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# Original Research Article

# Pharmacists and Nurses Perception of Medication Errors in a Nigerian University Teaching Hospital

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## Abstract

***Purpose****: To investigate the type and frequency of all medication dispensing and administration errors as perceived by pharmacists and nurses respectively, and the factors associated with such errors in a Nigerian university teaching hospital.*
***Methods:*** *The study was conducted at the Obafemi Awolowo University Teaching Hospitals, Ile-Ife and Ilesa, Nigeria. Data was collected by the use of pre-tested questionnaire administered to 35 pharmacists and a stratified sample of 130 nurses over a period of 2 weeks. The questionnaires were sorted and analysed.*
***Results****: The pharmacists that responded (80%) cited incorrect drug, incorrect strength of drug (70%) and wrong dose of drug (60%) as the most common dispensing errors. Fifty percent of pharmacists put the estimated frequency of occurrence of these dispensing errors at 1 per 100 prescriptions dispensed. Most of the nurses (65%) identified administration of wrong drug, administration of wrong dose (63%) and wrong time of drug administration (57%) as the most frequently occurring medication administration errors in the teaching hospital. All the pharmacists and 78% of nurses identified excess workload as the most important factor contributing to errors in medication dispensing and administration respectively.*
***Conclusion:*** *The fundamental factor perceived to be contributing to errors in medication dispensing and administration was excess workload resulting from insufficient members of staff.*

***Keywords:*** *Medication error, dispensing, drug administration, pharmacist, nurses, Nigeria*

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## Introduction

Providing drug treatment in the hospital setting requires a series of actions that have to be performed correctly by several members of the healthcare team, such as the physician, the unit clerk, the hospital pharmacist and the nurse. Errors can occur at any step of the process: from medication selection and ordering, to order transcription, to drug formulation, to drug dispensing and administration. For adults, the reported incidence of errors in treatment with medications ranges from 1-30 percent of all hospital admissions,[1] or 5 percent of orders written.[2] In paediatrics, however, this number has been reported to be as high as 1 in 6.4 orders.[3,4]

Medication errors produce a variety of problems for patients, ranging from minor discomfort to substantial morbidity that may prolong hospitalization or even lead to death.[5,6] The 1999 Institute of Medicine's (IOM) report implicates medication errors, at least in part, as a direct cause of up to 98,000 patient deaths annually in the United States.[4] Besides, in a 700-bed teaching hospital, drug errors associated with morbidity and mortality has been shown to increase inpatient health costs by an estimated $4,700 per hospital admission, or approximately $2.8 million annually.[4,7]

Medication administration errors are recognized as an important indicator of quality of drug therapy from the patient's perspective. One of the developments to reduce the problem of medication errors had been the introduction of automated dispensing. Good as the automated systems are, researchers have evaluated the effect of automated drug dispensing devices on errors, with the results showing that errors have not been entirely eliminated by this technology.[8] Therefore, the subject of medication error should be of interest to all concerned because it has far-reaching implications for the overall outcome of pharmacotherapy and it places enormous financial burden not only on the individual patient and their care-givers, but also on the health care system.

Errors in dispensing can either be ones of commission (e.g. dispensing the wrong strength of medication) or omission (e.g. not screening for drug interactions).[9] Moreover, dispensing errors can be actual or potential – they are detected before any harm occurs; and can further be categorized into mechanical (e.g. during preparation and processing) as well as judgmental (e.g. screening, counseling and monitoring). Finally, dispensing errors can be described in accordance with error theory – as either "slips" or "mistakes". Slips occur when an individual knows what to do but does something wrong or poorly due to such anecdotal factors as distractions, noise, boredom or sleep deprivation. Mistakes, on the other hand, involve errors of judgment and can occur where more common rules of habit pattern and knowledge do not apply.[10,11]

Some factors that have been identified as contributing to dispensing errors include: excess workload; look-alike, sound-alike drug names; confusing manufacturers' labeling and packaging; distractions such as receiving phone calls, television viewing and unnecessary conversations or 'idle chatter' during dispensing; poorly designed work area; as well as use of outdated and incorrect reference materials.[12] In spite of the above reasons and factors enumerated, a study has shown that there is no correlation between the number of prescriptions dispensed per hour and the total number of errors made, although dispensing error peaks were noted during the lunch hour and in the hour before closing.[13] The authors, therefore, suggested that important factors in error avoidance are continuous quality improvement mechanisms and minimal interruptions of dispensing procedures. Furthermore, it has been shown that hospital pharmacies without an independent check on pharmacist dispensing have a statistically significant higher rate of errors than those

hospital pharmacy departments with a second check on all work.[14]

The professional nurse, no doubt, is the practitioner most often associated with the responsibility of medication administration. An essential part of every nurse's training is committing to memory and practice the "Five rights" checklist: (1) the right drug, (2) the right dose, (3) the right route, (4) the right time, and (5) the right patient.[15] Although this is an invaluable verification tool, drug administration error is closely following errors associated with the prescribing, ordering process, as the second most frequent type of medication error.[9] Unlike prescribing errors, however, the rate of intercepting administration errors is rather low and there is a greater risk for harm occurring at this stage.[16] Unfortunately, it is this step in the medication delivery chain that receives the least support from independent checking and verification procedures. A number of factors have been cited as contributing to medication administration errors and these include: unfamiliarity with the nursing unit; interruptions during the process of drug administration; excess workload; inadequately trained staff; sleep deprivation; language barriers; medication look-alike, sound-alike names; as well as lack of sufficient data on the patient.[17,18]

The work environment has recently been fingered as the most significant contributing factor to errors in medication administration. For instance, it has been reported in their study that nurses who worked rotating shifts and the night shift had fewer hours of sleep than those who worked day or evening shifts.[18] Whereas 92.2 percent of the day shift and evening shift nurses obtained sleep for long durations without interruptions, only 6.2 percent of the night nurses do. It has been demonstrated that workload and environmental factors have an effect on medication errors.[19] The results indicated that the number of medication errors increased with darkness and the number of shifts worked by temporary nursing staff. Interestingly, the number of medication administration errors decreased with more overtime worked by permanent nursing staff.

The objectives of this research was to investigate the type and frequency of all medication dispensing and administration errors as perceived by pharmacists and nurses respectively, and most importantly, the factors associated with such errors in a Nigerian university teaching hospital.

## Methods

### *Setting*

This study was conducted at Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC). This is a tertiary care institution that serves as the main referral hospital for most of Osun State and Ondo State; it also doubles as the teaching hospital for the prestigious Obafemi Awolowo University, Ile-Ife, Nigeria. This teaching hospital is a multicentre facility by reason of its annexes which comprises (1) the urban comprehensive health centre at Eleyele in Ile-Ife, (2) the Wesley Guild hospital at Ilesha and (3) comprehensive health centre at Imesi-Ile (a community based health facility). Although the hospital has been in existence since the 1960's and known as the Ife State Hospital (ISH), it was upgraded and later converted to a teaching hospital following the establishment of the Faculty of Health Sciences in the Obafemi Awolowo University in the early 1970's.

The teaching hospital had 35 pharmacists and about 350 nurses in its employment. Ethical approval was sought and obtained from the Ethics and Research Committee of the hospital.

### *Research Instrument*

A pre-tested and appropriately modified questionnaire, which was prepared and administered in English – the official language in Nigeria, was used for this study. The instrument was validated and the indices obtained in the internal consistency and

reliability procedure were Cronbach α = 0.8 and n=17. It was modeled to reflect the thrust of the study i.e. perceived types of medication error – dispensing and administration errors – occurring at the facility, the estimated frequency of occurrence, factors associated with these errors and the appropriate measure(s) that could be taken to curb medication error in the institution in question. Two sets of questionnaires were used: the first set was administered to pharmacists and it addressed the subject of medication dispensing errors; whereas the second set was administered to nurses and it addressed drug administration errors. The 24-item questionnaires had two sections with section A comprising all the questions that borders on the subject, while section B addresses socio-demographic data of the respondents. The first question was "Are you aware of the occurrence of errors in medication dispensing/administration in this institution? Yes/no/don't know. If your response is no, please do not continue with this questionnaire." To determine the factors contributing to the identified dispensing/administration errors, a quasi-closed ended question was asked which listed 9 possible factors and a provision of others in form of open questions to specify unlisted options. Additionally, it was important to determine what measure(s) or strategies – in the opinion of the respondent – would bring a reduction in dispensing/administration errors in the teaching hospital. Hence, the question, "In your opinion, what measure(s) would bring about a reduction in occurrence of errors in medication dispensing/administration in our institution?" was asked. This identified 8 measures in each case with provisions of others to specify unlisted options.

### *Sampling and data collection*

The first set of questionnaire that addressed medication dispensing error was administered to all 35 pharmacists at the hospital and its annexes. However, the second questionnaire on drug administration error was administered to 130 nurses. The nurses were selected by stratified random sampling. Stratification was aimed at ensuring that respondents cut across both sexes and across a wide age range in addition to covering the major wards in the hospitals. Besides, questionnaire was only administered to nurses found in the following wards (which were pre-selected): Male Medical ward (15), Female Medical ward (15), Children Neonatal ward (10), Children Emergency ward (9), Children ward I (8), Children ward II (8), Orthopaedic ward (15), Accident & Emergency ward (10), Male Surgical ward (7), Male Medical ward (8), Eleyele annex (10) and Wesley Guild Ilesha (15). A total of 130 questionnaires were administered to the nurses. Precisely, the data collection took place between August 8 and 12, 2005. All the subjects participated voluntarily and they appeared clearly motivated to provide correct answers.

### *Data analysis*

Questionnaires were sorted and those found to have relevant missing items were discarded. For example 3 pharmacist respondents said they were unaware of occurrence of dispensing errors; while 2 others did not identify factors that could be contributing to errors in medication dispensing. All the variables were thereafter coded and entered into SPSS package which was also used for the descriptive statistics (including means and cross tabulations) reported.

## Results

Out of 35 pharmacists sampled, 25 responded and 5 questionnaires were discarded because they were either incomplete on items crucial to the study or indicated incorrectness so that only responses from 20 subjects were analysed. As regards the 130 nurses sampled on medication administration error, 123 responded and 8 questionnaires were discarded so that responses from a total of 115 subjects, which was quite representative

of the original sample of 130 nurses, in terms of the vital demographic variables, were consequently analysed.

Table 1 presents a compilation of some key socio-demographic variables of pharmacists and nurses respectively. The result showed that most of the pharmacists (90%) have a bachelor of pharmacy (BPharm) degree as the highest educational qualification. About 50% of the pharmacists have had less than 5 years of professional experience and a greater percentage (55%) have put in less than 5 years in the service of the institution.

Most of the nurses (83%) that participated in the study were females. With 80% having the Registered Nurse Diploma as highest educational qualification, 65% of nurses have got over 10 years of professional experience, while about the same percentage (60%) have been in the service of the teaching hospital for more than 10 years. The demographic factors within each professional group did not significantly affect either the occurrence or frequency of medication errors.

### *Occurrence of medication dispensing and administration errors*

The pharmacists (Table 2) identified essentially six types of medication dispensing error occurring at the teaching hospital, though most frequently occurring ones are: dispensing an incorrect drug (80%), dispensing an incorrect strength of drug (70%) and dispensing the wrong dose of drug (60%). The estimated frequency of occurrence of these dispensing errors was put at 1 per 100 prescriptions dispensed (50%). On the other hand, most of the nurses (Table 3) identified administration of wrong drug (65%), administration of wrong dose (63%) and wrong time of drug administration (57%) as the most frequently occurring medication administration errors in the teaching hospital. And the estimated frequency of occurrence of the identified medication administration errors was put at 1 per 100 drug administration (59%).

**Table 1:** Socio-demographic data of pharmacists and nurses

| Characterisitcs | Pharmacist n=20 | Nurses n=115 |
|---|---|---|
| *Gender* | | |
| Male | 60 | 17 |
| Female | 40 | 83 |
| Total | 100 | 100 |
| *Religion* | | |
| Christianity | 90 | 85 |
| Islam | 10 | 15 |
| Total | 100 | 100 |
| *Marital Status* | | |
| Married | 70 | 88 |
| Single | 30 | 12 |
| Total | 100 | 100 |
| *Highest educational Qualification* | | |
| Diploma | | 80 |
| First university degree | 90 | 16 |
| M.Sc | 5 | 4 |
| MBA | 5 | 0 |
| Total | 100 | 100 |
| *No. of Years in Practice* | | |
| 1-2 | 50 | 15 |
| 3-4 | 5 | 10 |
| 5-6 | 10 | 10 |
| >10 | 35 | 65 |
| Total | 100 | 100 |
| *No. of years in service at OAUTHC* | | |
| 1-2 | 50 | 25 |
| 3-4 | 5 | 5 |
| 5-6 | 10 | 10 |
| >10 | 35 | 60 |
| Total | 100 | 100 |

*OAUTHC, Obafemi Awolowo University Teaching Hospital Complex*

### *Perceived factors related to dispensing and administration errors*

Nine perceived factors associated with medication dispensing errors are summarized in Table 2. All respondents cited excess workload (in terms of number of

**Table 2:** Dispensing errors identified by pharmacists

| Item | Pharmacists = 20 | |
|---|---|---|
| *Type of dispensing errors identified* | n | % |
| Dispensing an incorrect drug | 16 | 80 |
| Performing calculation error | 8 | 40 |
| Dispensing an incorrect strength of drug | 14 | 70 |
| Wrong dose of drug | 12 | 60 |
| Failure to identify drug interactions | 6 | 30 |
| Failure to provide adequate instructions/counsel | 7 | 35 |
| | | |
| *Estimated frequency of occurrence* | n | % |
| 1 per 10 prescriptions dispensed | 3 | 15 |
| 1 per 100 prescriptions dispensed | 10 | 50 |
| 1 per 1000 prescriptions dispensed | 4 | 20 |
| 1 per 10000 prescriptions dispensed | 1 | 5 |
| 1 per 100000 prescriptions dispensed | 1 | 5 |
| I don't know the frequency of occurrence | 1 | 5 |
| | | |
| *Perceived contributing factors to dispensing errors* | n | % |
| Excess workload (i.e. number of prescriptions dispensed per unit time per personnel) | 20 | 100 |
| Look-alike drugs, sound-alike drug names | 15 | 75 |
| Confusing manufacturers' labeling and packaging | 15 | 75 |
| Crowded and confusing medication storage | 7 | 35 |
| Inadequate lighting and uncomfortable temperature in dispensing area | 17 | 85 |
| Heavy traffic and clutter within the dispensing area | 14 | 70 |
| Distractions (i.e. receiving phone calls, television viewing and unnecessary conversations during dispensing process) | 14 | 70 |
| Use of outdated and incorrect reference literature | 9 | 45 |
| Illegible handwriting of prescribers | 13 | 65 |
| | | |
| *Strategies for reduction of dispensing errors* | n | % |
| More pharmacists should be recruited | 20 | 100 |
| A superior or more experienced pharmacist should double-check dispensed medicines before drugs are handed over to the patient/care giver or nurse | 16 | 80 |
| There should be a purpose-built pharmacy or the dispensing area be restructured/reorganized for optimal performance | 12 | 60 |
| Pharmacists should concentrate when dispensing and avoid all forms of distractions | 11 | 55 |
| Dispensing pharmacists should seek clarification from prescribers when handwriting is illegible | 5 | 25 |
| Continuous professional education and re-training of all dispensing pharmacists is vital | 13 | 65 |
| Self-reporting of dispensing errors should be encouraged | 2 | 10 |
| Improved remuneration for pharmacists | 9 | 45 |

prescriptions dispensed per unit time per personnel) as the leading factor contributing to dispensing error in this institution. Eighty-five percent believed inadequate lighting and uncomfortable temperature in dispensing area as yet another factor, while 75% indicated confusing manufacturers' labeling and packaging as well as look-alike, sound-alike drug names as other causes of dispensing error. Heavy traffic and clutter within the dispensing area in addition to all forms of distraction during the dispensing process were cited as additional factors leading to medication dispensing error (70%). Some respondents (65%) alluded to illegible handwriting of prescribers as one of the perceived factors related to dispensing errors. Only 35% believed crowded and confusing medication storage could lead to dispensing errors.

Table 3 highlights the ten factors that were perceived by nurses as primarily contributing to medication administration errors. In all, 78% of respondents identified excess workload (i.e. the number of patients to whom medication is administered per unit time per personnel) as the leading factor, while 57% believed all forms of distractions and interruptions during medication administration could lead to error. Forty-two percent and 35% of respondents would attribute administration errors to lack of data concerning the patient and medication sound-alike names respectively. Other factors cited are: inexperienced staff (28%), inadequately trained nursing staff (26%), unfamiliarity with a nursing unit (25%) as well as sleep deprivation. Language barrier (14%) and wrong labeling (5%) were the least factors related to medication administration error.

***Curbing medication dispensing and administration errors***

In order to reduce the occurrence of dispensing errors, all pharmacists who participated in this study advocated for the recruiting of more pharmacists in the teaching hospital. Additionally, 80% of respondents affirmed that a superior or more experienced pharmacist double check dispensed medicines before they are handed over to patient/care-giver or to nurses. Another important strategy suggested for the reduction in dispensing error is the imperativeness of continuous professional education and re-training of all dispensing pharmacists (65%). Sixty percent of respondents called for a purpose-built pharmacy or a restructuring/reorganization of the dispensing area for optimal performance of dispensing functions; while pharmacists are advised to concentrate and avoid all forms of distractions during the dispensing process (55%).

The measures suggested by all nurses who participated in this study for curbing medication administration error are compiled as shown in Table 3. The foremost strategy for reducing administration error was the recruiting of more nurses (71%). Cooperation among all healthcare professionals – physicians, pharmacists and nurses – was also identified as crucial to reduction in administration errors (61%). Other important measures include: adequate orientation and familiarization with a nursing unit (57%), nurses should concentrate during drug administration and avoid all forms of distraction (48%), need for a superior or more experienced nurse to double check dispensed medicines before they are administered (40%) and self-reporting of medication administration errors should be encouraged (39%).

## Discussion

This study has identified some medication errors suggesting that there could have been many incidences of errors in medication dispensing and administration at the Obafemi Awolowo University teaching hospital which may have passed unreported. The result of this study is consistent with the findings of other workers[20] whose research identified wrong drug, wrong dose and wrong patient ranking highest among the types of dispensing errors. In this study, the

**Table 3:** Administration errors identified by nurses

| *Item* | Nurses = 115 | |
|---|---|---|
| *Type of drug administration errors identified* | N | % |
| Wrong drug administered | 75 | 65 |
| Wrong dose administered | 72 | 63 |
| Wrong time of administration | 66 | 57 |
| Wrong route of administration | 45 | 39 |
| Drug administered to the wrong patient | 38 | 33 |
| | | |
| *Estimated frequency of occurrence* | n | % |
| 1 per 10 drug administration | 15 | 13 |
| 1 per 100 drug administration | 68 | 59 |
| 1 per 1000 drug administration | 17 | 15 |
| 1 per 10000 drug administration | 7 | 6 |
| 1 per 100000 drug administration | 5 | 4 |
| 1 per 1000000 drug administration | 1 | 1 |
| I don't know the frequency of occurrence | 2 | 2 |
| | | |
| *Perceived contributing factors to administration errors* | n | % |
| Excess workload (i.e. number of patients to whom medication is administered per unit time per personnel) | 90 | 78 |
| Inexperienced staff (e.g. intern nurses) | 32 | 28 |
| Inadequately trained staff | 30 | 26 |
| Sleep deprivation | 24 | 21 |
| Unfamiliarity with a nursing unit | 29 | 25 |
| Distractions and interruptions during medication administration process | 66 | 57 |
| Medication sound-alike names | 40 | 35 |
| Lack of data concerning a patient | 48 | 42 |
| Language barrier | 16 | 14 |
| Wrong labelling | 6 | 5 |
| | | |
| *Strategies for reduction of administration errors* | n | % |
| More nurses should be recruited | 82 | 71 |
| A superior or more experienced nurse should double check dispensed medicines before drugs are administered | 46 | 40 |
| There should be adequate orientation and familiarization with a new nursing unit | 65 | 57 |
| Nurses should concentrate when dispensing and avoid all forms of distractions | 55 | 48 |
| All professionals involved in medication delivery (i.e. nurses, pharmacists and physicians) be more cooperative with one another | 70 | 61 |
| Continuous professional education and re-training of all nurses is vital so as to ensure strict observance of the '5 rights' of drug administration | 35 | 30 |
| Self-reporting of medication administration errors should be encouraged | 45 | 39 |
| There should be adequate commendation and reward for hardworking nurses | 23 | 20 |

administration of wrong drug and wrong dose of drug have been identified by nurses as the most frequently occurring administration errors in the teaching hospital. This is understood in the light of the fact that it represents a progression from the dispensers down to those administering, such that if a wrong drug is dispensed, there is a higher chance of wrong drug administration occurring. The nurse, for example, may deliver the "right drug" based on the prescribed order; but if the dosage is incorrect, the pharmacist and the nurse would miss the opportunity to correct the error. A multidisciplinary approach is, therefore, necessary for improved medication administration and minimization of error.[9] With estimated frequency of occurrence put at approximately 1 per 100 for both dispensing and administration errors, it becomes immediately apparent that there is need to give a more serious and urgent attention to the subject of medication error in drug therapy in this institution.

In identifying the perceived contributing factors to errors, virtually all the respondents seemed to agree on one point: excess workload. Certain researchers have posited that errors initiated during medication dispensing and administration are mostly associated with performance deficits (e.g. accidental slips and lapses).[21] Such performance deficits could have resulted from lack of qualified personnel to perform medication dispensing and administration functions; hence the excess workload. Inadequate lighting and uncomfortable temperature in dispensing area was also cited as a second most important factor relating to error in medication dispensing. This could be the underlying reason why there is an advocacy for a purpose-built pharmacy or a total restructuring/ reorganization of the existing pharmacy facilities for optimal service delivery. Of course, the system has a significant role to play in contributing to medication error. Not to be overlooked though, is the contribution of the individual healthcare professional to medication error, be it dispensing or administration error. For example, 70% of pharmacists signified that distractions of every sort could lead to error in medication dispensing; whereas 57% of nurses identified same as the second most important factor contributing to medication administration error.

Top on the list of suggested measures for reducing dispensing and administration errors is the need for engaging the services of more qualified professionals in the respective disciplines. With a staff strength of 35 pharmacists (interns inclusive), this hospital is among the teaching hospitals with the least number of pharmacists in the country. Without enough practitioners, it will be practically impossible to have superior or more experienced staff double check dispensed medicines before they are given out or administered to patients – and this is one of the important measures prescribed for curbing errors in medication delivery. Second on the list of suggested measures for error reduction in medication administration is the need for all professionals involved in medication delivery to be more cooperative and collaborate with one another. This is evidently informed by the perception that detecting and eliminating error is a collective responsibility irrespective of the medication delivery node at which the error was initiated. This is not in anyway absolving any individual healthcare professional from taking personal responsibility for the safety of their patients. It is against this backdrop that continuous professional education and re-training of personnel involved in medication dispensing and administration is being emphasized as one of the measures for reducing error. A number of respondents also suggested that self-reporting of medication dispensing and administration errors be encouraged as this will help others to learn from such mistakes and prevent subsequent recurrence.[4, 10]

## Conclusion

This study identified a limited number of errors in medication dispensing and

administration. The estimated frequency of occurrence of the identified errors was approximately 1 per 100 prescriptions dispensed or drug administrated. The fundamental perceived factor relating to errors in medication dispensing and administration was excess workload resulting from insufficient members of staff. It, therefore, follows as a recommendation that the most important measure/strategy for ensuring error-reduction in medication dispensing and administration is for the hospital to recruit more pharmacists and nurses so as to eliminate the perennial problem of excess workload. In the final analysis, there is need for the restructuring of the system so as create a system that is more conducive to the carrying out of medication dispensing and administration functions.

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