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The Medication Error Reduction Act of 2004:

An Observational Evaluation of the Levels of Awareness and Compliance Among Pharmacists— Who is Responsible?

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Abstract

In May of 2004, the Tennessee General Assembly passed the Medication Error Reduction Act of 2004 (MERA), which amended Title 63 of the Tennessee Code Annotated and as of July 1, 2004, defined several new criteria with which all written and electronic prescriptions must comply. The following research demonstrates that a majority of pharmacists are aware of the MERA legislation, but believe that a considerable number of prescriptions still do not comply with the new criteria. Additionally, an independent analysis of prescriptions showed that the majority of received orders were in fact noncompliant with MERA legislation.

Though they bear a significant fraction of the responsibility for medications-related errors, pharmacists can do little to ensure that prescriptions comply with the legislation. Pharmacists can only correct or modify noncompliant prescriptions with approval of the authorized prescriber. As a consequence, the Act is only effective if prescribers are enforcably held accountable for written and electronic prescriptions. The Tennessee General Assembly has introduced legislation for the Spring 2005 session to revise MERA with the input of the Board of Medical Examiners. As evidenced by this research, such revisions are necessary and would allow physicians and pharmacists to share a more equal responsibility for the reduction of medication-related errors, thus promoting better health and safety for Tennessee patients.

Keywords: Medication Error Reduction Act (MERA), legibility law, prescription legibility, medication errors, pharmacy, pharmacist survey

Introduction

Medications-related errors first came to the forefront of the healthcare industry with a series of reports published by the Institute of Medicine. The first report of this series, To Err is Human (Kohn, Corrigan, Donaldson) addressed the overall quality of healthcare in America and the consequences of preventable errors on patient health. Since the publication of this startling report in 2000, medications-related errors have increasingly become the subject of lawsuits and news headlines. To reduce and prevent these errors, many states have enacted new standards for the transmission of patient medical information, such as written and electronic prescriptions.

As described in the Fall 2004 issue of *Temessee Pharmacist*, the Tennessee General Assembly made several additions to the Tennessee Code Annotated (Title 63) by enacting the "Medication Error Reduction Act of 2004 (MERA)". The purpose of this act was to create a standard with which written and electronic prescription orders must comply, intending to reduce or prevent medications-related errors¹. The new standards set by MERA address several issues of prescription legibility and include the following:

- Written and electronic orders for a drug must be legibly printed or typed.
- Written and electronic orders for a drug must be signed on the date issued.
- The drug quantity must be written in both letters and numerals.

The aforementioned standards accompany those previously outlined in Title 63, which dictate that prescriptions must contain the name of the prescriber, the name and strength of the drug prescribed, instructions for proper use of the drug, and the month and day that the prescription was issued. Coupled with the new prescription criteria outlined in MERA, these more clearly-defined standards help reduce the potential for pharmacist error.

The purpose of MERA— to reduce and prevent medications-related errors— can only be effective if all medical professionals comply with the law. Because the new legislation amends several sections of Title 63, the new criteria applies to all medical professionals involved in the prescription process, including physicians, dentists, optometrists, nurses, and pharmacists. Without proper education and enforcement of the new legislation on **all** parties involved, the Act can do little to reduce or prevent medications-related errors. Promoting the overall safety and health of patients in Tennessee requires the cooperation of authorized prescribers and not simply pharmacists.

The primary function of this research was to evaluate the overall awareness among pharmacists with the Medication Error Reduction Act and prescriber compliance with the new legislation since its initiation in July of 2004. This was accomplished by two procedures, an on-site survey of area pharmacists, and an observational analysis of prescriptions dated after July 1, 2004. The purpose of the survey procedure was to assess the level of pharmacist awareness and the perceived levels of noncompliance regarding prescriptions received since July 1, 2004. The purpose of the observational analysis was to quantify the levels of noncompliance beyond pharmacist perceptions by analyzing individual prescriptions. It is expected that the results from these two procedures will demonstrate the overall effectiveness of the Act in terms of pharmacist awareness, the level of noncompliance among authorized prescribers, and potential avenues for improving future legislation. Because the Tennessee General Assembly has introduced legislation for the Spring 2005 session to revise the law, this research is especially significant in highlighting the need for such revisions.

Methods

¹ State of Tennessee General Assembly. *Public A as*, Chapter No. 678. May 2004.

As mentioned previously, this research was composed of two independent procedures, one that surveyed responses of pharmacists to MERA and its effectiveness, and a second procedure to quantify prescriptions that do not comply with both the new criteria and those previously outlined in Title 63.

Procedure 1, Pharmacist Survey. The survey was compiled to address several issues, including pharmacist awareness, the level of noncompliance among received prescriptions, and potential methods for further reducing medications-related errors. To determine these items, the survey was composed of the following questions:

- 1) Are you aware that the Tennessee state legislature passed the Medication Error Reduction Act in July 2004, a regulation that defines certain criteria with which medication information must comply? Respondents were given the option of selecting "Yes" or "No"; an attached sheet contained a summary of the legislation for any respondents selecting "No".
- 2) Of the prescriptions you have received sine July 1, 2004, what percentage of them do you feel are fully (100%) compliant with the criteria defined by MERA? Respondents were given the option of doosing one of five options, "0-20%". "21-40%", "41-60%", "61-80%" and "81-100%".
- 3) Of the prescriptions you have received since July 1, 2004, what percentage of them do you feel are at least partially compliant with the criteria defined by MERA? Respondents were given the same set of choices found in Question 2
- 4) Of the criteria outlined in MERA, which one do you feel is most often non-compliant? Respondents were given the option of choosing one of the following answers: "A. Prescription is not printed (in either non-cursive handwriting or from a computer print-out)", "B. Prescription is not signed by licensed professional", "C. Name and strength of medication is not included on the prescription", "D. Medication quantity is not written in both numbers and letters", "E. Prescription instructions are not included", "F. Prescription is not dated", or "G. Prescription is not signed on the day of order."
- 5) I feel that the MERA legislation is necessary and will significantly reduce medication errors. Respondents were given the option to choose one of the following: "Strongly Agree", "Agree", "Neutral", "Disagree", and "Strongly Disagree."
- 6) What else do you think could be done to prevent or reduce medications errors? Respondents were given the option to choose all that they felt applied from the following options: "A. Physicians should include the reason(s)/indication(s) for prescribing a certain medication", "B. Physicians and/or manufacturers should make a special effort to darify sound-alike/look-alike names", "C. Physicians should be required to darify abbreviations or completely write out sigs."
- 7) Would you favor a system where all prescriptions are transmitted electronically? Respondents were given the option of choosing "Yes" or "No".

After constructing the survey, a directory of 101 retail pharmacies (independent and chain) in the greater Knoxville area was compiled to generate a random sample. Prior to choosing a random sample, corporate representatives for the major chain pharmacies were contacted for survey approval. One major chain opted not to participate, reducing the number of potential pharmacies from 101 to 90. A stratified random sample of 70 pharmacies was then taken from the directory so that all participating chains would be represented.

On several days in December and January of 2004-2005, on-duty pharmacists at each of the chosen practice sites were asked to respond to the survey and were given the option to either participate in person or to complete the survey at their convenience. Out of the 70 pharmacists approached for the survey, 68 (97%, N=68) agreed to participate. Aside from answering the provided questions, pharmacists were also encouraged to add any additional comments regarding the

research or the MERA legislation in general. The surveys were then collected and all of the data compiled.

Procedure 2, Prescription Observations. The prescription analysis was performed at a community pharmacy centrally located in East Tennessee, where the majority of prescription orders are received from both the greater Knoxville and Chattanooga areas. To quantify the levels of noncompliance among received prescriptions, 500 printed or handwritten prescriptions dated after July 1, 2004 were pulled randomly in lots of 100. Each prescription was then examined for the criteria listed in Title 63, including whether the prescription was printed (in non-cursive handwriting or type-written), contained all of the necessary information (name of prescriber, name and strength, quantity, instructions for proper use, date, and signature on the date issued), and had the drug quantity written in both letters and numerals. Additionally, of those quantities not written in letters and numerals, the number of controlled substances was also noted. Each item of noncompliance was then recorded and compiled.

Results

Pharmacist Survey

Table 1 contains survey responses to question 1, which assessed the overall awareness of the

Medication Error Reduction Act among pharmacists. As illustrated in the table, 71% of the pharmacists surveyed responded that they were aware of the MERA legislation, while 29% were not. Because the remainder of the survey depended on information found in the Act, respondents who were unfamiliar with its contents were supplied with a short summary describing the new legislation.

Table 1. Awareness
Are you aware that the Tennessee state legislature passed
the Medication Error Reduction Act in July 2004, a
regulation that defines certain criteria with which
medication information must comply?

Response	Score
Yes	71%
No	29%

Table 2 contains data from survey questions 2 and 3, which sought to identify the percentage of prescriptions that pharmacists felt were fully or partially compliant with the new criteria found in

Table 2. Perceived Levels of Compliance		
Level of Compliance	Percentage Compliant	Score
Full Compliance. Of the prescriptions you have received since July 1, 2004, what percentage of them do you feel are fully (100%) compliant with the criteria defined by MERA?	0-20% 21-40% 41-60% 61-80% 81-100%	17.6 % 25.0 % 22.1 % 23.5 % 11.8 %
Partial Compliance. Of the prescriptions you have received since July 1, 2004, what percentage of them do you feel are at least partially compliant with the criteria defined by MERA?	0-20% 21-40% 41-60% 61-80% 81-100%	1.5 % 4.4 % 22.1 % 27.9 % 44.1 %

the MERA legislation. The table shows that 17.6% of pharmacists felt that between 0-20% of received prescriptions were fully compliant with the MERA legislation. Likewise, 25.0% felt that 21-40% of received prescriptions were fully compliant with the new legislation. Further details can be seen in the table.

The bottom portion of Table 2 describes the percentage of prescriptions that pharmacists felt were at least partially compliant with the new criteria. As shown in the table, 22.1% of the pharmacists surveyed felt that 41-60% of the prescriptions they had received since July 1, 2004 were at least partially

compliant and 27.9% felt that 61-80% of prescriptions were partially compliant. 44.1% of the pharmacists surveyed felt that the majority (81-100%) of received prescriptions were at least partially compliant with the new legislation.

Table 3 Of the criteria outlined in MERA, which one do you feel is most often non-compliant?		Table 4 Pharmacist Response to the necessity and significance of MERA legislation.	
Response	Score	Response	Score
Rx is not printed (non-cursive handwriting or typewritten)	41.2 %	Strongly Agree	51.5 %
Rx is not signed by a licensed professional	4.4 %	Agree	33.8 %
Name and strength of medication is not included on Rx	5.9 %	Neutral	13.2 %
Quantity is not written in letters and numerals	45.6 %	Disagree	1.5 %
Rx instructions are not included	0%	Strongly Disagree	0%
Rx is not dated	2.9 %		<u></u>
Rx is not signed on the day of order	0%		

The criteria which pharmacists felt were the most often noncompliant can be found in Table 3. The data here contains the new items outlined in MERA as well as those previously found in Title 63. The table illustrates that most pharmacists felt that the two criteria most often noncompliant are that the prescription is either not printed (41.2%) or that the medication quantity is not written in both letters and numerals. Other significant criteria included that the prescription was not signed by a licensed professional (4.4%), not dated (2.9%), or that it does not include both the name and strength of the medication (5.9%).

Table 4 describes the overall reaction of pharmacists to the Medication Error Reduction Act. More specifically, it illustrates whether pharmacists feel the MERA legislation is necessary and will significantly reduce medications-related errors. Over half of the respondents (51.5%) strongly agreed that the Act was necessary and will significantly reduce errors. Another 33.8% of pharmacists agreed that the law is necessary, while only 13.2% were neutral and 1.5% disagreed, believing that the Act would not significantly reduce medications errors.

In Question 6, three choices were presented as potential means for the further reduction or

prevention of medication errors. Table 5 illustrates these results. Because respondents could choose all that apply, the sum of the percentages do not equal 100%. As the table indicates, 80.8% of the pharmacists surveyed felt that including the reasons or indications for medications would aid in preventing or reducing medications-related errors. Another significant percentage (60.3%) felt that physicians should be required to clarify abbreviations

were presented as potential means for the further re	cuucuon or
Table 5 What else do you think could be done to prevent or reduce m errors?	edications
Response	Score*
Physicians should include the reason(s)/indication(s) for prescribing a certain medication.	80.8 %
Physicians and/or manufacturers should make a special effort to clarify sound-alike/look-alike names.	47.1 %
Physicians should be required to clarify abbreviations or completely write out sigs.	60.3 %
* Respondents could choose all that applied; the sum of these percentages equal 100%	does not

or completely write out sigs. Finally, a smaller percentage (47.1%) of respondents felt that clarifying sound-alike or look-alike names would significantly prevent or reduce medications errors.

Table 6		
Would you favor a system where all		
prescriptions are transmitted electronically?		
Response	Score	
Yes	75%	
No	25%	

Finally, the last question of the survey assessed whether pharmacists would favor a system in which all prescriptions were transmitted electronically. The results of this data are included in Table 6. Over three-quarters (75%) of the respondents stated that they would favor a system where all prescriptions were transmitted

Prescription Observations

To quantify the relative level of noncompliance with MERA, 500 prescriptions dated after July 1, 2004 were pulled from file and analyzed for the criteria outlined in the new legislation as well as that previously found in Title 63. To qualify for this analysis, the prescriptions had to be handwritten or printed (either from the physician's office or via fax); call-in prescriptions were not considered. The prescriptions were drawn in lots of 100 from a random five business days. Each prescription was then analyzed individually and noncompliant criteria were recorded. Table 7 lists the results from these observations.

Because a number of the prescriptions analyzed were noncompliant with multiple criteria, the sum of the percentages here does not equal 100%. As shown in the table, 56.8% of the prescriptions observed were not printed (in non-cursive handwriting or from a computer print-out). 10.4% of the prescriptions did not contain the name of the prescriber. Note that prescriptions were

scored for this criterion if either: 1) The prescription was not signed, or 2) The prescription was a hospital or institution blank and included no additional means of identification other than a signature.

6.2% of the prescriptions did not have the name and strength of the drug included. By far, the most noncompliant criterion was that the medication quantity was not written in both letters and numerals, with 70.8% of the observed prescriptions being noncompliant. More importantly, 15.2% of the total prescriptions were written for controlled substances and did not have the quantity written in

Table 7 Preservation Observations		
Criteria	Score (n=500)	
Rx was not printed	56.8%	
Name of prescriber not included*	10.4%	
Name and strength of drug not included	6.2%	
Quantity not written in letters and numerals	70.8%	
(Controlled substances)	15.2%	
Proper instructions not included	2%	
Rx was not dated	2.6%	
Rx was not signed on the date issued 3%		
* "Name of prescriber not included" referred both to those prescriptions where the prescriber did not sign the prescription or in the case where the prescription was a hospital or institution blank and only a signature was included.		

both letters and numerals. The final three criteria listed in the table were that proper instructions were not included, the prescription was not dated, and that the prescription was not signed on the date issued, with scores of 2%, 2.6%, and 3%, respectively.

Figures 1-4 illustrate actual prescriptions analyzed in this study. To comply with HIPAA regulations and to protect identities of the prescribers, all identifiable information has been blurred out or removed altogether.

Discussion

The purpose of the survey was to evaluate the overall awareness of the Medication Error Reduction Act among pharmacists and its perceived effectiveness. The results of the survey clearly indicate that a majority of pharmacists (almost three-fourths) were familiar with the Act and its contents. However, because they require verification and approval from the authorized prescriber before modifying or correcting noncompliant prescriptions, pharmacists have relatively little power in assuring the compliance of written or electronic prescriptions.

When a question regarding the accuracy or validity of a prescription arises, the pharmacist is required by law to contact the authorized prescriber for verification prior to dispensing the medication. The pharmacist may then be faced with trying to contact the prescriber through a receptionist or nurse, which as several respondents noted, often results in an extended game of "phone tag." Though the law allows the pharmacist to delay dispensing the prescription until verification is made, it does nothing to alleviate the dilemma of having to tell a waiting customer that verification from the prescriber is needed and may take anywhere from a few minutes to several hours to receive.

Despite the new standards set by MERA, pharmacists believed that the new legislation would do little to reduce medications-related errors if it was not being effectively enforced. This was further evidenced by their responses to questions 2 and 3, which sought to evaluate how many prescriptions they perceived were being fully or partially compliant with the new criteria. As was seen in the results, 25% of the respondents believed that only 21-40% of the prescriptions they had received were fully compliant with the new criteria. Also significant was the fact that 22.1% believed that 41-60% of received prescriptions were compliant. Although 23.5% believed that 61-80% were fully compliant with MERA, many commented that this number is still far below the number of prescriptions that *should* be fully compliant.

Several pharmacists also noted that the types of prescriptions they received often influenced the perceived levels of compliance. At some practice sites, the majority of prescriptions came from electronic orders, where the levels of noncompliance are generally low. Other pharmacies, however, which receive the majority of their prescriptions as handwritten orders, reported a higher number of noncompliant prescriptions.

The criteria that survey respondents felt were most often noncompliant was that the prescriptions were either not printed (in non-cursive handwriting or from a computer print-out) or that they did not have the quantity written in letters and numerals. As will be described later, these perceptions were consistent with independent observations of actual prescriptions. Many of the respondents commented that it was difficult to simply choose one of the options listed on the survey. Again, this was also consistent with prescription analysis, as many contained multiple violations.

Despite not being effectively enforced, the majority of pharmacists believed that this type of legislation is necessary and, if enforced, would reduce medications-related errors. To make the legislation more effective, however, respondents indicated that including the indications for prescribing certain medications and completely writing out abbreviations would further prevent or reduce medications errors. A smaller percentage felt that physicians and manufacturers should make a special effort to clarify sound-alike and look-alike names, but that this type of modification would be unnecessary if prescriptions were already compliant with the other criteria. In addition, several respondents also noted that many manufacturers already make a special effort to clarify sound-alike and look-alike names, but that hydr-ALA-zine.

The final question in the survey assessed whether pharmacists would favor an all-electronic transmission system as a potential means for reducing or preventing medications-related errors. Three-fourths of the pharmacists surveyed indicated that they would favor a system where all prescriptions were transmitted electronically. Several pharmacists responded that this would not only reduce and prevent medications-related errors— it would also help to reduce the number of potential forgeries. An electronic system reduces errors by transmitting prescriptions that are completely legible and, as will be discussed later, it also eliminates the need for receptionists to call in prescriptions.

Though a majority of pharmacists favored an all-electronic prescription system, some had reservations. One issue raised was that, although there are a reduced number of errors, some have been known to occur in physicians offices which utilize electronic devices (such as PDAs) to transmit prescriptions. Physicians may unknowingly choose the wrong strength or quantity simply by a misplaced pen stroke.

Several respondents also had concerns with *all* prescriptions being transmitted electronically, citing that certain medications, such as controlled substances, should still be transmitted by traditional means. Additionally, a few noted that an all-electronic system would be a prime target for abuse or manipulation by highly-skilled personnel. Such a system would require high levels of encryption as well as safeguards to prevent abuse. A final concern expressed by several of the respondents was the cost of implementing an electronic transmission system, an issue expected to be considerably more significant for independent and smaller community pharmacies.



Fig 1. Prescription legibility Is the second medication here Celexa 20mg or Celebrex 200mg?



Fig 2. Legibility of controlled substances This medication was first mistaken for Lortab, but was later corrected to Lornotil, after the last word was determined as being "diarrhea"; Physician was contacted for verification.

Following the survey, respondents were given the opportunity to ask questions or give any additional comments regarding this research or the Medication Error Reduction Act itself. One pharmacist noted another potential source of which result error may from miscommunication between the physician and pharmacy through non-licensed personnel, such as receptionists and medical assistants. She noted that pharmacists, authorized prescribers, and pharmacy technicians are licensed or registered by the State of Tennessee. However, non-licensed personnel may be just as involved in the transfer of medical information between the physician and the pharmacy, but are not currently required to have any type of formal education. Other pharmacists confirmed this observation, noting specific instances where receptionists were unable to pronounce certain medications or were asked to spell out generic prescription orders to the pharmacist over the telephone.

The observational analysis ot prescriptions permitted an actual quantification of noncompliant criteria, confirming the perceptions found in the pharmacist survey. As was seen in the survey responses, the two most noncompliant criteria were that the prescriptions were not printed (in non-cursive handwriting or from a print-out) or that they did not have the medication quantity written in letters and numerals. Moreover, 15.2% of the medications noncompliant with this criterion were controlled substances, where the

likelihood of forgery is typically higher. It can be reasonably inferred that requiring medication quantities to be written in letters and numerals is an effort to reduce the prevalence of forgery and abuse of controlled substances. However, when prescribers fail to put this component of the MERA legislation into practice, the effort to reduce forgery is thus cancelled out.

Prescriptions that either did not have the signature of the prescribing physician or were simply a clinical blank and contained only the signature of the prescriber (and not a printed version of the name indicated elsewhere on the prescription) were scored as not including the "name" of the prescribing physician. Larger institutions, such as medical centers and hospitals have a number of physicians on-duty at any particular time, many of which use the same blanks. As a result, verifications on prescriptions may be difficult to obtain. Many prescriber signatures are unintelligible at best and make it virtually impossible to contact the physician it verification of a prescription is required. Simply Fig 3. Use of computer-generated prescriptions along with the signature would easily eliminate ubere MERA criteria are fulfilled automatically. this problem.

The results of the observational analysis

also illustrated that over 50% of the prescriptions were not written in non-cursive handwriting or were not from a computer print-out. Writing a prescription in cursive automatically introduces the potential for error, as pharmacists must interpret even the most subtle pen stroke. Physician handwriting has always been the subject of tongue-in-cheek humor, even being highlighted in "Can



Fig 4. Handwritten compliant prescription The above figure demonstrates a handwritten prescription compliant with the new criteria.

The man of the second	
7/13/2004	
Rx:	
Dilantin	
100 mg cap	
Dispense: 93 (ninety-three)	
Label:	
Take 1 (one) cap PO 3 (three) ti	imes daily.
For scizure disorder.	
Refills:	
1 (onc)	
May substitute	Dispense as written

requiring that a prescriber print his or her name The above image demonstrates the advantage of a computerized system

You Read These Rxs?", a feature in every issue of the NCPA's Pharmacy Times. As examples of the problems associated with legibility issues, actual prescriptions from this analysis can be viewed in Figures 1 and 2, showing the need for this type of legislation. Figure 3 illustrates the advantage of a computer-generated print-out tor using prescriptions. Handwritten prescriptions, as seen in Figure 4, can also comply with all of the regulations outlined in the new legislation. Humor aside, prescriber handwriting can be a serious issue as a simple misinterpretation of a prescription may lead to a potentially disastrous medication error. In other words, the life of the patient may be at stake-writing legibly seems hardly the sacrifice to simply ensure the health and safety of the patient.

Conclusion

Overall, the pharmacists surveyed in this research believed that the MERA legislation is necessary, but in order to be completely effective, it should be enforced on authorized prescribers as well. After all, pharmacists are only a piece of the "error puzzle"—the responsibility of reducing and preventing medications-related errors should be shared by the prescribers who write prescription orders and the pharmacists who dispense them. As a result, the Medication Error Reduction Act could readily accomplish its goal of reducing or preventing medications errors if properly enforced by the appropriate government entities.

As this research has shown, a majority of pharmacists are well aware of the new legislation; additionally, nearly all of the pharmacists surveyed agreed that such legislation is necessary. However, the law grants pharmacists little power in modifying or correcting noncompliant prescriptions, because approval by the authorized prescriber is required. As described above, contacting the authorized prescriber almost always involves a considerable delay in dispensing a prescription. In many cases, the one or two hours a customer is required to wait is one or two hours too many. Most importantly, this delay may be completely unnecessary— if its provisions are followed correctly, the Medication Error Reduction Act greatly reduces the possibility of delaying a prescription, especially if the verification is to simply clarify an ambiguous or illegible word.

Therefore, this research demonstrates the need for revising the Medication Error Reduction Act, as proposed by the General Assembly for the Spring 2005 session. Because pharmacists cannot prescribe medications and their ability to modify prescriptions is subject to the approval of the authorized prescriber, their responsibilities to ensure compliance with the MERA legislation can only go so far— prescribers and pharmacists together must share the responsibility of reducing and preventing medications-related error. It is evident that legislation such as MERA is a step in the right direction to promote better health for Tennessee residents; however, as seen in this research, the law is only effective if Tennessee prescribers are also enforced to comply. So far, the Board of Pharmacy has taken the steps necessary to enforce the law on Tennessee pharmacists, but is powerless if prescribers are not held to this same standard. It is time for Tennessee prescribers physicians, dentists, optometrists, and other professionals alike— to be held to that same standard.