sig: starting ___ take 1 / 2 / 3
tabs PO qd / q a.m. x ___ days
Rx: singulair 4mg / 5mg / 10mg / Disp: #30 Sig: 1 PO q hs
Rx: albuterol HFA / combivent MDI / xopenex HFA
Disp: #1 Sig: 2 puffs w spacer q 4-6 hours prn wheezing
then, 2 puffs w spacer q 4-6 hours prn wheezing x 3 days,
Rx: inspirease / spacer Disp: #1 Sig: use with inhalers
Rx: albuterol syrup Disp: ___ ml. Sig: ___ tsp PO tid x ___ days,
then ___ tsp tid prn wheezing
Rx: rondec DM syrup Disp: 120ml Sig: (6-12 yrs) 1/2 tsp / (adults) 1 tsp
PO q 4-6 hours prn cough or congestion
Rx: atarax 25mg Disp: #30 Sig: 1 PO q 6 hours x 3 days, then 1 PO q 6
hours prn rash / swelling / itching
Rx: cimetidine 30mg Disp: #12
Rx: phenergan 25mg supp. / phen... Disp: 1
Rx: naproxen 550mg Disp: #20 Sig: 1
Rx: indocin 25mg Disp: #50 Si... 8 hours, then days, then
Rx: skelaxin 800mg Disp: #40
Rx: pyridium 200mg Disp: #6
Rx: lidocaine viscous Disp: 10
throat. Gargle and swal...
Rx: kenalog in orabase: Disp:
prn pain

Rx:

Rx:

RX#:
RF: TAKE ONE TABLET BY MOUTH EVERY
WRITE DAY
DISP:LISINOPRIL-HCTZ 20-12.5 MG TAB

ORD:15
DISP:15
DAYS:15

Rx:

TOTAL NUMBER OF PRESCRIPTIONS (circled):
one / two / three / four / five / six / seven / eight

NO REFILLS

*Figure 9.* Prescription D, faxed to the pharmacy by the physician.

*Figure 10.* Prescription E, delivered by the patient to the pharmacy.

```
                        Otolaryngology

                        Dallas,
                          ph#:
                          fax:  ___ ___ ____

                        PRESCRIPTION

Name:
Addr:                                              MRN:
                                                   DOB:
                                                   Age:
                                         Home phone:
                                         Work phone:
                                         Subscriber ID:


Allergies: ASACOL 400, MORPHINE SULFATE, VICODIN 5-500


propranolol 20 mg Oral Tab
Qty Disp: 180                                 Refills: 3
Route: Oral
Start:

SIG: Take 2 Tabs by mouth three times daily




Signature
Electronically authorized by:
        MD                          NPI:

A generically equivalent drug product may be dispensed unless
the practitioner indicates the words 'Brand Necessary' or
'Brand Medically Necessary' on the face of the prescription.

This prescription has been electronically transmitted via
facsimile to

at                                 11:20 AM by

The valid recipient of this fax must notify
```

*Figure 11*. Prescription F, faxed to the pharmacy by the physician.

*Figure 12.* Prescription G, delivered electronically to the pharmacy.

The prescription examples shown vary not only in their visual presentation but also in their prescription content (see Table 1). This lack of consistent information on prescriptions drives a significant portion of the millions of phone calls every year made from pharmacies back to physicians seeking vital pieces of information to fill a prescription successfully. Without a clear form with readable and correct directions, the physician is apt to miss conveying major pieces of information. Prescription example B measures 8.5 inches by 11 inches; there is no grouping of needed information, only a

large unlined box. The physician has written in proportion to the space given, using a swipe of the pen to separate two prescriptions. The physician has been left to determine how to best present the pharmacist that the prescription specifies. Understanding how information is read and processed will be incorporated into the prescription redesign.

Prescription Pad Examples

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| Physician name | ● | ● | ● | | ● | ● | ● |
| DEA | | | | ● | ● | | ● |
| DPS | | | | | ● | | ● |
| NPI | | | | | | | |
| Patient Name | ● | ● | ● | ● | ● | ● | ● |
| Patient Contact | ● | ● | ● | ● | | ● | ● |
| Patient Birthdate | ● | | ● | | | ● | ● |
| Space for Two Prescriptions | | | ● | | | | |
| Prescription Name | ● | ● | ● | ● | ● | | ● |
| Brand Necessary | | | | | ● | ● | |
| Strength | ● | | ● | ● | ● | | ● |
| Amount | ● | | ● | ● | | ● | |
| Directions | ● | | ● | ● | | ● | ● |
| No Refill/Refill | ● | | | | ● | ● | ● |
| Warning | | | | | | | ● |

*Table 1.* Prescription Pad examples A-G, prescription information comparison.

How Documents are Read

Because pharmacists fill a prescription every 2.18 minutes over a 10-hour shift, helping with the location of essential information easily is paramount in the process of the prescription pad redesign. The visual used will be aided by an understanding of how documents are read. Studies have shown that a reader's eye goes through a series of motions called a saccadic movement, punctuated by pauses called fixation pauses. Information is read as a group of words within one eye span, a pause, and a shift of eyes to another group of words. At normal reading distance, an eye span is about 13 picas, or just over 2 inches. If columns of text are set wider than this measurement, readers must move their heads to follow their eyes. This necessity makes for both tiring and inefficient reading. The upper limit, then, for the length of a line meant for continuous reading is about 27 picas, or 4.5 inches (Gaffney, Jarrett, 2009).

A reader also goes through a process of rereading that is called regression, and when reading from one line of type to the next, he or she performs a return sweep. Readers often reread material, usually key words, in previous lines; how often depends partly on the complexity of the material. This rereading process is thought to aid short-term memory, as connections are continually made between what has just been read and what is currently being read. Too long a line makes it harder for the reader to find the beginning of the next line, creating confusion and difficult reading (Gaffney, Jarrett, 2009).

The proportion and distribution of space between lines, words and characters are also major factors in determining readability. There must be enough space between the lines so that the eye can easily move in a horizontal direction, enough space between

words so that they can be perceived as units, and enough space between letters so that they can be distinguished. There must not be so much space that the eye fails to easily make the transition from the end of one line to the beginning of the next, that words do not flow easily into each other, or that letters do not compose visually into words.

According to some studies, reading is processed through words and groups of words rather than by reading individual letters, and recognition depends on familiarity. This familiarity allows the eye to be able to read words that are set in upper and lower case, even if the bottom half of a word is missing. The shape of the word is recognized, not the individual letters. This recognition causes type that is set in all capital letters to be difficult to read because the words appear as horizontally oriented rectangles, and the reader is forced to stop reading to decipher words in all caps. Text made up of typefaces with very large x-heights tends to exhibit some of the same problems as words that lack the familiar visual outlines. Serif faces tend to move the eye along the horizontal direction of reading, and the serifs themselves become an additional means of differentiating letters from one another. Key relationships for readability are therefore those that exist between visual type size (characters per pica), line length and line spacing (Bastoky, 2009).

A user automatically comprehends visual relationships by grouping things that are similar and separating things that are visually different. In the prescription form, these associations provide visual cues to the functionality and importance of the type itself. Once the mind comprehends these cues, it associates them with their functions, defining a visual language. For example, once the size, typeface and location are determined, the

user will continue to associate these characteristics with the visual navigation throughout

the rest of the form (Gaffney, Jarrett, 2009).

*Figure 13*. Three prescription categories highlighted to illustrate varied design placement.

How Graphic Design and Design Thinking Effects Communication

A successful prescription redesign will produce a new vehicle of communication and also influence behavior. By basing the redesign on end-user's' needs, the adaptation will enable physicians to move away from the traditional paper prescription pad.

The boundaries of design have moved beyond the visual aspect of an artifact to an influence broadened to include and affect the behaviors that surround the artifact. Gary Hustwit's recent film, *Objectified*, praises design icons like OXO and Flip for their well-planned simplicity. This and other popularized notions of design inform the business community so that it now considers "improving ease of use," not aesthetics, as the primary value that design offers. Naoto Fukasawa, a respected designer with IDEO, a global award-winning design firm that takes a human-centered, design-based approach to helping organizations in the public and private sectors innovate and grow, furthered the role of design, stated at its most relevant design "dissolves into behavior." The design should fit so well with user needs and expectations that it is invisible. (Faricant, 2010).

Case Study: Target

An example that illustrates the successful application of design thinking is the Target-redesigned prescription bottles by Deborah Adler (see Figure 14). A family experience was the catalyst for her graduate school thesis. Adler's grandmother took her grandfather's medication by mistake. Adler found that difficult-to-read prescription labels had caused the problem. Her research found that 60 percent of Americans don't take their medications as prescribed because of confusion about prescription labels. Her thesis, *Safe RX*, included a complete packaging system with a redesigned bottle in a D-shape rather than a cylinder, a label with the drug name prominently positioned at the top—printed in

separate colors for each member of the family—and an information card with the intake

schedule. As a designer from a family of physicians, Adler felt that this system might be

her way to contribute to the field of medicine. While researching ways to take her idea to

market, she found that her best prospects for adoption were through a national pharmacy.

She always felt that her concept was a good fit for Target, a company with a focus on

community involvement and a commitment to design as a way of differentiating itself.



*Figure 14.* Target Prescription Bottle Concept, Deborah Adler, 2004.

Target decided to adopt the idea, teaming Adler with Klaus Rosburg, a Brooklyn-

based industrial designer hired by Target, to refine her concept for its pharmacies. The

two created a new bottle shape that stands on its round childproof cap designed to

facilitate reading. As in her proposal, the labels list the drug name at the top, followed by

intake instructions and then the doctor name and refill options, with the Target pharmacy

name at the bottom. A card on the common uses and side effects of the drug is tucked

behind the label. The pharmacies provide six colored rubber rings that attach to the neck

of the standard bottle so that each member of the family has a unique color for his or her personal medications. Adler also redesigned the graphical warning symbols to be more intuitive. The result of the test is Target's new ClearRX prescription system (Talarico, 2008).

<div align="center">Case Study: Kaiser Permanente</div>

The application of design thinking can also move beyond the boundaries of an artifact and affect behavior that leads to change. An example is the large health care provider Kaiser Permanente, which sought to improve the overall quality of both patients' and medical practitioners' experiences. By teaching design thinking techniques to nurses, doctors and administrators, Kaiser hoped to inspire its practitioners to contribute new ideas. Over the course of several months Kaiser teams participated in workshops with the help of IDEO and a group of Kaiser coaches.

One project to reengineer nursing-staff shift changes at four Kaiser hospitals perfectly illustrates both the broader nature of innovation "products" and the value of a holistic design approach. The core project team included a strategist (formerly a nurse), an organizational-development specialist, a technology expert, a process designer, a union representative and designers from IDEO. This group worked with innovation teams of frontline practitioners in each of the four hospitals.

During the beginning phase of the project, the core team collaborated with nurses to identify a number of problems in the way shift changes occurred. Chief among these was the fact that nurses routinely spent the first 45 minutes of each shift at the nurses' station, debriefing the departing shift about the status of patients. Their methods of information exchange were different in every hospital, ranging from recorded dictation to

face-to-face conversations. They compiled the information they needed in order to serve patients in a variety of ways—scrawling quick notes on the back of any available scrap of paper, for example, or even on their scrubs. Despite a significant investment of time, the nurses often failed to learn some of the things that mattered most to patients, such as how they had fared during the previous shift, which family members were with them and whether certain tests or therapies had been administered. For many patients, the team learned, each shift change felt like a hole in their care. Using the insights gleaned from observing these important times of transition, the innovation teams explored potential solutions through brainstorming.



**NKE**plus    6 Essential Parts

- Nurse Role
- Supporting Staff Roles

In-Room Nurse-Patient Engagement
Nurse invites patient to participate in exchange of information.

1. Last Hourly Round

2. In-Room SBAR

3. In-Room Safety Check

4. Careboard with Shift Goals & Teachback

5. Pre-shift Assignments

6. Unit Support

During End of shift                    During handoff

★ CUSTOM FITS: Customize these parts of NKEplus based on the unit's unique needs and dynamics.

*Figure 15*. Six parts of the nurse change over process.

In the design that emerged for shift changes, nurses passed on information in front of patients rather than at the nurses' station. In only a week the team built a working prototype that included new procedures and some simple software with which nurses could call up previous shift-change notes and add new ones. They could input patient information throughout a shift rather than scrambling at the end to pass it on. The

software collated the data in a simple format customized for each nurse at the start of a shift. The result was both higher-quality knowledge transfer and reduced prep time, permitting much earlier and better-informed contact with patients.

As Kaiser measured the impact of this change over time, it learned that the interval between a nurse's arrival and the first interaction with a patient had been more than halved, adding a huge amount of nursing time across the four hospitals. Perhaps just as important was the effect on the quality of the nurses' work experience. One nurse commented, "I'm an hour ahead, and I've only been here 45 minutes." Another said, "[This is the] first time I've ever made it out of here at the end of my shift."

Thus a group of nurses significantly improved their patients' experience while also improving their own job satisfaction and productivity. By applying a design thinking methodology, they were able to create a relatively small process innovation that produced an outsize impact. The new shift changes are being rolled out across the Kaiser system, and the capacity to reliably record critical patient information is being integrated into an electronic medical-record initiative at the company (Jana, 2010).

## Pharmacist's Evolving Responsibilities

Pharmacists need to gain time with patients as their responsibilities evolve to encompass more drug management. Pharmacists are being enlisted by some health insurers and large employers to help address the fact that as many as half of prescription are not taken as prescribed. In their unique role, pharmacists also maintain the front line of detecting prescription overlap or dangerous interaction between drugs and for recommending cheaper options to expensive medicines.

The Blue Shield of California seeks to address the shortage of primary-care doctors by using the education, expertise, free time and plain-spoken approach that pharmacists use to talk to patients at length about what medicines they are taking and to keep close tabs on their well-being. Since 2006, some Medicare plans started covering medication-therapy management programs, paying $1 to $2 a minute to pharmacists to review patients' medicines with them, and in 2010, about one in four people covered by Medicare Part D prescription drug plans will be eligible.

Pharmacists are also advising patients about medication through grants such as the Wisconsin Pharmacy Quality Collaborative, which standardizes medication- therapy management and ensures quality care. Similarly, Humana, which has offered pharmacists medication advising for a few years, is studying a third of 62,000 pharmacies in its network to see "whether a pharmacist seeing a patient in person has more impact than a phone call." (Abelson, Singer, 2010).

Thomas Sullivan of *Policymed.com* states that

> 31 million more patients entering the health care system through government programs, and with populations getting older and living longer, the number of prescriptions will grow exponentially. Not only will we need companies and funding to create and discover the drugs to provide to this influx of people, [but also] we will need pharmacists to help fill prescriptions. Allowing our pharmacists to continue their role in educating patients will help ensure that patients follow their medical therapy and management, which will save lives and money.

TranscribeRx

As one of society's last handwritten documents, the prescription vehicle is a strong example of using old technology to solve today's problems. A prescription pad redesign could promote change in the prescription process by using a tool based on this thesis's research findings, an electronic tablet prescription pad app, *TranscribeRx*. *Dictionary.com* defines an app as "typically a small specialized program downloaded onto a mobile device." Currently the market offers electronic tablet apps that allow for prescription writing such as *Rx-Writer* and *iPrescribe*, but none incorporate the convenience and ease of handwriting.

*TranscribeRx*, an app that transcribes handwriting into an electronic prescription, will allow the physician to use handwriting combined with current and accurate technology. By making positive changes that have the end users in mind and that are based on their expectations of the prescription process, *TranscribeRx* will meet these needs by allowing physicians to handwrite their prescriptions with handheld technology; translate it into a more readable and accurate text; and access patient, pharmaceutical and insurance information in one step. The pharmacist can use the time gained from the decreasing need for callbacks to the physician to give patients the consultation time they need.

# CHAPTER III

## STATEMENT OF PROBLEM

Based on the first round of research findings, physicians currently do not have a tool that allows for self-paced progression away from handwriting their prescriptions on a paper pad to using a more legible electronic version. Pharmacists list their number-one problem as the lack of correct or legible information on prescriptions. Pharmacists state that time for patient consultation equals the professional importance of prescription completion. Patients are more apt to ask their pharmacists specific questions about their medications than their physicians. Physicians, pharmacists and patients agree that the process seems hurried, noting a lack of time among all three groups.

### Hypothesis

Currently there is no visual standard for the prescription pad. As responsibilities of physicians and pharmacists continue to evolve to meet upcoming growth in healthcare, do physicians have a prescription tool that allows for the most expedient writing of the prescription? If physicians were provided with an electronic version of the prescription pad that allowed information to be entered in the familiar format of handwriting, would they use it? How would the contents of the pad differ from a paper pad? Would a consistent and complete presentation of prescription information allow pharmacists to save time by finding essential information with ease?

**Chapter IV**

METHODS

The Vehicle of Communication

The research process was launched to pharmacists with a survey accompanied by a traditional paper prescription pad design that addressed the inefficiencies shown in the previous examples (see Figures 3-6 and Table 1). The original size of the paper pad layout is based on the largest scan area used by pharmacies, 6 inches by 5.5 inches. If they adhere to this size limit, the prescription can be printed out in the physician's office, given to the pharmacist and scanned in one pass if a problem with electronic transmission should occur. Pharmacists were asked to mark up the printout with any additions and comments that would make the pad more completely fit their needs. These changes and suggestions were returned and applied to a second version. The second round of changes moved the form toward the information compliance required and worked as a basis for the electronic redesign to come.



*Figure 16.* First round of the prescription pad.

*Figure 17.* Round two of paper prescription pad.

These changes included space for multiple physicians and physician assistants to be listed, along with their required numbers (see Figure 17). As the eye moves across the page, it finds the date. The patient's name and date of birth, with the date of birth noted as the most commonly missing item, is next. Lines areas offer the physician more writing room. The large numbers, 1 and 2, visually group the information pertaining to a single medication and immediately tell the pharmacist the number of prescriptions requested.

Pharmacists were asked that if the prescription pad became electronic, were there additions that would help with their patient consultations? One suggestion was to replace common physician abbreviations with their full meanings (Bihari, 2010), making

prescription directions more patient-friendly. This suggestion would later be applied into

the patient-direction section of the graphic design outcome (see Figure 18).

| Commonly Used Medical Abbreviations | |
|---|---|
| **Text** | **Translation** |
| How Often to Take Medication | |
| ad lib | freely, as needed |
| bid | twice a day |
| prn | as needed |
| q | every |
| q3h | every 3 hours |
| q4h | every 4 hours |
| qd | every day |
| qid | four times a day |
| qod | every other day |
| tid | three times a day |
| When to Take Medication | |
| ac | before meals |
| hs | at bedtime |
| int | between meals |
| pc | after meals |
| How Much Medication to Take | |
| caps | capsule |
| gtt | drops |
| i, ii, iii, or iiii | the number of doses (1, 2, 3, or 4) |
| mg | milligrams |
| ml | milliliters |
| ss | one half |
| tabs | tablets |
| tbsp | tablespoon (15ml) |
| tsp | teaspoon (5ml) |
| How to Use Medication | |
| ad | right ear |
| al | left ear |
| c or o | with |
| od | right eye |
| os | left eye |
| ou | both eyes |
| po | by mouth |
| s or ø | without |
| sl | sublingual |
| top | apply topically |

*Figure 18.* Physician prescription abbreviations and their translations.

Electronic Prescriptions

Although requirements are in place for the contents of the current prescription pad, there is a lack of adherence and little or no enforcement. The lack of specific information provided by the physician to the pharmacist prevails as a common problem. *Surescripts.com*, a network that connects prescribers in all 50 states and the District of Columbia through their choice of e-prescribing software to the nation's leading payers, chain pharmacies and independent pharmacies, reports that the technology is in place to allow physicians to produce prescriptions electronically by e-prescribing. Texas hosts 3,681 pharmacies with the capacity of receiving prescriptions electronically.

*The Clinician's Guide to E-Prescribing* provides the following information. Electronic prescribing, or e-prescribing, is defined by the United States Department of Health and Human Services as the transmission, using electronic media, of prescription or prescription-related information between a prescriber, dispenser, pharmacy benefit manager or health plan either directly or through an intermediary, including an e-prescribing network. Because e-prescribing has a proven potential to reduce medication errors and the cost of medical care, the Medicare Prescription Drug Improvement and Modernization Act (MMA) of 2003 mandated that all plans and pharmacies participating in the new Medicare prescription drug benefit (Part D) support an electronic prescription program by 2012 to avoid penalty.

An e-prescription originates with the prescribing physician, who uses a computer to send the prescription through an approved electronic data intermediary (EDI) to a receiving pharmacy's computer. The EDI provides the infrastructure to connect a computer system used by a prescribing physician with a computer system used by a

pharmacy. The EDI facilitates the secure transmission of an e-prescription order, a refill authorization request and other patient-care information between a physician and a pharmacy. The prescription software used by the prescriber must submit the prescription through an approved EDI in order for the e-prescription to be valid. E-prescribing does not include a prescription that is transmitted by facsimile, including those sent from a prescribing physician's computer to a receiving pharmacy's fax machine; or printed from the physician's computer.

Recent changes in regulations related to e-prescribing allow for full use of an electronic tablet. On March 31, 2010, the DEA published in the *Federal Register* an interim final rule, Electronic Prescriptions for Controlled Substances, which became effective June 1, 2010. The rule revises the DEA regulations to provide practitioners with the option of writing prescriptions for controlled substances electronically. The regulations also permit pharmacies to receive, dispense and archive these electronic prescriptions by the United States Department of Justice.

<div align="center">Advantages of E-prescribing</div>

The ability of e-prescribing to enhance the prescription experience for physicians, pharmacists and patients is extensive. *TranscribeRx*, an app that allows handwriting to produce an electronic prescription, moves to reduce errors and the liability they place on both physicians and pharmacists.

E-prescribing software may also link to drug-reference software programs, such as *Epocrates,* a comprehensive drug-reference program for mobile devices that includes searchable brand, generic, over-the-counter and alternative medicines. Physicians can have immediate access to a patient's medication history to avoid adverse drug conflicts or

problems with other current prescriptions. These factors eliminate the current frequency of pharmacist-to-physician callbacks, with a warning system incorporated at the point of prescribing.

*The Clinician's Guide to e-Prescribing* states that physician offices receive more than 150 million callbacks from pharmacies with questions, clarifications and refill requests. Medco® Health Solutions, Inc., conducted a survey of Boston-area physicians, and 88 percent of those surveyed said they or their staff spend almost one-third of their time responding to phone calls from pharmacies regarding prescriptions. E-prescribing can significantly reduce the volume of pharmacy callbacks related to handwriting legibility, mistaken manual prescription choices, and formulary and pharmacy benefits, thus positively impacting office workflow efficiency and overall productivity.

Both prescribers and pharmacies can save time and resources spent on faxing prescriptions, reducing labor, unreliability and paper expense with e-prescriptions. Using e-prescribing, refill or renewal authorization can be an automated process that provides efficiencies for both prescribers and pharmacies. This is the procedure: the staff in the pharmacy generates a refill request/authorization delivered through the network to the physicians' system; the request is approved or denied, with the response returned electronically to the pharmacy.

It is estimated that 20 percent of paper-based prescription orders go unfilled by the patient, at least in part due to the time involved in dropping off a paper prescription and waiting for it to be filled (Pannell, 2009). By eliminating or reducing patient wait time, e-prescribing may help reduce the number of unfilled prescriptions. Allowing electronic refill requests can also improve the efficiency of this process, reducing

obstacles that may result in less patient compliance. As previously noted, patients stated that the number-one change request to the current prescription process was that the complete handling of prescriptions be carried out between the physician's office and the pharmacy.

E-prescribing allows the physician to check with health plan/insurer formularies at the point of care. Thus generic substitutions or lower-cost therapeutic-equivalent medications can be encouraged and help reduce patient costs. Lower costs for patients can also help improve medication compliance. Improved physician convenience can be attained when physicians use an electronic tablet and wireless network to write or authorize prescriptions. E-prescribing systems also enable the use of automated analytical queries and reports, which are impossible with a paper prescription system. An example of such reporting would be the ability to find all patients with a particular prescription during a drug recall.

**CHAPTER V**

RESULTS

To strengthen prescription readability, move toward ensuring prescription accuracy and give patients consultation time, surveys and interviews for this investigation reached a number of conclusions.

Physicians surveyed said they would experiment with an electronic app that gave them the choice of handwriting their prescriptions and having them transcribed. One reason that physicians choose to continue to use the paper pad is its mobility. Having to use a desktop machine made the physicians feel chained to their desks, and putting a computer in each exam room was not financially feasible. The concept of mobile access to real-time patient information and clinical references while working in patient care areas was very appealing.

The Electronic Tablet App Choice

How can the prescription communication vehicle give the physician information access at the point of care and maintain the ease and mobility of a handwritten prescription? When queried about the ability to handwrite on an electronic tablet application, review patient history, check for possible drug conflicts and have the prescription sent directly to the pharmacy, all answered that they would want to see an example.

Specifics of *TranscribeRx*

*TranscribeRx*, an app that turns handwriting into an electronic prescription, allows the physician to use handwriting combined with current and accurate technology. As a replacement for traditional paper prescription pads, *TranscribeRx* transcribes handwritten text to an electronic prescription, e-prescribes with a database connection, and provides sustainability and security of information. By making positive changes with the end users in mind, based on their expectations of the prescription process, *TranscribeRx* will reflect these needs instead of making the users adapt to a product, thus allowing the physician to handwrite their prescriptions with handheld technology; translate it to a more readable and accurate text; and access patient, pharmaceutical and insurance information in one step. The pharmacist can use the time gained from the decreasing need for callbacks to the physician to give patients the consultation time they need.

A wireless electronic tablet can accompany physicians to where they need to be for more-interactive patient care. The app provides an approachable, interactive technology with quicker access to current information. Current electronic tablets provide a better resource for more-accurate prescriptions with on-demand access to patient health records, prescription conflicts and dosage reference. *TranscribeRx* allows for wireless connection to office desktops for more precise and accurate internal recordkeeping.

The *TranscribeRx* app would allow physicians to transcribe their handwriting into an electronic prescription on both Macintosh and Droid platform devices. Current popular models of electronic tablets exist in two wireless platforms, the Apple iPad and the Droid Samsung Galaxy. Each tablet offers a large writing area, a landscape size of 1024 x 768 pixels (7.75 inches x 5.75 inches) and 1024 x 600 pixels (7.75 inches x 5 inches),

respectively. The large screen dimension makes the tablet better suited for handwriting with the *TranscribeRx* app (see Figure 19). The large size and long battery life of an electronic tablet would allow pad usage for a typical physician shift.

*TranscribeRx* is focused on the transcribing of handwriting to text. During one interview, the electronic app was referred to as *TRx*, pronounced t-rex, and this pronunciation was used through the rest of the research and application. The Apple iPad was used with a pen-type stylus. An electronic stylus is an instrument for writing that is the size and shape of an average ballpoint pen. On electronic tablets, it is an input device used to write text on the tablet surface

<div align="center">Security</div>

Previous paper prescription pad security was handled by using pantographs, which produced a VOID on the face of the prescription if copied or scanned. Another option for security involved using thermochromatic ink, which insures originality with a symbol, printed on the back that reveals itself when heat was applied.

Companies, such as *Surescripts-Rx*, certify e-prescribing applications and their authenticity. Physicians and pharmacies exchange medical information electronically according to industry standards by using this technology. This certification is based on the National Council for Prescription Drug Programs (NCPDP) Script Standard. It is important that patients know that e-prescriptions are not sent over the Internet or via e-mail, but through private and secure networks, such as the *Pharmacy Health Exchange*. Medicare reimbursement requires a legible provider identity for services rendered or ordered. When physicians submit an order or other medical record documentation for Medicare to review for coverage, they can use a handwritten or electronic signature. The

Centers for Medicare & Medicaid Services (CMS) says it will not accept medical records containing a physician's stamped signature. CMS auditors will reject any document signed with a physician's signature stamp (Kaiser, 2010)

<p align="center">What is an Electronic Signature?</p>

*ARx.com*, a global provider of cost-efficient digital-signature solutions, defines a digitized signature as an image of a pen-to-paper signature. An electronic signature can be an electronic sound, symbol or process associated with a record. It is a mark added to a document to indicate intent to sign. A digital signature is a form of encryption that tightly binds documents to a unique number or electronic "fingerprint." Private companies called certification authorities provide private/public software with key combinations used to encrypt and decrypt documents, and they issue "certificates" to bind the public keys to the key holders. However, the certification practice lacks national governance guidelines. Electronic signatures are legally valid in all 50 states, and the security standards of electronic signatures are addressed in the security and privacy provision of HIPAA (Kaiser, 2008).

The Texas Medical Association states that HIPAA transactions do not require a digital signature at this time. However, HIPAA-covered entities that use electronic signatures for transactions must adhere to U.S. Department of Health and Human Services electronic signature standards. The software program must provide the following:

1. Nonrepudiation – assurance that the signer cannot deny signing the document in the future

2. User authentication – verification of the signer's identity at the time the signature was generated

3. Message integrity – certainty that the document has not been altered since it was signed

A 2000 federal law effectively voids previous requirements that prescriptions be on paper or printed as a hard copy and does away with requirements that prescriptions be hand-signed. The practitioner can sign written prescriptions electronically using a system that replicates the practitioner's manual signature if (1) the system's security features require the practitioner to authorize each use and (2) the prescription is printed on paper designed to prevent unauthorized copying of a completed prescription or erasure or modification of information written on the prescription (Kaiser, 2010)

Sustainable

E-prescriptions have been described as the solution to improved patient safety and a reduction of skyrocketing medication costs. *The Clinician's Guide to E-Prescribing* states that approximately 3 billion prescriptions are written, making traditional paper prescriptions one of the largest paper-based processes in the United States. The *TranscribeRx* app can aid in the transformation of a traditional paper-based workflow to one more that is environmentally friendly. The writing of prescriptions can be streamlined and made more efficient by using *TranscribeRx* to provide an electronic handwriting alternative to the traditional paper pad.
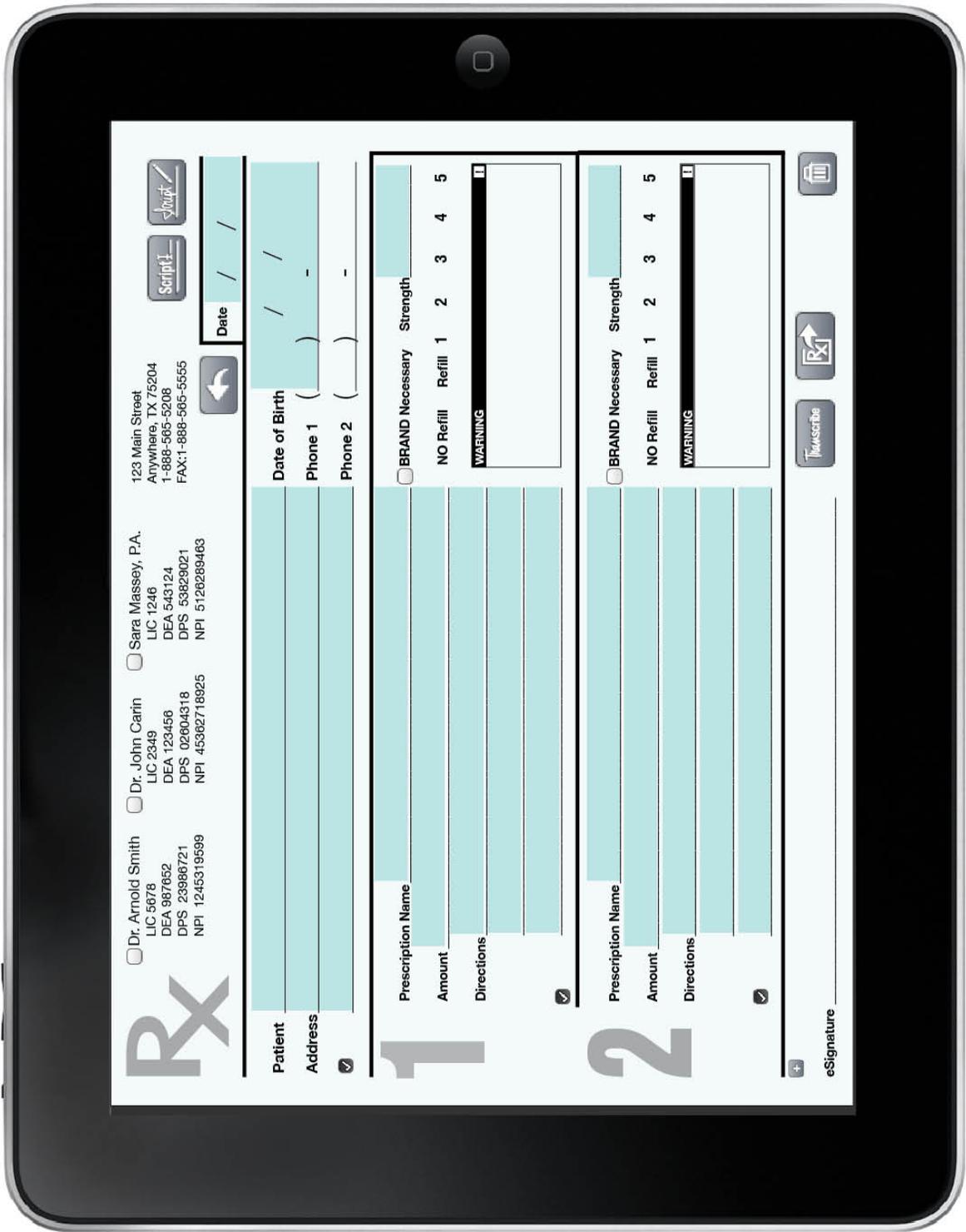
*Figure 19. TranscribeRx* screen.

*Figure 20. TranscribeRx* prescription screen with points of significance.

*Points of Significance*

1. *Physician information.* Multiple physician and physician assistant names and required numbers.

2. *Transcribe icons.* Choice of text or handwriting entry.

3. *Green boxes.* They act as visual clues to physicians, showing areas that must be completed.

4. *Number of prescriptions.* Current law prohibits more than two prescriptions on a single page. Additional prescriptions are added with the selection of the small + button below the number 2. This selection brings up another screen containing entry space for a 3rd and 4th prescription. Each prescription is visually sectioned with the use of a bold line to visually group the necessary information.

5. *Database check.* After prescription information is entered, this selection connects to the appropriate database for information.

6. *Additional prescriptions.* This is a new page stating that prescriptions 3 and 4 will appear.

7. *Warning box.* Warnings of potential drug conflicts, allergies, etc.

8. *Transcribe.* This step changes handwriting to text and goes to additional screen for final approval.

9. *Rx.* This sends forms electronically to pharmacists.

Design Rationale

The visual presentation applies a hierarchy, incorporating the strongest systematic presentation of prescription information.

*Background color*

Color choice and it's application to *TranscribeRx* is based on the need and preference of physicians, who are the only users of the three to see the pad app interface. Two swatch color choices, green and blue, were shown, with a bold black outline to reflect how the color works against the black edge of the tablet (see Figure 21). The best

background for an electronic app is between 10 and 25 percent of a color (Gaffney, Jarrett, 2009). The swatches below are both 15 percent of their prospective color.

The color blue was a swatch option because it is the overwhelming "favorite color." Blue symbolizes trust, loyalty, wisdom, confidence, intelligence, faith, truth and heaven. The color of the sky and the ocean, blue is a visual constant and is perceived as calming and sedate.

The color green is associated with nature and is the second-most-favorite color. While the color psychology associated with green can be envy or poison, it is the most restful color for the human eye, and it can improve vision (Cherry). Green is also the predominant color partnered with medicine.
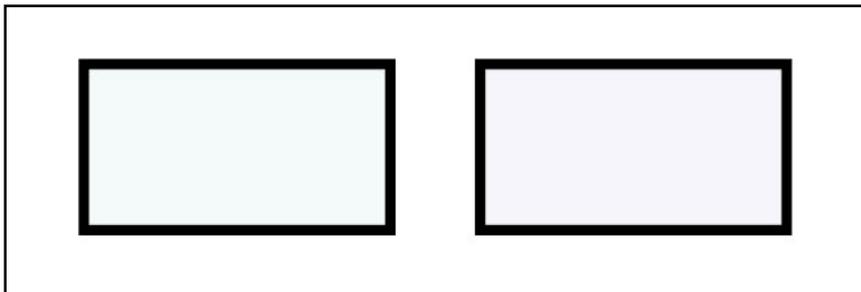
*Figure 21. TranscribeRx* background swatch choices.

An exhibition called "Artifact Spotlight: The Color of Medicine" at the Canada Science and Technology Museum in Ottawa shows how the color green conquered the hospital world during the 20th century. Green was a popular choice. Surgeons first added spinach-leaf green to their clothing in 1914 to reduce glare from traditional hospital whites. In the 1930s, hospital decorators used green to influence patient moods. It carried associations with nature, growth and recovery. Tiled surgical suites, patient rooms,

clothing and instruments all went green in the post- World War II era (Pantalony, 2009).

For *TranscribeRx*, green was the preference by physicians three out of four times.

*Buttons*

Common button designs lessen the visual learning curve and provide a sense of

visual familiarity for physicians. Icons use rollovers that state icon functions. Research in

psychology and marketing indicates that humans have a cognitive preference for picture-

based rather than text-based information. Studies have shown that pictorial aids improve

recall and comprehension. Research has compared various techniques for using picture-

based information and supports the use of integrative instructions, a combination of

textual and pictorial communication, to promote comprehension and adherence (Katz,

Kripalani, Weiss, 2006).



*Figure 22*. Buttons designed for *TranscribeRx*.

*Form Layout Choices*

Hierarchy is defined on the website *ThinkingwithType.com* as the use of size, weight,

placement and spacing to express the parts of a page or document and their relative

importance. The *TranscribeRx* app resembles the ideal prescription pad based on

pharmacist need found in this research, combined with the application of visual hierarchy

to lead physicians through the prescription form.

Physician and physician assistant names, with their required numbers, are listed at the top, along with the physician office location. The bottom of the form is divided into four areas. The patient and two prescription areas of information are each grouped visually using a thick line. Behind each area that needs to be filled in lies a darker version of the green background color. Once an area has been completed and transcribed, the screen disappears. This visual cue helps the physician see that all needed information has been entered. These darker-screened sections aid in the visual grouping of related text elements. It is important that the color is applied lightly, staying within the range of a 10 to 25 percent screen (Bastoky, 2009). At the bottom of the form is the physician signature space.

The form text is a small, bold sans serif face. The choice of this face was based on its readability at a small size and its contrast with the prescription form's sans serif font. The higher resolution of electronic tablet screens allows for the easy readability of this font.
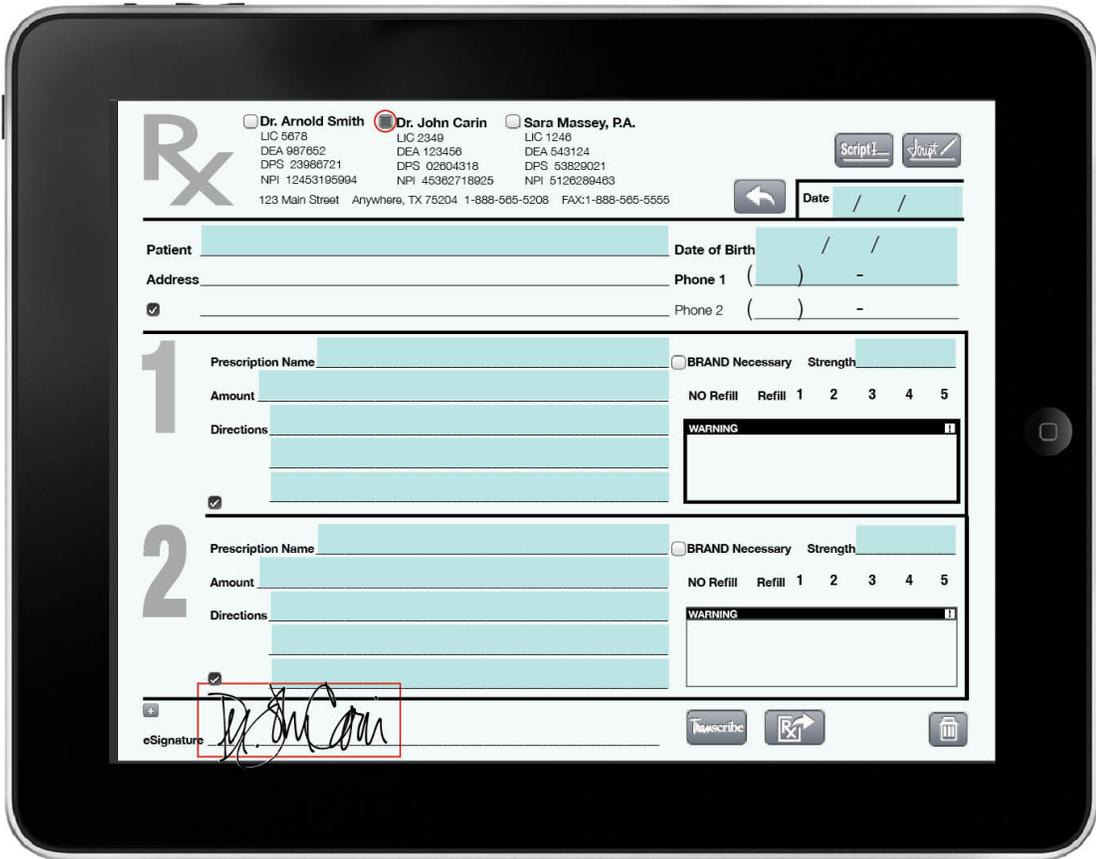
*Figure 23. TranscribeRx* app screen shot of step one.


Physicians begin the prescription writing process by selecting their name option at

the top of the app. When they press on the button next to their name, a security screen

appears requesting their personal identification number (PIN). The PIN number is entered

by using a stylus. Once the PIN is approved, the physician's e-signature is loaded in the

signature line located at the bottom of the page.

*Figure 24. TranscribeRx*, step two.

Step two involves the choice of information entry. Two selections are available: handwritten and text, with handwritten chosen (see Figure 24) These icons show the choice graphically.

Figure 25. TranscribeRx, step three.

The handwriting option is selected, and the physician enters the date and the patient's name. The Transcribe button is chosen. The check is selected, causing the patient database to be accessed and the information to be retrieved. An alternate version has the patient information set up before the appointment by the physician's assistant (PA), allowing the physician more time with the patient.

*Figure 26. TranscribeRx*, patient information retrieved.

The app connects and searches the physician's database and enters the updated patient information. Once this step is completed, the dark-green shade behind the required information disappears. By double-clicking the patient field, accurate patient medical history can be accessed, providing the doctor with immediate information.

This function also allows the physician access to patients' current medication list and medication history information. The patient's history can be updated or corrected.

*Figure 27. TranscribeRx*, prescription information handwritten by physician.

The physician handwrites the chosen prescription, the amount and the directions, then chooses when a brand name is necessary and enters the strength. This section will link to a computerized physician order entry (CPOE), an electronic prescribing system that intercepts errors as soon as the formulary choice is entered and appears in the WARNING box. The CPOE produces prompts posted in the warning box, listing potential drug interaction, overdose potential or possible allergic reactions. This accurate and up-to-date information allows physicians to be knowledgeable about new drugs on the market. Warning information pulled from the physician's database informs physicians, pharmacists and patients. The warning field can also contain information

about other drugs currently taken by the patient or a current condition that might cause side effects when combined with the new drug (Kuperman, 2007).

These alerts are decision support tools for physicians that help them avoid errors related to drug interactions and/or allergic reactions, which together are called adverse drug events (ADEs). The scientific literature reports that one-quarter of patients experience an ADE episode, and one-third of those are preventable. ADEs are a major part of the current presidential administration's focus on eradicating human error and in turn increasing overall health care system efficiency (Stahl, 2009). A reduction in adverse effects increases the quality of patient care while reducing health care costs through the elimination of unnecessary medical care.

Another facet of the prescription-error problem involves prescription medications that have names that are spelled or pronounced similarly but have very different pharmacologic traits. A prescription error could cause serious problems for a patient. Consider this example from an *Institute for Safe Medication Practices* report. *Celebrex* is prescribed for arthritis; *Celexa* is prescribed for depression, and *Cerebyx* is an epilepsy drug. There are also two products whose names are pronounced the same: *Lamicel* and *Lamisil*. The first is a cervical dilator, and the latter is an antifungal agent.

Directions will expand on commonly abbreviated directions for the patient and be translated into terms the patient can more easily follow (see Figure 18).
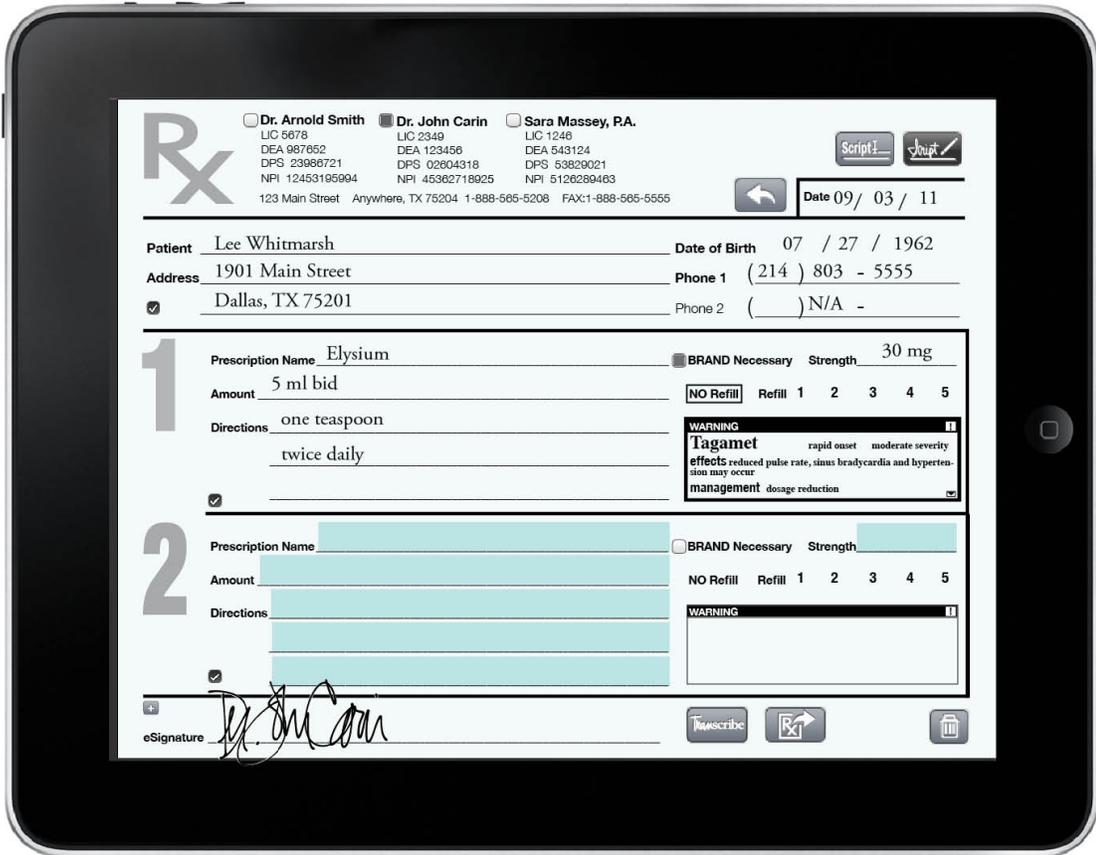
*Figure 28. TranscribeRx*, Prescription transcribed and checked, warning box activated.

*Figure 29.* Completed electronic prescription.

The most important asset of *TranscribeRx* is that it provides correct prescriptions. After the physician has completed the prescription, the screen displays exactly what the pharmacy will receive, giving the physician the opportunity to verify the information one last time before forwarding. The file then leaves the physician's office to travel through the EDI for authentication and on to the pharmacist for filling.

*Figure 30. TranscribeRx* prescription showing text option and form scrolled.

Physician Response

Physicians were given hard-copy color printouts of the *TranscribeRx* screens for review. The *TranscribeRx* prescription process was explained orally. An Apple iPad showed a screen shot of the app with accurate size and color. Physicians given the Apple iPad with a notepad app tried it, partnered with a stylus, to get the feel of using an app that allows for handwriting. A stylus was used so that physicians could feel the difference in the tactile quality of the slick screen versus a pen touching paper. All physicians interviewed expressed a positive response to *TranscribeRx*, with three out of four seeing the potential for time savings. All physicians surveyed who currently use paper

prescriptions could see it fitting into their current workflow. In addition, this specific

group thought they would explore the data-entry option.



*Figure 31. TranscribeRx* form received electroniclly at the pharmacy, actual size.

Pharmacist Response

The electronic prescription form received by the pharmacist is visually the same

as the *TranscribeRx* screen that the physician fills out. Pharmacists were shown an

example of the completed prescription output for their final response to this research.

Areas of specific comment included easy readability; all information areas needed for a

prescription with accuracy and efficiency were present and easy to find.

**Chapter VI**

CONCLUSION

This investigation, *Dispensing Relief: Evolving the Prescription Experience,* explores the need for a prescription pad redesign. Prescription pad experiences, needs and expectations were addressed with the application of graphic design and design thinking. How can the prescription communication vehicle give the physician information access at the point of care and provide the ease and mobility of a handwritten prescription? How does the pharmacist find time to conduct this new expectation of consultation? What change in the process would allow the patient more time with the pharmacist?

The outcome of surveys, interviews and research has led to *TranscribeRx*, an app for electronic tablets that translates handwriting into electronic prescriptions. After demonstrating the app to physicians and the app output to pharmacists, it has been determined that the effects of the app, *TranscribeRx*, could be beneficial to the three user groups: physicians, pharmacists and patients. Physicians saw the new pad option as the opportunity to use e-prescribing while retaining the ease of handwriting, paired with mobility. Pharmacists reviewed the electronic output from *TranscribeRx* and found it easy to read and consistent in its presentation of required prescription information, equating time saved during the filling process to more potential time spent with patients. Patients could receive more consultation time as well as an email or text confirmation of their prescriptions.

To continue to test the success of *TranscribeRx*, the full development of the app is in order. The cost incurred for the venture is estimated at $10,000. Various government grants will be applied for in order to proceed in that direction.

## Next Step

This investigation has addressed the direct needs of the physician and the pharmacist and solutions that affect the patient. The same process of graphic design and design thinking could be applied to the information sheet included with the prescription. Currently, this vital piece of information is largely ignored or discarded by patients. The interaction between the reader and the instruction leaves vast room for improvement. The large paper, folded with all of the convenience of a road map, can be as large as two by two feet in size, roughly like reading the Sunday morning newspaper. The instruction sheet includes paragraph after paragraph listing potential hazards, warnings of possible side effects, legal information and dosages written in small, light unreadable type.

## Future Investigations

The research outcomes leading to *TranscribeRx* have led to the following questions:

1. Could *TranscribeRx* be incorporated into an emergency-room situation to aid hospital-based pharmacists?

2. Is it feasible to add a Spanish-translation option to aid in the consultation among the three groups?

3. Could the *TranscribeRx* combination of the handwriting on electronic forms to translated text be fitted for other service-industry needs, such as ticket-writing for the police?

4. Could the transcription of handwriting to text help children learn to spell?

5. Could professionals in the field who currently use handwritten forms, such as property appraisers, use the transcribing principles of *TranscribeRx*?

6. Could government forms, such as passport documentation, use this technology to eliminate errors?

7. Could insurance adjusters use the ability to handwrite combined with database access to handle claims onsite immediately?

8. Could an auto mechanic use the *TranscribeRx* technology to diagnose automobile problems and provide the auto owner with a readable analysis?

9. Could *TranscribeRx* technology help travelers communicate in a foreign country by accessing a translation database such as the web translation site Babelfish.com?

10. Could *TranscribeRx* provide a repairman with the ability to provide an on-site estimate of the job?

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## VITA

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After graduating from Baylor University in 1985 with a B.F.A. in Communication Design, Lee worked in the design industry in Dallas, Texas. In 1992, East Texas State University (renamed Texas A&M University–Commerce) offered Ms. Whitmarsh an adjunct position in its award-winning design program. This opportunity evolved to her current position with the university as the Director of Visual Communication.

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