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Drug therapy problems in asthma identified during pharmacist-led educational interventions

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ABSTRACT

Background: Drug therapy problems (DTPs) interfere with desired goals of therapy. This study evaluated DTPs in asthma identified during a pharmacist-led intervention in the asthma clinics of two Nigerian hospitals. **Methods:** This intervention study was conducted in the asthma clinics, University of Nigeria Teaching Hospital and Lagos University Teaching Hospital. Eligible participants were patients with asthma recruited into a pharmacist-led intervention study and followed up for 6 months. The Pharmaceutical Care Network Europe – Drug-related Problem Classification V6.2 in English (PCNE-DRP V6.2) was utilized to evaluate the DTPs. **Results:** Seventy-eight patients with asthma participated. A total of 158 DTPs were identified. Majority of the DTPs were manifest (96.2%). Salmeterol/Fluticasone (Seretide® Diskus®) was most implicated (43.7%). The most common type of DTP was patients not benefitting from the optimal effect of their drug treatment (63.9%). More than half of the causes were from drug under-used/administered (55.1%) or the patients unable to use the drug form as directed (60.1%). About three-quarter (76.6%) of the DTPs were totally solved. **Conclusion:** Drug use/administration process was the major cause of the DTPs. Patient counseling accounted for a bulk of the interventions. Pharmacists should be proactive in preventing, identifying, and resolving DTPs.

Keywords: Asthma, drug therapy problems, interventions, pharmacist

INTRODUCTION

A drug therapy problem (DTP) is a common cause of morbidity and mortality among patients.^[1,2] DTPs are undesirable events experienced by patients that are related to their drug therapy and interfere with achieving the desired goals of therapy.^[3,4] DTPs are usually classified as: needs additional drug therapy, unnecessary drug therapy, ineffective drug therapy, dosage too low, dosage too high, adverse drug reaction, and noncompliance.^[5,6] DTPs can occur whenever drugs are utilized for prevention, diagnosis or management of disease, irrespective of differences in demographics.^[7]

Pharmacists have the expertise to identify, resolve, and prevent DTPs.^[8] Interestingly, the responsibilities of pharmacists have moved beyond drug dispensing to render pharmaceutical care services that entail collaboration with other members of the healthcare team.^[8,9]

In the management of asthma, many factors affect the outcomes of therapy such as the administration route,

inhaler device techniques, and adherence to prescribed medications.^[10,11] The use of inhalers is a cornerstone in asthma management.^[12,13] Many patients with asthma find it difficult to use their inhalers properly.^[14] This is worse when they have to use different inhaler devices for asthma relief and control as the differences in design, instructions, and dosing regimens might be confusing to the patients.^[15] DTPs in asthma may lead to unwanted side effects, higher treatment costs, and poorly controlled asthma.^[10]

Previous studies conducted in different countries such as Australia, India, Egypt, Spain, Serbia, and Sudan have demonstrated the relevance of pharmacists' interventions in community pharmacies and asthma clinics.^[10,16-21] In Nigeria, there is a dearth of data that provide evidence for pharmacists collaborating with other members of the healthcare team in an asthma clinic and identifying, resolving, or preventing DTPs. Pharmacists, as medication custodians, are expected to ensure that patients get the best outcomes from the use of their medicines.^[22] This study described DTPs in asthma

identified during a pharmacist-led intervention in two Nigerian tertiary hospitals using a specific classification tool.

METHODS

Study Design

This was an intervention study conducted in the Respiratory Units of the Department of Medicine, University of Nigeria Teaching Hospital (UNTH), Ituku-Ozalla, Enugu State and the Lagos University Teaching Hospital (LUTH), Idi-Araba, Lagos State between March 2016 and September 2017. All patient data were maintained with confidentiality. Patients were encouraged to participate but duly informed that participation was voluntary.

Study Setting

Both UNTH and LUTH are federal tertiary hospitals that serve as major referral centres. Enugu is the capital of Enugu State located in South Eastern Nigeria while Lagos is the commercial capital of Nigeria. The Respiratory Clinic of UNTH holds every Tuesday. In LUTH, the Respiratory Clinic holds on Mondays. However, LUTH also runs an Asthma Clinic on Wednesdays. The Clinics were led by Consultant Pulmonologists. There were Senior Registrars, Junior Registrars, House Officers, Matrons, Nurses, and other support staff such as the Medical Records Officers. The Matrons, Nurses, and other support staff were in separate offices and not in the same consulting room with the physicians. There were no Pharmacists. Pharmacists who were members of staff of the hospitals were never in the asthma clinics for the duration of the study.

Eligibility Criteria

The eligible participants were patients with asthma who visited the asthma clinics. The inclusion criteria for participation in the pharmacist-led intervention study comprised confirmed diagnosis of asthma by a physician, no concurrent respiratory medical condition, patients not less than 16 years old, ability to communicate in English (oral and written), able/willing to complete follow-up questionnaires, and telephone access. The exclusion criteria were patients who were pregnant, breastfeeding, or diagnosed of any mental health disorder.

Sample Size and Selection

Recruiting patients was difficult as few patients visited the clinics for their asthma reviews. Some of the patients reported that they missed their reviews when they forgot, had tight schedules, financial constraints or perceived they did not have the discomforting symptoms of asthma. Thus, this study was time-driven. Patients were recruited within 12 months. Sample size was not calculated.

The patients with asthma that met the eligibility criteria within a year of recruitment were eligible for participation in the study. All patients had 6-month participation time. The researcher's utilized start and stop dates that were specific to each of the patients with asthma. These patients were informed about the survey on DTPs.

Data Collection/Analysis

The Pharmaceutical Care Network Europe – Drug-related Problem Classification V6.2 in English (PCNE-DRP V6.2) was utilized by the pharmacist researchers to detect, report, and resolve DTPs during the course of the study.^[23] On a broad scale, the instrument has four primary domains for problems, eight primary domains for causes and five primary domains for interventions. There are sub-domains which are explanatory for the principal domains.^[23]

By virtue of the training of pharmacists, they have the expertise to identify, resolve, and prevent DTPs as well as to educate patients to make informed decisions about their medicines. However, the pharmacists involved with the research were educated on the use of the DRP-PCNE V6.2 scoring form.

Data were analyzed per protocol as only data for patients who completed the study were utilized. The DTPs were identified by the patient, pharmacist, or physician during or outside clinic visits. Physicians identified DTPs during the clinic visits. The prescribing physicians were consultant pulmonologists or senior residents in pulmonology. The pharmacist researchers also identified DTPs during their follow-up phone calls with the patients. All patients were provided the telephone numbers of the pharmacist researchers and informed that they could initiate phone calls any time. Unsolicited phone calls were made by the pharmacists to the patients once-weekly. Descriptive statistics were used to describe the patients' characteristics and DTPs.

Ethical Considerations

Ethical approval was obtained from the Health Research and Ethics Committee (HREC) of the UNTH, Ituku-Ozalla, Enugu State (NHREC/05/01/2008B-FWA00002458-1RB00002323) and the LUTH, Idi-Araba, Lagos State (ADM/DCST/HREC/APP/431). The patients provided both written and oral consents, before participation. Confidentiality was maintained.

RESULTS

Seventy-eight patients with asthma were involved in the study with 39 patients recruited from each hospital. None of the patients declined participation. However, there were two dropouts in LUTH and one drop out in UNTH. Other participants were recruited to fill the void of dropouts as there was a stopping rule of 39 participants per hospital. The decision to work with this size was reached due to the delay in recruitment of eligible participants and the possible number of patients that could be recruited from both hospitals within a year. Only data for patients who completed the study were utilized.

More than half of the participants were females (61.5%). A total of 158 DTPs were identified within the 6-month follow-up period for the patients.

More than half of the patients with the DTPs (69%) were above 45 years old. Majority of the DTPs were manifest (96.2%) and Salmeterol/Fluticasone (Seretide® Diskus®) was most implicated (43.7%) [Table 1].

The most common type of DTP was patients not benefitting from the optimal effect of their drug treatment (51.9%) [Table 2]. The DTPs were identified by the patient, pharmacist, or physician. The two problems identified by physicians were on costs and patients' inability to afford medicines without availability of suitable alternatives. Obviously, few problems were identified by the physicians as they were the prescribers. Patients identified problems such as no effect of drug treatment and wrong effect of drug treatment. Pharmacists identified all the sub-domains of the type of DTP probably due to their training in rendering pharmaceutical care services.

Drug use/administration process was the major cause of the DTPs. More than half of the causes were from drug

Table 1: Drug therapy problems, *n*=158

Variables	<i>n</i> (%)
Gender	
Male	46 (29.1)
Female	112 (70.9)
Age (in years)	
17–30	21 (13.3)
31–45	28 (17.7)
46–60	75 (47.5)
>60	34 (21.5)
Type of medication	
Prescription	156 (98.7)
Over-the-counter	2 (1.3)
Class of drug	
New	3 (1.9)
Refill	155 (98.1)
Problem discovered by	
Patient	36 (22.8)
Pharmacist	120 (75.9)
Physician	2 (1.3)
Drugs involved with drug-related problems	
Formoterol/Budesonide (Symbicort®)	25 (15.8)
Salmeterol/Fluticasone (Seretide® Diskus®)	69 (43.7)
Salmeterol/Fluticasone (Seretide® Evohaler®)	2 (1.3)
Salbutamol inhaler (Ventolin®)	48 (30.4)
Loratadine/Cetirizine	1 (0.6)
Theophylline/Ephedrine (Frano1®)	1 (0.6)
Salbutamol tablets	4 (2.5)
Clarithromycin tablets	1 (0.6)
Montelukast tablets	2 (1.3)
Prednisolone tablets	4 (2.5)
Cefuroxime axetil tablets, 500 mg	1 (0.6)
Type of problem	
Potential	6 (3.8)
Manifest	152 (96.2)

under-used/administered (55.1%) or the patients unable to use the drug form as directed (60.1%) [Table 3].

Table 2: Type of drug therapy problem, *n*=158

Type of drug therapy problem	<i>n</i> (%)
No effect of drug treatment	8 (5.1)
Effect of drug treatment not optimal	82 (51.9)
Wrong effect of drug treatment	2 (1.3)
Untreated indication	3 (1.9)
Adverse drug event (non-allergic)	17 (10.8)
Adverse drug event (allergic)	6 (3.8)
Toxic adverse drug event	3 (1.9)
Drug treatment more costly than necessary	26 (16.5)
Unnecessary drug treatment	3 (1.9)
Patient dissatisfied with therapy	6 (3.8)
Therapy failure (unknown reason)	2 (1.3)

Table 3: Causes of drug therapy problem

Causes of drug therapy problem	<i>n</i> (%)
Drug selection	
Inappropriate drug	4 (2.5)
Inappropriate combination	1 (0.6)
Inappropriate duplication	3 (1.9)
Too many drugs for indication	2 (1.3)
More cost-effective drug available	23 (14.6)
Dose selection	
Drug dose too low	1 (0.6)
Drug dose too high	1 (0.6)
Dosage regimen not frequent enough	2 (1.3)
No therapeutic drug monitoring	1 (0.6)
Pharmacokinetic problem	4 (2.5)
Deterioration/improvement of disease	5 (3.2)
Treatment duration	
Duration of treatment too short	3 (1.9)
Drug use/administration process	
Patient gets/takes drug on wrong times	1 (0.6)
Drug under used/administered	87 (55.1)
Drug not taken/administered at all	8 (5.1)
Wrong drug taken/administered	2 (1.3)
Patient unable to use drug form as directed	95 (60.1)
Logistics	
Prescribing error (information wrong or missing)	2 (1.3)
Dispensing error (wrong drug or dose)	1 (0.6)
Patient	
Patient forgets to take drug	10 (6.3)
Patient uses unnecessary drug	1 (0.6)
Other	
Other cause	1 (0.6)
No obvious cause	4 (2.5)

Interventions were mainly on the patient or carer level, with patient (medication) counseling accounting for 86.7% of the interventions [Table 4].

For the outcome of interventions, more than three-quarter (76.6%) of the DTPs were totally solved [Table 5]. An example of DTPs totally solved were the resolution of oropharyngeal candidiasis by educating patients with this problem to rinse their mouths after using their corticosteroid-containing inhalers. An example of an unsolved DTP is a patient's dissatisfaction with the use of a pressurized metered dose inhaler device due to the techniques but that is the only device available for salbutamol inhaler in Nigeria.

The outcomes of interventions that were unknown include those interventions that were never evaluated. For instance, patients had poor inhaler techniques that were evaluated

Table 4: Types of intervention

Types of intervention	n (%)
No intervention	1 (0.6)
Prescriber level	
Prescriber informed only	10 (6.3)
Prescriber asked for information	2 (1.3)
Intervention proposed, approved by prescriber	65 (41.1)
Intervention proposed, not approved by prescriber	1 (0.6)
Patient/carer level	
Patient (medication) counseling	137 (86.7)
Written information provided only	1 (0.6)
Patient referred to prescriber	6 (3.8)
Drug level	
Drug changed	10 (6.3)
Dosage changed	1 (0.6)
Formulation changed	1 (0.6)
Instructions for use changed	3 (1.9)
Drug stopped	8 (5.1)
New drug started	1 (0.6)
Other	
Other intervention	2 (1.3)
Side effect reported to authorities	1 (0.6)

Table 5: Outcomes of intervention

Outcomes of intervention	n (%)
Unknown	
Outcome of intervention unknown	17 (10.8)
Solved	
Problem totally solved	121 (76.6)
Partially solved	
Problem partially solved	17 (10.8)
Problem NOT solved	
Lack of cooperation of physician	2 (1.3)
No need or possibility to solve problem	3 (1.9)

during their asthma reviews. If a poor inhaler technique was identified at the 6th month of the patent, the researchers did not follow-up after the 6-month stipulated time frame.

There are two controller inhalers majorly prescribed in Nigeria. Salmeterol/Fluticasone or Formoterol/Budesonide. Examples of “no need or possibility to solve problem” include patients who could not tolerate one of the controller inhalers and switched to the other, only to complain about costs of the latter.

DISCUSSION

A total of 158 DTPs were identified within the 6-month follow-up period for the patients. This was higher than the 53 DTPs identified in an earlier retrospective study conducted in UNTH and University of Nigeria Nsukka Medical Centre over a 15-year period.^[24] The disparity in the findings from the two studies could be due to the study design. In the retrospective study, only the DTPs that are documented in the patient folders by the physicians were identified. Pharmacists are specifically trained to identify and resolve DTPs and might spot more of these in their interactions with patients.^[25] Furthermore, the University of Nigeria Nsukka Medical Centre neither has a respiratory nor asthma clinic. A prospective observational study conducted in Pakistan that involved assessing prescriptions, administration sheets, laboratory results, and pathophysiological status identified 91 DTPs.^[26] DTPs have been reported to be highly prevalent among patients hospitalized at respiratory care units in mainland China.^[27] It is possible that more DTPs would be identified in settings that are specialized in asthma or respiratory diseases as there would be more patients. The variations in the number of DTPs identified could be due to the differences in study design, study duration or type of hospital.^[24]

Drug use/administration process was the major cause of the DTPs. More than half of the causes were from drug under-used/administered or the patients unable to use the drug form as directed. Patients with asthma should always have their inhaler techniques demonstrated to them by their health professionals with the health professionals requesting that they re-demonstrate, as correct techniques decline without routine review.^[28] Improper inhaler techniques are associated with poorly controlled asthma and frequent hospitalizations.^[29] The most common type of DTP was patients not benefitting from the optimal effect of their drug treatment. Salmeterol/Fluticasone (Seretide® Diskus®) and Salbutamol inhaler were most implicated for the DTPs probably due to their frequent prescription as controller inhalers for twice-daily use and reliever inhalers when necessary, respectively.

The steps for asthma inhaler devices should be followed sequentially, making it cumbersome for the patients.^[30] In the management of asthma, optimal drug delivery is essential.^[31] It is important to repeatedly educate asthmatic patients on proper inhaler techniques when they go for asthma reviews or for drug refills as inhaler technique may deteriorate after initial education.^[30] The high rates of poor inhaler techniques may arise from the deficiency in the knowledge of the proper use of the asthma devices by health professionals and confusion among health professionals over who should take responsibility for patient education.^[30,32,33] Clinical pharmacists

can effectively identify and prevent clinically significant DTPs.^[26]

Interventions were mainly on the patient or carer level, with patient (medication) counseling accounting for more than four-fifths of the interventions. Since most of the DTPs were based on poor inhaler techniques, the pharmacist researchers met with the prescribers in both respiratory clinics to discuss and demonstrate proper inhaler techniques for the asthma devices. The prescribers and patients were presented. Patients were counseled on the need to use their controller inhalers, as prescribed, even when they did not feel the discomforting symptoms of asthma.

More than three-quarter of the DTPs were totally solved. This was possible due to the good rapport between the pharmacist researchers and the prescribers. Collaborations between health professionals should be initiated, developed, and sustained. Although these collaborations could improve the quality of care and patient outcomes, communication problems often occur between pharmacists and other members of the health care team and pharmacists' recommendations are not always accepted by other providers.^[34] Patient self-management, an important component in the management of asthma, is improved by collaboration among different members of the health care team.^[35] Another possible reason could be intensive follow-up on the patients by the researchers which ensured reinforcements. Patient education was the major strategy employed to prevent DTPs.

This study was conducted in two tertiary hospitals in Nigeria. The small sample size of patients with asthma was due to the few number of patients that accessed the tertiary hospital on Clinic days. Thus, generalizations should be made cautiously. There are several discrepancies between the scoring forms for PCNE-DRP V6.2 and the current PCNE-DRP V9.1. There are variations in the number of principal domains and sub-domains, as well as content. For instance, the PCNE-DRP V9.1 has five principal domains while PCNE-DRP V6.2 has four. The third and fourth principal domains in PCNE-DRP V6.2 are Type of Intervention and Outcome of Intervention, respectively. In the PCNE-DRP V9.1, the third, fourth, and fifth principal domains are Planned Intervention, Acceptance of the Intervention Proposals, and Status of the DRP (outcome of intervention), respectively.^[36] Thus, the peculiarities in the different versions should be noted when decisions are made. Due to the differences and regular updates, it is apt to utilize the most updated version of the instrument for future studies.

CONCLUSION

Drug use/administration process was the major cause of the DTPs. Patient counseling accounted for a bulk of the interventions. Pharmacists need to play proactive roles in preventing, identifying, and resolving DTPs. In asthma clinics, interprofessional collaborations that include pharmacists should be encouraged.

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