
Original Research Article

Evaluation of drug therapy problems among patients receiving care in National Orthopedic Hospital in Nigeria

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Abstract

Purpose: Drug Therapy Problems (DTPs) are common in hospitals, especially those that are resource limited, leading to a wide range of clinical and economic implications. The purpose of this study was to evaluate the profile of drug therapy problems, causes, intervention and outcomes of interventions

Methods: This retrospective study involved the review of 6 years DTP records of the National Orthopedic hospital, Enugu. The Drug Related Problem instrument (version 5) by Pharmaceutical Care Network Europe was used. DTP record of 2009 to 2012 was reviewed, analysed and categorized into problems, causes, interventions, and outcomes of interventions. The results were presented in frequencies and percentages.

Results: A total of 343 DTPs were identified from 83 different drugs. The mean age of the patients was 30.23±25.86 years. Prescription only medicines (75%) were the most encountered. Antibiotics and analgesic contributed 64.7% of all the DTPs

identified. About half (49.3%) of the DTPs identified were as a result of dosing problems. Poor Drug/Dose selection accounted for more than half (53.1%) of the causes of DTPs. Intervention was highest (43.3%) at prescriber level. Reasonable number of the intervention proposed was approved by the prescribers (54%). Most of the DTPs identified (63.8%) were totally resolved.

Conclusion: There was high prevalence of DTPs among the patients. Problems were mostly as a result of dosing errors while the major cause was poor Drug/Dosage selection. Intervention was highest at prescriber level. A reasonable number of the intervention proposed was approved by the prescribers and most of DTPs identified were totally resolved.

Keywords: Drug therapy problems, Pharmacist intervention, Outcomes, Pharmaceutical care, Orthopedic hospital

Indexing: Index Copernicus, African Index Medicus

Introduction

Drug Therapy Problems (DTPs) are a consequence of unmet drug-related needs (irrational drug use). Rational use of drugs requires that patients receive medicines appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and their community” [1]. A patient would be said to have DTP if s/he experienced any undesirable event which involves, or is

suspected to involve drug therapy and that interferes with achieving the desired goals of therapy [2].

The incidence of DTPs (and the related negative outcomes) encountered per patient is becoming higher and thus, a public health problem. Back then in 1987, some 12,000 deaths and 15,000 hospitalisations secondary to Adverse Drug Reactions (ADRs) were reported to FDA, many more of such went unreported [3]. Also in the US, more than 1.5 million preventable

medication-related adverse events occur each year [4]. A study in Brazil indicated that out of the 56.5% of uncontrolled health related problems encountered, 380 (73.6%) of them were DTPs (actual) and 81 (21.3%) were having risks for potential DTPs. Consequently, out of every two patients, one of them would have at least one form of DTP [5]. An average of 2.6 DTPs were identified by Root *et al* (2012), in Minnesota [6]. In Yogyakarta Indonesia, 63% unnecessary drug therapies in geriatric hospitalised patients were reported [7]. Furthermore, 81% of 827 patients in 5 hospitals in Norway were observed to have DTPs at the rate of 2.1 DTP per patient [8]. Another study revealed that 85% of patients had at least 1 DTP, and 29% of them had 5 or more DTPs, with an average of 3.7 DTPs encountered per patient [9]. In Nigeria however, there was a study on HIV-infected patients that showed up to 89% of prescriptions with potential DTPs [10]. Another study on diabetic patients reported that all the prescriptions had DTPs (potential or actual), with an average of 4 DTPs per patient [11].

DTPs of various forms affect various outcomes of drug treatment. One of such outcomes is the measurable and observable clinical outcomes [3,5,8,11]. DTPs also lead to poor quality of life (QoL) of patients, thereby compromising the goal of drug therapy. The economic implication of DTPs is also very high, seen from both patients' and government's (health care budget) perspective. In the 80s, the cost of drug related morbidities has been estimated to be as high as \$7 billion, annually in US [3]. As of 2001 about \$177 billion medication-related morbidity and mortality has been estimated [4,12].

Studies have shown the benefits of pharmaceutical care intervention either through detecting and correcting DTPs, improving patient's QoL or economically; saving costs. Nwaozuzu *et al* (2013), reported that pharmacists' interventions in antiretroviral drug therapy significantly reduce the occurrence of DTPs [10]. According to Root *et al* (2012), implementation of a pharmacist-led Medication Therapy Management (MTM) increased quality of care, identification and resolution of DTPs [6]. Similarly, through pharmacist-provided MTM of chronic disease conditions, patients acquired experience on their medication which helps in preventing and resolving DTPs [13]. Moreover, pharmacist-provided MTM services

have been shown to reduce patient out-of-pocket costs through interventions such as generic substitution and therapeutic inter change [9,14]. DTPs are a big burden on the healthcare system and there are numerous advantages in resolving them. This aim of this study therefore was to evaluate the profile of drug therapy problems, their causes, interventions and outcome of interventions made in the National Orthopaedic hospital Enugu

Methods

Study Design

This was a descriptive retrospective study which involved the review of patients' records for DTPs for 6 years.

Study Setting

The National Orthopaedic Hospital, Enugu .is a regional specialist hospital that treats and manages orthopaedic, burns, and plastic/reconstructive cases. The hospital runs a general out-patient department, alongside surgical out-patient and staff clinic, and has a total of 212 beds for in-patients.

Drug therapy problems and Interventions are well documented. Pharmacists have access to patients' folders as they get acquainted with patient's data. They join in consultant's general ward round and collaborate with other members of health care team in providing care for the patient.

Study Population

The folders of patients, who attended the hospital during the 6 years period, were identified by a pharmacist to be having at least one DTP in their prescriptions.

Study Instrument

This study protocol was based on the recommendation made during the working conference of the Pharmaceutical Care Network Europe (PCNE) in January 1999, a classification scheme was constructed for drug related problems (DRPs) [15].

The classification is for use in research into the nature, prevalence, and incidence of DRPs and

also as a process indicator in experimental studies of Pharmaceutical Care outcomes. It is also meant to help health care professionals to document DRP-information in the pharmaceutical care process.

The basic classification has 6 primary domains for **Problems**, 6 primary domains for **Causes**, 5 primary domains for **Interventions** and 4 primary domain of **Outcome**. However, on a more detailed level there are 21 grouped sub-domains for Problems, 33 grouped sub-domains for Causes, 17 grouped sub-domains for Interventions and 7 grouped sub-domains of outcome. Those sub-domains can be regarded as explanatory for the principal domains.

For the use of the PCNE classification it is important to separate the real problem (that affects or is going to affect the outcome) from its cause. Often such problems are caused by a certain type of error e.g. prescribing errors or drug-use or administration errors. But there might be no error at all involved. Also, a medication error does not necessarily have to lead to a drug-related problem. The cause is usually the behaviour that has caused the problem. A cause or a combination of causes and a problem together, will usually lead to one or more interventions with one or more resultant outcomes.

Data Collection Procedures

For the 6 years (2007 to 2012), patients' records were audited and reviewed for DTPs and the information documented by pharmacists using data collection form. The data collection form contains the patients' age, patients' gender, the prescriber information, name of drug(s), dose regimen, class of DTP, causes of the DTP, interventions carried out by the pharmacists and outcomes of such interventions.

Data analysis

The data were abstracted into the study instrument and subsequently used for analysis. The data were reviewed and collated by researchers. The collated data were coded and entered into version 20 of SPSS for analysis. Descriptive analysis was done on the data, presented in simple frequency tables and percentage in domains of Problem, Causes, Interventions and Outcomes.

Results

Two hundred and forty-seven folders containing at least one DTP were evaluated, of this, a total of 343 drug therapy problems (DTPs) resulting from 83 different drugs encountered in this study were identified. The results also showed that out of 328 of the prescriptions reviewed in which gender was specified, 44.8 and 55.2% of them were prescribed for female and male patients respectively with a mean age of 30.23 ± 25.86 years for the total population. Prescription only medicines and new prescriptions accounted for about 75 and 90% of drugs encountered respectively. Antibiotics and analgesics constituted 60.9% of all the drugs encountered; they subsequently contributed 64.7% of all the DTPs identified in this study. The average number of drugs per prescription was 1.44 (0.82%) Table 1.

About half (49.3%) of the DTPs identified were dosing problems. 'Drug dose too high or dosage regime too frequent' which is a sub-domain of dosing problem, topped the list (21.3%) and it was closely followed by 'drug dose too low or dosage regimes not frequent enough' (17.8%) Table 2. Poor Drug/Dose selection accounted for more than half (53.1%) of the causes of DTPs identified in this study. The identified DTPs were mainly due to 'inappropriate dosage selection' (19.6%) followed by 'inappropriate drug selection' (17.37%), Table 3.

A total of 591 interventions were made, (Table 4), the interventions made at the prescriber and drug levels accounted for 80.8% while the interventions made at patient level was 14%. One hundred and twenty-nine (54%) interventions proposed to the prescribers was approved. The pharmacist intervention led to change of drug dosage in 47.7% of interventions made at drug level while 36% of interventions was directed to patient (medication) counselling at the patient level.

Most of DTPs identified were totally resolved (63.8%) while the outcomes of 34.7% of the inventions were unknown. Table 5.

The distribution of the DTPs by gender showed (Table 6) that DTPs of Adverse Drug Reaction and Drug Choice Problem were more prevalent among female patients than their male counterparts while Dosing Problem, Drug Use

Table 1: Patients and prescription information

Patients' information	Frequency	Percent
Female	146	44.6
Male	181	55.4
Prescription information		
Over the counter drugs	67	19.5
Prescription only medicines	256	74.6
Refills	28	8.2
New prescription	298	86.9
Drug class		
	Frequency	Percent
Antibiotics	125	36.4
Analgesics	84	24.5
Antimalarial	30	8.7
Haematinics/Vitamins	30	8.7
Anti Ulcer/GIT (Prokinetics and antispasmodics)	16	4.7
Anti Allergic drugs	3	0.9
Cardio-vascular drugs: Anti HTN/Anti-coagulants	26	7.6
Sedatives	2	0.6
Infusion	1	0.3
Anti Diabetes	5	1.5
Others	10	3.0

Table 2: Identified drug therapy problems

Domains	Freq.	%
1. Adverse Reactions: patient suffers from an adverse drug event		
Side effect suffered (non-allergic)	18	5.2
Side effect suffered (allergic)	2	0.6
Toxic effects suffered	7	2.0
2. Drug Choice Problem: patient gets or is going to get a wrong (or no drug) drug for his/her disease and/or condition		
Inappropriate drug (not most appropriate for indication)	14	4.1
Inappropriate drug form (not most appropriate for indication)	3	0.9
Inappropriate duplication of therapeutic group or active ingredient	33	9.6
Contra-indication for drug (incl. Pregnancy/breast feeding)	12	3.5
No clear indication for drug use	2	0.6
No drug prescribed but clear indication	23	6.7
3. Dosing Problem: patient gets more or less than the amount of drug he/she requires		
Drug dose too low or dosage regime not frequent enough	61	17.8
Drug dose too high or dosage regime too frequent	73	21.3
Duration of treatment too short	17	5.0
Duration of treatment too long	18	5.2
4. Drug use Problem: wrong or no drug taken/ administered		
Drug not taken/administered at all	33	9.6
Wrong drug taken/administered	3	0.9
5. Interactions: there is a manifest or potential drug-drug or drug-food interaction		
Potential interaction	21	6.1
Manifest interaction	2	0.6
6. Others		
Patient dissatisfied with therapy despite taking drug(s) correctly	0	0
Insufficient awareness of health and diseases (possibly leading to future problems)	0	0
Unclear complaints. Further clarification necessary	0	0
Therapy failure (reason unknown)	1	0.3
Total	343	100.0

Table 3: Causes of drug therapy problems

Domains	Freq.	%
1. Drug/Dose Selection: the cause of the DRP is related to the selection of the drug and/or dosage schedule		
Inappropriate drug selection	70	17.37
Inappropriate dosage selection	79	19.60
More cost-effective drug available	0	0.00
Pharmacokinetic problems, incl. ageing/deterioration in organ function and interactions	13	3.23
Synergistic/preventive drug required and not given	15	3.72
Deterioration/improvement of disease state	2	0.50
New symptom or indication revealed/presented	10	2.48
Manifest side effect, no other cause	25	6.20
2. Drug use Process: the cause of the DRP can be related to the way the patient uses the drug, in spite of proper dosage instructions (on the label)		
Inappropriate timing of administration and/or dosing intervals	58	14.39
Drug underused/ under-administered	25	6.20
Drug overused/ over-administered	22	5.46
Therapeutic drug level not monitored	4	0.99
Drug abused (unregulated overuse)	1	0.25
Patient unable to use drug/form as directed	11	2.73
3. Information: the cause of the DRP can be related to a lack or misinterpretation of information		
Instructions for use/taking not known	3	0.74
Patient unaware of reason for drug treatment	0	0.00
Patient has difficulties reading/understanding Patient Information Form/Leaflet	0	0.00
Patient unable to understand local language	0	0.00
Lack of communication between healthcare professionals	42	10.42
4. Patient/Psychological: the cause of the DRP can be related to the personality or behaviour of the patient.		
Patient forgets to use/take drug	2	0.50
Patient has concerns with drugs	0	0.00
Patient suspects side-effect	0	0.00
Patient unwilling to carry financial costs	0	0.00
Patient unwilling to bother physician	0	0.00
Patient unwilling to change drugs	0	0.00
Patient unwilling to adapt life-style	3	0.74
Burden of therapy	0	0.00
Treatment not in line with health beliefs	0	0.00
Patient takes food that interacts with drugs	1	0.25
5. Logistics: the cause of the DRP can be related to the logistics of the prescribing or dispensing mechanism		
Prescribed drug not available (anymore)	12	2.98
Prescribing error (only in case of slip of the pen)	3	0.74
Dispensing error (wrong drug or dose dispensed)	2	0.50
6. Others		
Other cause	0	0.00
No obvious cause	0	0.00
Total	403	100.00

Table 4: Pharmacist interventions to the drug therapy problems (N = 591)

Domains	Freq	%
1. At prescriber level (n = 239)		
Prescriber informed only	75	31.38
Prescriber asked for information	8	3.35
Intervention proposed, approved by Prescriber	129	53.97
Intervention proposed, not approved by Prescriber	3	1.26
Intervention proposed, outcome unknown	99	41.42
2. At patient/carer level (n = 82)		
Patient (medication) counselling	86	35.98
Written information provided only	17	7.11
Patient referred to prescriber	6	2.51
Spoken to family member/caregiver	59	24.69
3. At drug level (n = 239)		
Drug changed	11	4.60
Dosage changed	114	47.70
Formulation changed	6	2.51
Instructions for use changed	33	13.81
Drug stopped	54	22.59
New drug started	21	8.79
4. Other intervention or activity (n = 31)		
Other intervention	4	0.55
Side effects resolved	27	99.45

Table 5: Outcomes of intervention rendered

Domains	Freq	%
1. Not known		
Outcome intervention not known	119	34.7
2. Solved		
Problem totally solved	219	63.8
3. Partially solved		
Problem partially solved	3	0.9
4. Not solved		
Problem not solved, lack of cooperation of patient	0	0.0
Problem not solved, lack of cooperation of prescriber	0	0.0
Problem not solved, intervention not effective	2	0.6
No need or possibility to solve problem	0	0.0
Total	343	100.0

Problem and Drug Interactions were more common among the male patients than their female counterparts.

Discussion

The 343 DTP identified in this study is relatively high considering the fact that it resulted from only 83 different drugs. However, Ramalho de Oliveira *et al* (2010) identified 38,631 DTPs

over a period of 10 years [9], 380 DTPs were identified by Nascimento *et al*, (2009) during the period of two years [5], and Root *et al*, (2012) identified 88 DTPs from 40 patients [6]. The difference in the number of DTPs encountered is probably due to the difference in the research design. The result also shows that males suffered from DTPs than female which is similar to the finding of Odili *et al* (2011) where male ventures such as bus driving, motorcycles and

Table 6: Distribution of DTP by gender and prescription fill

Drug Therapy Problems	Gender		
	Female (%)	Male (%)	Total (%)
ADR_Side effect suffered (non-allergic)	10 (55.6)	8 (44.4)	18 (100)
ADR_Side effect suffered (allergic)	2 (100)	0 (0)	2 (100)
ADR_Toxic effects suffered	4 (66.7)	2 (33.3)	6 (100)
DCP_Inappropriate drug (not most appropriate for indication)	9(64.3)	5 (35.7)	14 (100)
DCP_Inappropriate drug form (not most appropriate for indication)	1 (33.3)	2 (66.7)	3 (100)
DCP_Inappropriate duplication of therapeutic group or active ingredient	13 (40.6)	19 (59.4)	32 (100)
DCP_Contra-indication for drug (incl. Pregnancy/breast feeding)	5 (50.0)	5 (50.0)	10 (100)
DCP_No clear indication for drug use	0 (0)	2 (100)	2 (100)
DCP_No drug prescribed but clear indication	15 (65.2)	8 (34.8)	23 (100)
DP_Drug dose too low or dosage regime not frequent enough	25 (43.9)	32 (56.1)	57 (100)
DP_Drug dose too high or dosage regime too frequent	20 (29.0)	49 (71.0)	69 (100)
DP_Duration of treatment too short	7 (43.8)	9 (56.3)	16 (100.0)
DP_Duration of treatment too long	9 (56.3)	7 (43.8)	16 (100.0)
DUP_Drug not taken/administered at all	14 (42.4)	19 (57.6)	33 (100.0)
DUP_Wrong drug taken/administered	1 (33.3)	2 (66.7)	3 (100.0)
DI_Potential interaction	11(52.4)	10 (47.6)	21 (100.0)
DI_Manifest interaction	1 (50.0)	1 (50.0)	2 (100.0)
O_Therapy failure (reason unknown)	0 (0)	1 (100)	1 (100.0)
Total	147 (44.8)	181 (55.2)	328 (100.0)

ADR= Adverse drug reaction, DCP= Drug choice problem, DP= Dosing problem, DUP= Drug use problem, DI= Drug interaction, O= Others

(67.5%) also suffered more DTPs [11]. This is expected as most young men engage in risky tricycle as their daily businesses which predispose them to accidents.

The results showed that the population was relatively younger. Though, this may not be the true reflection of the population because of scanty reportage of true ages of the patients in the prescriptions studied. Most of the ages were reported as 'adult' which does not reflect the true ages of the patients. This result differs from a study[7] that showed that the majority of patients with DTP were 60 years and above. These differences could be attributed to the type of hospital used in the two studies as this present study was carried out in an orthopaedic hospital unlike the previous study that was conducted in a general hospital. Increasing age causes an increasing vulnerability to develop diseases and, in the elderly, the tendency to acquire multiple and chronic diseases. This population therefore is prescribed and uses more drugs than younger

populations. In addition, multiple complaints, atypical disease presentation and physician prescribing habits and practices have resulted in the use of multiple drugs in these people, particularly in institutions [16].

Our study showed that a total of 83 drugs were prescribed for the patients during their hospital visit, with mean (1.44± 0.818) drugs per prescription which is commendable. This could be attributed to the younger population encountered in this study. Polypharmacy is one of the variables often associated with ageing, it was found to be the independent predictor of adverse drug reactions (ADRs) in the study by Holh *et al.* (2001) [17]. Similar research, [18] found the potential of ADRs occurrence was 6% among patients prescribed two kinds of drug, 50 % for five kinds of drugs and 100 % in patients using eight or more kinds of drugs.

The result of this study identified two major causes of DTPs to be either due to 'dosing

problem' or 'inappropriate drug selection'. This result is consistent with a number of studies on DTPs that in each case dosing and/or drug selection problems were identified among the major forms of DTPs encountered [5,7-9,11,19,20]. Even though there is slight variation in the extent (percentage) of these problems encountered in each case, the difference might be because of the difference in the area and design used in different study. Patients who are exposed to unnecessary drug therapies can only realise the toxic potential of that drug and have little or no chance of realising any positive outcome associated with such unnecessary treatment [21].

The classes of drugs that were mostly encountered that were associated with DTP were antibiotics. This prescription pattern is expected in orthopaedic cases as most of surgical procedures are usually covered by antibiotic before and after the procedure to prevent infection. According to this study, more than half of antibiotics encountered in this study were used in children. Also, about 40% of the drugs encountered in the DTP profiling in this study were used in children. This high rate of DTPs in children maybe because children are usually exposed to fractures and burn injuries which are special indications and dosing patterns are usually different from that of adult, making them more susceptible to DTPs if conservative measures are not taken towards managing them with drugs.

Analgesics are as important as antibiotics in orthopaedic cases as pain is usually associated with almost all cases of orthopaedic problems. An adverse drug reaction is maybe misinterpreted as a new medical condition. Another drug is then prescribed, and the patient is placed at risk of developing additional adverse effects relating to this potentially unnecessary treatment. To prevent this trend, doctors should always consider any new signs and symptoms as a possible consequence of current drug treatment as most of the new prescription constituted more than three quarters of the DTPs encountered in this study. Before any new drug treatment is started, the need for the drug should be re-evaluated and a non-drug treatment should be considered [22].

The result of this study also revealed that intervention was highest at prescriber and drug levels. However, in the case of 10-years study where 80% of DTPs identified in Fairview's

MTM programme were resolved at the drug or patient level without the direct involvement of patients' physician(s). This could be as a result of collaborative practice agreements between the pharmacists and physicians [9]. The trend found in this study wasn't also the case in the work of Root *et al*, (2012), where 75% of the pharmacists' proposed interventions were approved [6]. This difference in the rate of approval of proposed intervention could be as a result of lack of strong collaboration between healthcare providers in Nigerian hospitals. Pharmacists' intervention directed towards change in drug dosage, according to this research was 48% of the interventions at the drug level and patient medication counselling accounted for 36% of the interventions at patient level. Similarly, the 10-years research by Ramalho de Oliveira *et al*, (2010), shows that patients' education (counselling) accounted for the highest rate of pharmacists' intervention (35.8%), while the lowest being directed towards change in drug dosage (10.5%) [9]. This also reveals that pharmacist in orthopaedic hospital Enugu need to spend quality time with the patients.

Most of DTPs identified were totally resolved while the outcomes of about 35% of the interventions were unknown. Pharmaceutical care interventions have been shown to prevent and resolve DTPs and improve patients' conditions [5,6,9,10]. This is predicated in high acceptance of the intervention by the doctors. Pharmacists in this hospital should make use of this opportunity to reach out to patients that are greatly in need of their attention; no matter how busy they are especially in this era of ever expanding role of a pharmacist. The role of pharmacists has been clinically proven to improve many outcomes regarding patient health, including greater patient safety, improved disease and drug therapy management, effective healthcare spending, improved adherence, and improved quality of life [23].

Conclusion

The drug therapy problems among the patients receiving care in the orthopaedic hospital Enugu were high. The DTPs identified were mostly as a result of dosing problem while the major cause was poor Drug/Dosage selection. The intervention was highest at prescriber level and it was followed distantly by intervention at drug level, then intervention at patient level. Reasonable number of the intervention proposed

was approved by the prescribers. Most of DTPs identified were totally resolved. This practice of DTP identification and resolution should be intensified in order to maximise patient's therapeutic benefits.

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