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# Impact of interruptions and distractions on dispensing errors in an ambulatory care pharmacy

ELIZABETH ALLAN FLYNN, KENNETH N. BARKER, J. TYRONE GIBSON, ROBERT E. PEARSON, BRUCE A. BERGER, AND LEO A. SMITH

**Abstract:** A possible association between interruptions and distractions and the occurrence of dispensing errors was investigated.

Fourteen pharmacists and 10 technicians in an ambulatory care pharmacy at a general medical-surgical hospital were tested for distractibility by using the group embedded figures test (GEFT) as well as for visual acuity and hearing. They were videotaped as they filled prescriptions during a 23-day period in 1992. A study investigator compared each filled prescription with

the physician's written order, noted details of deviations, verified with the pharmacist any errors that occurred, and asked the pharmacist to correct the error if necessary. Interruptions and distractions were detected and characterized by reviewing the videotapes.

None of the study participants had significant hearing or visual impairment. There was a significant association between GEFT scores and error rates. A total of 5072 prescriptions were analyzed, and 164 errors were detected, for

an overall error rate of 3.23%. Wrong label information was the most common type of error (80% of errors detected). A total of 2022 interruptions (mean  $\pm$  S.D. per half hour per subject,  $2.99 \pm 2.70$ ) and 2457 distractions (mean  $\pm$  S.D. per half hour per subject,  $3.80 \pm 3.17$ ) were detected. The error rate for sets of prescriptions with one or more interruptions was 6.65% and for sets during which there were one or more distractions, 6.55%. Interruptions and distractions per half hour were both significantly associated with errors.

In an ambulatory care pharmacy, interruptions and distractions over a half-hour period were associated with dispensing errors, a majority of which involved incorrect label information.

**Index terms:** Administration; Ambulatory care; Dispensing; Errors, medication; Personnel, pharmacy; Pharmaceutical services; Pharmacists, institutional, hospital; Prescriptions

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Dispensing errors have been measured by observation and occur at rates of between 1% and 24% (Table 1).<sup>1-8</sup> Dispensing error rate is one indicator of drug distribution quality, from the patient's perspective, in a prescription-filling operation. Errors and error rate have been used as outcome measures of the quality of drug distribution.<sup>9-12</sup> The quality of output of a drug distribution system is a function of the interaction between humans, procedures, equipment, and the work environment. Staffing constraints, a hectic work environment, and excessive workload demands on pharmacists have raised concerns about a potential increase in dispensing errors. Studies have supported associations between dispensing errors and lighting levels,<sup>4</sup> prescription workload,<sup>3,4,6,7</sup> and noise.<sup>13</sup> It is suspected that distractions and interruptions lead to performance errors.<sup>14</sup> A study of distractions and errors in an ambulatory care pharmacy found that more distractions occur in this environment and require that

more time be spent correcting errors.<sup>5</sup>

The objective of this study was to determine whether dispensing errors are influenced by interruptions or distractions.

## Methods

The study pharmacy was located in a 451-bed non-government, not-for-profit general medical-surgical hospital with clinics serving ambulatory patients.<sup>15</sup> The research plan was reviewed and approved by the hospital's internal review board and the institutional review board for the use of human subjects in research at Auburn University.

Fourteen pharmacists and 10 technicians who were scheduled to work in the ambulatory care pharmacy during the 23-day study period provided informed consent and agreed to participate. Each participant's visual acuity (including colorblindness), hearing, and distractibility were tested. Visual acuity was determined

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**Table 1.**  
**Dispensing Error Rates in Prescription-Filling Operations<sup>a</sup>**

Reference	Type of Pharmacy	No. Errors	No. Prescriptions	Error Rate (%)
1	Community; patient follow-up	29	223	13
2	Ambulatory care			
	Pharmacists	48	929	5
	Technicians	44	1,055	4
3	Ambulatory care, teaching hospital	1,085	9,394	12
4	High-volume military ambulatory care	369	10,889	3
5	Ambulatory care	37	3,227	1
6	Ambulatory care	164	5,072	3
7	Ambulatory care	552	9,846	6
8	Community <sup>b</sup>	24	100	24

<sup>a</sup>Error categories common to each of the reviewed studies are included in the table for comparison purposes.

<sup>b</sup>In this study investigators were disguised as shoppers who had one of three different prescriptions filled.

by using the visual acuity test (far and near).<sup>a</sup> Color-blindness was determined by using the color perception (far) test.<sup>a</sup> A person can miss two items and still pass the colorblindness examination.

Hearing ability can affect perception of sound that can result in a distraction or an interruption. An auditory examination that followed Occupational Safety and Health Administration guidelines was administered to check for hearing impairment.<sup>16</sup> Audiometric testing was performed by using manual audiometry.<sup>b,c</sup> It was not possible to comply with the recommended 14-hour break from exposure to workplace noise before administration of the test because of scheduling needs in the pharmacy, but this was not believed to be important because no 90-decibel (dB) noises (which could have affected hearing ability temporarily) were recorded during the study. Audiometric tests were performed on each ear to assess pure tone, air conduction, and hearing threshold. Test frequencies included 500, 1000, 2000, 3000, 4000, and 6000 hertz.<sup>16</sup> Hearing impairment was defined as a hearing-threshold level in excess of an average of 15 dB at 500, 1000, and 2000 hertz.<sup>17</sup> Visual and hearing tests were administered in the hospital's employee health clinic.

Distractibility was evaluated by using the group embedded figures test (GEFT), which measures field dependence.<sup>18</sup> This test requires approximately 30 minutes to complete. Field dependence is used as a measure of a person's unique susceptibility to distractions. Dembo<sup>19</sup> defined field independence and dependence as "measures of the extent to which individuals are able to overcome effects of distracting background elements (the field) when they attempt to differentiate the relevant aspects of a particular situation." A person who is field independent would score high on the test (up to 18) and would theoretically be less distracted and fill prescriptions more accurately than someone who is field dependent. If a relationship is identified between field dependence or independence and errors, the GEFT will allow identification of pharmacists or technicians who may be relatively immune to the effects of distractions in the environment.

The prescription-filling operation involved a clerk

receiving the prescription and a technician typing the label (for discharge prescriptions) or creating the label in the computer (for clinic prescriptions). A technician or a pharmacist retrieved the medication, counted the number of dosage units, and packaged and labeled the medication. An automated tablet-counting device was used for 58 medications. A pharmacist performed the final inspection and then placed the medications at the end of the filling counter for the investigator to inspect before they were dispensed to the patient. Errors were brought to the attention of the responsible pharmacist so the error could be corrected before the medication was dispensed.

**Definitions.** An interruption was defined as the cessation of productive activity before the current prescription-filling task was completed for any externally imposed, observable, or audible reason. An interruption was not counted when workers stopped productive activity of their own volition.

A distraction was defined as a stimulus from a source external to the pharmacist that was not followed by cessation of activity but by the pharmacist continuing productive efforts while responding in a manner that was observable.<sup>20</sup> This definition recognizes that individual workers may differ in their ability to continue working and their need to stop working when a potential interruption or distraction occurs.

Interruptions and distractions may interfere with the rehearsal process needed for remembering information.<sup>21</sup> This has the potential to adversely affect information-processing tasks, such as memory and decision-making, involved in prescription filling.

Interruption and distraction workload was defined as the frequency of interruptions or distractions per prescription set, per half hour, and per shift. Interruption workload per subject was measured, because prescription workload has been associated with dispensing errors.<sup>3</sup> Interruptions and distractions were detected by reviewing videotapes of pharmacy staff filling prescriptions.

A prescription set was defined as all the prescriptions presented by a patient or the patient's agent. Prescriptions excluded from this study included prescriptions for compounded items, investigational

drugs, and medications that could not be verified.

A dispensing error was defined as an event involving one or more deviations from an interpretable physician's written order, including written modifications made by the pharmacist pursuant to contact with the physician or in compliance with pharmacy policy.<sup>22</sup> The number of errors per prescription was recorded. Dispensing errors were classified as wrong drug, wrong dosage strength, wrong dosage form (correct drug), wrong label information, or wrong quantity; the quantity dispensed was excluded when the number of units was greater than 10 because of the difficulty in accurately collecting these data in a timely and unobtrusive manner.<sup>4</sup> Liquid measures were included if it was possible to observe the volume dispensed. If the quantity or volume of liquid could not be determined, the prescription was classified as "no error" if there were no errors in any other categories.

An opportunity for error was defined as an individual prescription included in the study.

Wrong label information was defined as deviation from one or more of the following federal or state requirements for label contents, whichever was more strict<sup>23</sup>:

1. Name and address of dispenser (pharmacy).
2. Serial number of prescription.
3. Date of prescription or date of filling.
4. Name of prescriber.
5. Name of patient, if stated on the prescription.
6. Directions for use, including precautions, as indicated on the prescription. (Auxiliary label information included on the package by the pharmacist that was not required by the physician was not evaluated.)
7. For controlled substances, inclusion of the transfer warning "Caution: Federal law prohibits the transfer of this drug to any person other than the patient for whom it was prescribed."
8. Drug name.
9. Drug strength (if more than one strength was available).
10. Quantity dispensed.
11. Expiration date.
12. Manufacturer or distributor (principal labeler).

The operational definition of dispensing error rate was the number of filled prescriptions involving one or more deviations from the physician's written order divided by the total number of prescriptions filled and evaluated by the observer and expressed as a percentage. Error rates were calculated for each pharmacist per prescription set and per half hour.

**Data collection techniques.** *Determination of dispensing errors.* The investigator compared the contents of each filled prescription and the label information with the physician's written order and entered each prescription number and the time of the visual inspection into a palmtop computer. If the investigator did not recognize the item, the imprint code on the dosage unit was compared with an inventory list containing all codes. The investigator noted details of any deviations from the physician's order in the computer, verified

that an error had been made with the pharmacist who checked it, and asked the pharmacist to correct the error if this was believed to be necessary.

A key issue of concern throughout the data collection period was the potential influence of the investigator on the pharmacists. What effect did immediate feedback on errors have on subsequent performance? Did the pharmacists improve their accuracy over time partly because of receiving feedback? To check for this possibility, each pharmacist's dispensing error rate was plotted against the overall (cumulative) half hour of exposure to the investigator. If the error rates decreased over time and there was no comparable change in another independent variable, the investigator's feedback may have been responsible in part for the improvement in accuracy.

*Distractions and interruptions.* Two video cameras recorded prescription-filling operations and interruptions from two different angles throughout each eight-hour study day. The counter where medications were filled and where the final inspections occurred was included in the view of camera 1, along with some drug storage areas. The label-generation area and some other drug storage areas were included in the view of camera 2. An 8-mm camcorder (camera 1) was positioned above the heads of pharmacy staff and partially hidden by a divider so they would not be constantly reminded of its presence. The camera recorded the date and the time, in hours and minutes, throughout the day. The second video camera was connected to a VHS video recorder set to record in the extended-play mode. When possible, videotapes in each camera were changed when the pharmacists and technicians were not involved in prescription-filling tasks in order to avoid data loss.

The videotapes were reviewed simultaneously. The 8-mm tape was started, and then the VHS tape was started and fast-forwarded or reversed until it was determined to be synchronized with the 8-mm tape (on the basis of the movement of personnel between camera views). The investigator was blinded to the time of occurrence of errors while interruption and distraction data were collected. Time of interruption or distraction, prescription-filling task affected, type of interruption or distraction, study participant affected, reason for the interruption or distraction, and comments were entered directly into a computer spreadsheet during review of the videotape.

Data were collected for 23 days (184 hours), Monday through Friday from 0830 to 1630, March 6 through April 8, 1992. The pharmacy was closed on one day of the study.

**Statistical analysis.** Analysis of covariance was performed by using square-root transformation<sup>24</sup> of the number of errors as the dependent variable and interruptions and distractions as the independent variables. Each of the variables was evaluated in terms of total per prescription set and total per half hour. Three analyses

were performed: one controlling for the GEFT score of each pharmacist, a second controlling for the number of prescriptions filled per study participant (workload), and a third controlling for both the GEFT score and the number of prescriptions.

The level of significance was set at  $p = 0.1$  because the associations were under exploration and a Type I error, although it could lead to increased expenditures to prevent interruptions and distractions, would not harm a patient.

## Results

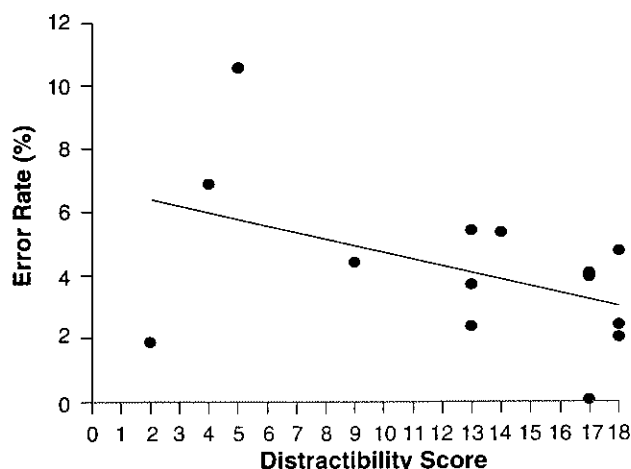
A total of 5072 prescriptions were analyzed and included in the study. A total of 164 errors were detected, for an overall error rate of 3.23%. The true error rate of this pharmacy system was calculated to lie between 3.11% and 3.36% (90% confidence interval).<sup>25</sup> Daily dispensing error rates ranged from 1.23% to 8.40% (S.D. = 1.48). Examples of errors detected are in the appendix. The number of deviations initially identified as errors was 195. This was reduced to 169 after 26 errors were reclassified as nonerrors because they resulted from a computer system problem or an acceptable interpretation by the pharmacist. The computer problem was the result of codes that resulted in "at bedtime" instead of "every night at bedtime" or "in the morning" instead of "every morning." Five deviations that were considered to be acceptable applications of professional judgment were not counted as errors (e.g., adding "for pain" to the label for an as-needed narcotic).

Wrong label information was the most common type of error (80% of the errors detected). Most label errors involved incorrect instructions to the patient (46%), followed by incorrect physician (18%), wrong number of refills (8%), and miscellaneous (28%). The relative frequencies of the remaining error categories were wrong quantity, 7%; wrong drug, 6%; wrong strength, 6%; and wrong dosage form, 1%.

None of the participants in the study had significant hearing or visual impairment. The GEFT scores ranged from 2 to 18 (out of a possible 0 to 18), with a mean of 13 for the 14 pharmacists. Figure 1 shows the relationship between GEFT score and each pharmacist's overall error rate. There was a significant association between the two ( $p = 0.099$ ), indicating that the more distractible pharmacists (i.e., those with a low GEFT score) had higher error rates than pharmacists who were less distractible (i.e., those with a high score). When two outlier scores were eliminated according to procedures described by Fox<sup>26</sup> for studentized residuals and Cook's  $D$ , the association between GEFT score and error rate was significant at  $p = 0.034$ .

**Interruptions.** A total of 2022 interruptions of pharmacists were detected, affecting 1143 prescription sets. The error rate for prescription sets with one or more interruptions was 6.65%. The error rate for the 1551 uninterrupted prescription sets was 5.67%. One

**Figure 1.** Relationship between pharmacist distractibility and overall dispensing error rates.



set was affected by 16 interruptions; there were no errors in this prescription set, and the pharmacist's GEFT score was 13.

A significant correlation was found between the number of interruptions per prescription set and a pharmacist's GEFT score ( $r = -0.0384$ ,  $p < 0.05$ ). This is consistent with expectations, because the higher the GEFT score, the fewer the interruptions, indicating a potential resistance to interruptions. Scores on the GEFT were used as a covariate to control for each pharmacist's susceptibility to interruptions. However, the relationship between interruptions per prescription set and dispensing errors per prescription set was not significant when GEFT scores were used as a covariate ( $F = 1.47$ ,  $p = 0.225$ ).

The effect of the number of interruptions per half hour per pharmacist per day on the number of dispensing errors per half hour per pharmacist per day was evaluated to determine whether there was an effect over time. The mean  $\pm$  S.D. number of interruptions per half hour per pharmacist was  $2.99 \pm 2.70$ . The maximum number of interruptions per half hour was 17. There was a significant relationship between interruptions and errors when these were totaled by half hour ( $F = 8.22$ ,  $p = 0.004$ ). However, there was a significant interaction between interruptions and GEFT score ( $F = 1.78$ ,  $p = 0.077$ ). This complicates the interpretation of the main effect of interruptions on errors when GEFT scores are controlled for. The Pearson correlation coefficient indicated a significant relationship between interruptions per half hour and dispensing errors per half hour ( $r = 0.0995$ ,  $p < 0.05$ ), but this analysis did not consider GEFT score.

Controlling for the number of prescriptions filled per half hour per pharmacist, we found a significant effect of interruptions per half hour on errors per half hour ( $F = 8.78$ ,  $p = 0.003$ ).

In order to evaluate the potential for modifying

**Table 2.**  
**Types of Interruption by Error Rate**

Type of Interruption	No. (%) Interruptions on Prescription Sets with Errors	No. (%) Interruptions on Prescription Sets without Errors
Facility-related	2 (1.6)	16 (0.8)
Job-related, other than prescription-related	14 (10.9)	221 (11.7)
Miscellaneous	0 (0.0)	60 (3.2)
Prescription-processing- related	109 (85.2)	1502 (79.3)
Unrelated to job	3 (2.3)	95 (5.0)
Total	128 (100.0)	1894 (100.0)

interruptions, interruptions were classified into types (Table 2.) The frequency of interruption types was compared for prescription sets with errors and those without errors. Most interruptions were related to prescription-processing questions, which could be decreased with additional staff training. A number of interruptions were caused by staff looking up at people passing through the ambulatory care pharmacy on their way to the inpatient pharmacy.

**Distractions.** A total of 2457 distractions were detected as pharmacists filled 1329 prescription sets. The prescription set error rate for sets during which there were one or more distractions was 6.55%. No distractions were detected for 1365 prescription sets; the error rate for these prescription sets was 5.64%. One prescription set was affected by 12 distractions; there were no errors in that prescription set, and the pharmacist's GEFT score was 17. When distractions were summarized over the average half-hour period, pharmacists were subjected to a mean  $\pm$  S.D.  $3.80 \pm 3.17$  distractions per half hour, with a maximum of 16 distractions per half hour.

We hypothesized that, if GEFT scores are an indicator of distractibility, low scores should be associated with more distractions and high scores with fewer distractions. This hypothesis was confirmed: There was a significant negative relationship between the number of distractions per prescription set and a pharmacist's GEFT score ( $r = -0.0423$ ,  $p < 0.05$ ). This analysis was exploratory and was undertaken to determine whether there were any differences in the effect of distractions on error rates, controlling for GEFT score.

Controlling for GEFT score, distractions were not associated with dispensing errors in prescription sets ( $F = 1.21$ ,  $p = 0.271$ ). An analysis of the effects of distractions on errors, controlling for the number of prescriptions, was performed because of a significant correlation between the number of prescriptions per set and the number of errors. There was a small improvement in the main effect of distractions, but this was not significant.

Distractions had a significant effect on dispensing errors when each variable was totaled by half hour ( $F =$

**Table 3.**  
**Types of Distractions by Error Rate**

Type of Distraction	No. (%) Distractions on Prescription Sets with Errors	No. (%) Distractions on Prescription Sets without Errors
Facility-related	3 (1.9)	43 (1.9)
Job-related, other than prescription-related	30 (19.4)	411 (17.9)
Miscellaneous	5 (3.2)	129 (5.6)
Prescription-processing- related	95 (61.3)	1364 (59.3)
Unrelated to job	22 (14.2)	355 (15.4)
Total	155 (100.0)	2302 (100.0)

6.28,  $p = 0.012$ ). The relationship between distractions per half hour and errors per half hour was significant ( $r = 0.0948$ ,  $p < 0.05$ ), but this analysis did not consider GEFT scores. The slope for the regression line was positive but small, indicating that, as distractions per half hour increased, so did dispensing errors per half hour.

When we controlled for the number of prescriptions filled per half hour, the effect of distractions per half hour was significant ( $F = 6.90$ ,  $p = 0.009$ ). However, there was a significant interaction effect between distractions and the covariate number of prescriptions per half hour, indicating that the assumption of homogeneous variance was violated ( $F = 1.76$ ,  $p = 0.016$ ). The main effect of distractions per half hour is therefore difficult to interpret when the number of prescriptions filled is controlled for. The effect of distractions per half hour may be significant at certain frequencies of distraction.

A comparison between sources of distractions for prescription sets with errors and sets without errors is presented in Table 3.

**Combined effects of interruptions and distractions.** Analysis of covariance was used to evaluate the amount of variance explained by interruptions and distractions per prescription set when these were considered together, controlling for GEFT score. There was not a significant effect on errors on the basis of data per set ( $F = 1.47$ ,  $p = 0.225$ ). Controlling for the number of prescriptions per set, we found no significant effects of interruptions and distractions (interruptions,  $F = 1.49$ ,  $p = 0.222$ ; distractions,  $F = 0.49$ ,  $p = 0.485$ ). There was a significant effect when interruptions and distractions were combined over a half-hour period (interruptions,  $F = 6.89$ ,  $p = 0.009$ ; distractions,  $F = 2.17$ ,  $p = 0.141$ ). When we controlled for the number of prescriptions filled per half hour, the effects of interruptions per half hour per day were significant ( $F = 8.88$ ,  $p = 0.003$ ), but distractions did not have a significant effect.

## Discussion

Interruptions and distractions had an effect on errors only when they were totaled over a half-hour

period. There was no significant effect when the data were analyzed to see whether there was a direct effect of interruptions and distractions on prescription sets. This suggests that there is a workload effect of interruptions and distractions and is consistent with the proposition that interruptions force workers to review their work upon returning to the task to decide what to do next. It is possible that this review (a double-check) resulted in self-detection of errors and subsequent correction. It is also possible that the types of interruptions in this pharmacy were not the kind that disrupt performance (i.e., not similar to the task interrupted and not placing a large demand on working memory).<sup>27</sup>

Did the observer have an effect on the study participants? Subjects who are observed performing routine tasks revert to their normal behaviors within one to three hours after observation begins.<sup>28,29</sup> A statistical analysis of the effect of study day on errors, by pharmacist, did not find a significant effect. This evidence does not support the presence of an effect of the observer on the observed. However, when error rates were plotted against time to determine whether decreasing error rates may have been due to feedback about errors, 3 of 14 pharmacists demonstrated a decrease in their error rates; 2 of these 3 pharmacists filled the most prescriptions in the study. This supports the idea that the error rates of three pharmacists may have been affected by the feedback from the investigator who corrected errors.

This study had several limitations. The analyses involving interruptions and distractions may have underestimated the occurrence of these stimuli if they occurred while a videotape was being changed, if the investigator was not able to insert a new tape before the previous tape was finished recording, or if the stimuli occurred off camera.

Investigator accuracy could be an issue, because nobody double-checked the investigator on prescriptions that were deemed free of error except, on one occasion, a patient who came back and said the pharmacist did not dispense enough insulin. The investigator did have a double-check on prescriptions for which errors were detected, because each pharmacist was asked to verify that an error had occurred before being asked to correct the error. Therefore, underdetection of errors was the primary concern. The investigator was exposed to the same environment and low lighting level as the pharmacists were. Adding a light to the area where the investigator worked was considered, but it was decided that this would have altered the environment of the pharmacists. The investigator's length of full-time experience in high-volume outpatient pharmacies was greater than that of any of the study participants. The investigator did not have any other work responsibilities (e.g., answering the telephone, responding to questions from technicians) and so had a lighter workload than the pharmacists. Any dispensing

error the investigator failed to detect was likely a form of systematic error, which could have led to underreporting of the true error rate.

With respect to the potential underestimation or overestimation of errors in this study, the overall error rate (3.23%) was comparable to the error rate of 3.38% detected by Buchanan et al.<sup>4</sup> with similar methods (feedback on content errors only—label errors were corrected at a later date if this was deemed necessary). McGhan and colleagues<sup>2</sup> found a similar error rate to the one in our study: 3.53% overall. Guernsey and colleagues<sup>3</sup> detected an error rate of 10.4% in a study that did not involve feedback on errors being given to the pharmacists; this rate was calculated by using definitions and error categories that were comparable to those used in our study.

On the night before day 18 of the onsite data collection period, the National Broadcasting Corporation aired a television program that included a segment about medication errors in hospitals.<sup>30</sup> Examples of serious injury or death resulting from medication errors were described. The investigator watched the program to judge its potential effect on the study participants the next day. Before data collection, the investigator asked one of the participants if he or she had watched television the previous night, and the participant had not. A pharmacist who worked in a different part of the pharmacy department was seen with a videotape and a sign-out sheet—he was preparing to lend a videotape of the television program to anyone who was interested. The investigator asked the pharmacist if he could wait until the data collection period was over before he allowed anyone to borrow the tape, as a precaution; the pharmacist agreed. Although the television program had the potential to influence the investigator and the study participants in some way, we have no knowledge, evidence, or perception that it actually did.

Three pharmacists believed that they were more careful than usual during the study, according to a questionnaire administered after the study, but errors still occurred. There did not appear to be a decreasing trend in errors committed over time for each pharmacist, which supports the proposition that the investigator did not inadvertently "train" the pharmacists to reduce their error rates or sensitize them to their errors.

The fact that there were no large differences between the sources of interruptions and distractions when error rates were compared calls for a comprehensive approach to decrease any and all sources of interruptions and distractions. To help minimize errors, staff members should be trained to avoid interrupting or distracting other staff when they are filling prescriptions. A recommendation was made to eliminate traffic from the other areas of the inpatient pharmacy by relocating the ambulatory care pharmacy, providing visual barriers around the ambulatory care pharmacy, or rerouting traffic to an entrance that does not require passage

through the ambulatory care pharmacy.

Additional research on the association between pharmacist distractibility and dispensing errors should be performed to confirm or dispute the findings for the 14 pharmacists in this study. Additional evidence is needed before the GEFT can be used as a pre-employment screening tool.

## Conclusion

In an ambulatory care pharmacy, interruptions and distractions over a half-hour period were associated with dispensing errors, a majority of which involved incorrect label information.

\*Titmus Vision Tester, Model OV-7M, serial no. 43791, Titmus Optical Co., Inc., Petersburg, VA 23803.

<sup>b</sup>Audiometric Testing Room, Model 1204, serial no. 776, Industrial Acoustics Company, Bronx, NY 10462.

<sup>c</sup>GSI 16 audiometer, serial no. 2226, Grason-Stadler, Inc., Milford, NH 03055.

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## Appendix—Examples of dispensing errors

### Wrong drug

Prescription written for:	Filled as:
Halcion 0.25 mg	Xanax 0.25 mg
Augmentin	Amoxicillin
Tylenol elixir	Tylenol with codeine elixir
Cafergot	Ergostat
Metamucil sugar-free for diabetic patient	Metamucil
Insulin NPH, beef/pork mixture	Insulin NPH, human

### Wrong form

Prescription written for:	Filled as:
Procan	Procan SR
Isordil 5-mg oral tablet	Isordil 5-mg sublingual tablet

### Wrong strength

Prescription written for:	Filled as:
Desyrel 50 mg	Desyrel 100 mg
Bactrim single strength	Bactrim double strength
Zantac 300 mg	Zantac 150 mg
Tylenol with codeine #4	Tylenol with codeine #3
Penicillin VK 250 mg	Penicillin VK 500 mg

### Wrong label information

Prescription	Directions written by prescriber	Directions typed
Calcium carbonate 10 grain	Take 2 tablets twice a day	Take 1 tablet twice a day
Morphine	Every 4 hours as needed	As needed
Metronidazole 250 mg	Take 1 tablet 3 times daily for 7 days	Take 1 tablet 3 times daily
Prilosec	Take 1 capsule twice daily	Take 1 capsule daily
Medrol 4 mg	Take 2 tablets every other morning	Take 2 tablets every morning