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Impact of pharmaceutical care interventions on the occurrence and resolution of drug therapy problems in antiretroviral drug therapy

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Abstract

Pharmaceutical care (PC) has been shown to improve the outcome of drug therapy in many disease conditions. HIV/AIDS is one of the disease conditions that are fraught with many problems that can benefit from this new emphasis of pharmacy practice also known as 'pharmacists care'. This study is designed to determine the number and types of drug therapy problems occurring in the drug therapy of HIV patients receiving treatment at a tertiary hospital in southeast Nigeria and to evaluate the impact of pharmaceutical care activities on the occurrence of these drug therapy problems (DTPs). The components of the American society of health-system pharmacists (ASHP) guidelines on 'standardized method for pharmaceutical care' was used as a data collection instrument to evaluate, document and intervene in the antiretroviral therapy of about one thousand four hundred and seventy three (1,473) patients. The study showed significant reduction in the incidence of drug therapy problems following the Pharmacist's intervention activities. The study found out that eighty-nine percent (89%) of the prescriptions had potential drug therapy problems before the interventions which were reduced by 12% to seventy-seven percent (77%) after the intervention. The study also identified seventeen (17) different potential drug therapy problems prior to the interventions. A re - evaluation of these potential drug therapy problems after the interventions showed the very significant percentage reductions in the occurrence of each DTP. The study showed that pharmacists' interventions in antiretroviral drug therapy through Pharmaceutical care can significantly reduce the occurrence of drug therapy problems associated with antiretroviral drug therapy

Keywords: Pharmaceutical care, HIV/AIDS, Drug therapy problems, Pharmacist interventions, Hospital pharmacy

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1. Introduction

Drug therapy problems are negative patient outcomes. They can worsen patient health conditions, cause death, prolong patients' length of hospital stay, increase direct cost of medical care and reduce quality of life and patient satisfaction. Identifying them requires a systematic approach where critical thinking and problem solving skills are needed (Oparah, 2010). The existence of DTPs created the need for pharmaceutical care to which it poses considerable and diverse challenges. For instance, as at 2002, about 45,000 pharmaceutical encounters had been documented in the USA [by Strand and co] with over 19,000 DTPs identified, prevented and resolved with considerable financial impacts (Oparah, 2010).

The concept of pharmaceutical and the challenges of HIV/AIDS has been discussed in part one of these presentations where we presented and discussed the results of this study as it relates pharmaceutical care and adverse drug reactions in patients receiving antiretroviral drugs. This part of the study presents and discusses the result of the study as it relates the occurrence and resolution of DTPs through systematically planned and implemented pharmaceutical care activities.

Drug therapy problems has been classified into indication, effectiveness, safety, compliance (adherence) and untreated indication DTPs. Helper and Strand in 1990 however classified them into 7 classes; unnecessary drug therapy, wrong drug, dose too low, dose too high, adverse drug reaction, inappropriate adherence, needs additional drug therapy. Pharmaceutical care concept requires the pharmacist to identify these problems and needs and solve or meet them. This new role requires the pharmacist to apply a higher level of drug knowledge, clinical skill and independent judgment to his work and to accept the burden of responsibility.

2. Method

This is part 3 of 4 from a study carried out using the method described below. The other parts will also be subsequently published in this journal. Before the study, an application for ethical approval of the study was sent to the management of the medical centre used for the study and the approval was granted.

The components of the American society of health-system pharmacists (ASHP) guidelines on 'standardized method for pharmaceutical care' was used as a data collection instrument to evaluate, document and intervene in the antiretroviral therapy of about one thousand four hundred and seventy three (1,473) patients. Data was collected from the patients' prescription sheets, laboratory report forms, care/ART cards, and other relevant forms in their treatment folders. Other relevant information was also

obtained from the patients through oral interview. The data collected at this stage formed the base-line/ pre - intervention data for the study.

After documentation of these base-line data, pharmaceutical care interventions was implemented where necessary and this included:

1. Patient education using a validated educational material applied uniformly to all the patients in the study.
2. Healthcare personnel education, counseling and discussions.
3. Recommendations for changes of drugs/regimens, change of drug dose interval, duration or dosage form, addition of more drugs, treatment of untreated conditions, implementation of non-drug therapy, patient referral.
4. Ensuring that patients do their laboratory tests.
5. Monitoring the laboratory test results and carrying out interventions where necessary.
6. Giving patients access to pharmacists any time they needed it i.e. maintaining constant communication between the patients and the pharmacists.

Then a repetition of the data collection and documentation above was done nine (9) months after the implementation of the pharmaceutical care interventions mentioned above. This data represents the post - intervention data.

The two data sets (baseline / pre-intervention & post-intervention data) were then be collated, analyzed and compared to see if the interventions resulted in any significant differences in the occurrence of drug therapy problems. Appropriate statistical analysis was also applied to the data using Microsoft Excel and SPSS tools. Inclusion and exclusion criteria used for the study were;

1. New patients were excluded from the study since they will have had no previous encounter with the system and so no existing data on them.
2. Patients selected were those who have received treatment, drugs and counseling from the hospital for at least nine (9) months (i.e. who have visited the hospital for at least three (3) times).
3. Both adults and children as well as males and females were involved in the study.
4. Patients whose medications will last for less than three (3) months will be excluded from the study. This is to give the interventions enough time to make impacts and produce the possible results and to ensure uniformity of treatment duration and contact with the pharmacist in all the participating patients.

3. Results

Drug therapy problems occurring before and after pharmacists' intervention were identified and categorized. Frequencies and descriptive statistics were then calculated for these measures. The study showed significant reduction in the incidence of drug therapy problems following the Pharmacist's intervention activities.

The study found out that eighty-nine percent (89%) of the prescriptions had potential drug therapy problems before the interventions which were reduced by 12% to seventy-seven percent (77%) after the intervention. The study also identified seventeen (17) different potential drug therapy problems prior to the interventions. A re - evaluation of these potential drug therapy problems after the interventions showed the following percentage reductions;

1. ART - ineligible patient starting ART (57%).
2. Wrong patient name/no name on prescription (100%).
3. Incorrect drug combination/regimen (48%).
4. Incorrect dosage (57%).
5. No drug for another medical problem (77%).
6. Possible drug – drug/drug – disease interaction (63%).
7. Possible aggravation of adverse effects by drug (56%).
8. Inappropriate duration of drug administration by patient (66%).
9. Inappropriate frequency of drug administration by patient (82%).
10. Lack of adherence counseling (70%).
11. Contraindication/drug allergy (64%).
12. Confusing/incomplete prescription (22%).
13. Lack of CD4 count and other laboratory investigations (57%).
14. Abrupt stoppage of drug administration by patient (46%).
15. Refusal to take drugs by patient (100%).
16. Intake of drug overdose by patient (55%).
17. Prescriber's handwriting ineligible/unclear (100%).

This shows that the incidence of each of these potential drug therapy problems was reduced by over 55% (except one case that had 22% reduction) after the interventions.

Table 1. Age distribution

Age Range	**Number of Patients**		Difference (A – B)	% of total = A or B/T x 100
	Pre - intervention evaluation (A) (% of total)	Post - intervention evaluation (B) (% of total)		
2 yrs – 15 yrs	146	146	0	10
15 yrs above	1327	1327	0	90
Total (T)	1473	1473	0	100

Table 1 shows that 90% of patients involved in the study were adults (18years and above) while 10% of the patients were children (2yrs – 15yrs).

Table 2. Sex (gender) distribution

sex	Number of Patients		Difference (A - B)	% of total = A/T or B/T x 100
	Pre - intervention evaluation (A) (% of total)	Post - intervention evaluation (B) (% of total)		
Male	513	513	0	35
Female	960	960	0	65
Total (T)	1473	1473	0	100

Table 3. Distribution of incidence of Drug Therapy Problems (DTPS)

Variable	Frequency of Patients		Difference (A – B)	%difference (A – B)/ A x 100).
	Pre-intervention evaluation (A) (% of total)	Post -intervention evaluation (B) (% of total)		
Number of non - DTP cases.	160 (11%)	341 (23%)	-181	113%
Number of DTP cases.	1313 (89%)	1132 (77%)	181	13%
Total (T)	1473	1473	0	0

Table 4. distribution of the frequency of DTPs

DTPs	Frequency of DTPs		Difference (A – B)	% difference (A – B)/A X 100.
	Pre - intervention evaluation (A)	Post - intervention evaluation (B)		
ART - ineligible patient starting ART.	21	9	12	57
Wrong patient / name or no name on prescription.	13	0	13	100
Incorrect drug combination / regimen.	29	15	14	48
Incorrect dosage regimen.	169	72	97	57
No drug for a medical problem.	145	34	111	77

Possible drug – drug /drug - disease interaction.	19	7	12	63
Possible aggravation of adverse effects by drug.	9	4	5	56
Inappropriate duration of drug intake by patient.	35	12	23	66
Inappropriate frequency of drug intake by patient.	656	116	540	82
No adherence counseling by adherence counselors.	211	63	148	70
Contraindication / drug allergy.	39	14	25	64
Written prescription confusing or complex.	951	747	207	22
No prescriber's name or signature on prescription paper.	201	611	-410	(-204)
CD4 Test / other tests not done as should.	916	394	522	57
Patient stopped taking his/her drugs.	46	25	21	46
Patient refused to take drugs.	5	0	5	100
Patient taking overdose.	11	5	6	55
Prescriber's handwriting ineligible/unclear.	12	0	12	100

Table 3 above shows that the interventions resulted in a 113% increase in the incidence of non – DTP cases as well as a 13% decrease in the incidence of DTP cases.

Table 4.Distribution of the frequency of DTPS

DTPs	**Frequency of DTPs**		Difference (A – B)	% difference (A – B)/A X 100.
	Pre - intervention evaluation (A)	Post - intervention evaluation (B)		
ART - ineligible patient starting ART.	21	9	12	57
Wrong patient / name or no name on prescription.	13	0	13	100
Incorrect drug combination / regimen.	29	15	14	48
Incorrect dosage regimen.	169	72	97	57
No drug for a medical problem.	145	34	111	77
Possible drug – drug /drug - disease interaction.	19	7	12	63

Possible aggravation of adverse effects by drug.	9	4	5	56
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Patient refused to take drugs.	5	0	5	100
Patient taking overdose.	11	5	6	55
Prescriber's handwriting ineligible/unclear.	12	0	12	100

4. Statistical analysis

Hypothesis

H_o: Pharmaceutical care interventions do not reduce the occurrence of drug therapy problems (DTPs) in patients receiving antiretroviral drug therapy.

H_a: Pharmaceutical care interventions reduce the occurrence of drug therapy problems (DTPs) in patients receiving antiretroviral drug therapy.

To test this hypothesis, we use the distribution of the outcome of interventions in drug therapy problems as shown in table 8 which is adjusted thus,

VARIABLES	POSITIVE OUTCOME	NEGATIVE OUTCOME	TOTAL
Pre - intervention	1078	395	1473
Post- intervention	1464	9	1473

We will use the lower pre - intervention figures. Here again, the expected frequency is 50/50 as the chance probability is also half (1/2). As such,

$$X^2 cal = \frac{[F_o - F_e]^2}{F_e} = \frac{(1078 - 50)^2}{50} + \frac{(395 - 50)^2}{50} = 21{,}136 + 2380.5 = 23{,}516$$

Also Df = (R – 1) (C – 1)

= (2 – 1) (2 – 1)

= 1

Again from chi - square (X^2) table, Df 1 at 95% confidence level = 3.84

Thus we have,

X^2 cal = 23,516 and

X^2 tab = 3.84

Therefore, based on our decision rule, we reject H_o and accept H_a since X^2 cal > X^2 tab and conclude that pharmaceutical interventions prevent potential drug therapy problems in the management of patients on chronic anti - infective drug therapy.

5. Discussion

Drug therapy problems have negative effects on pharmaceutical care and results in negative drug therapy outcomes. Their identification and resolution is imperative for the success of any drug therapy program.

The most prominent drug therapy problems indentified in the study include inappropriate frequency of drug intake by patients where it was observed that many of the patients were taking their drugs irregularly. Most of the antiretroviral drugs at the time of the study were recommended to be taken every 12 hours (twice daily) with just a few of them recommended for once daily dosing. Many of the patients were not able to adhere to the recommended dosing frequencies of these drugs and in some cases the drugs were taken only when the patients felt like taking them or when they remembered to take them or worse still, when they felt ill. This poor adherence is capable of compromising their treatment, induce drug resistance and cause therapeutic failure and early death. The pharmaceutical care interventions however resulted in a significant reduction in the occurrence frequency of this drug therapy problem. Another drug therapy problem identified was the lack of adherence counseling for the patients and this could have been the cause of many of the patient – related drug therapy problems identified in the study.

The frequency of its occurrence was also reduced significantly after the interventions. Many of the prescriptions were also observed to be confusing / complex and this could result in fatal errors in the dispensing of medications. The improvement in the frequency of occurrence of this problem incidentally, was not as high as in the case of the other drug therapy problems. This is an indicator for training or retraining of

medication prescribers on the need for clarity in prescription writing. Again many of the prescriptions had no prescriber's name or signature on them and in many cases also the dosage regimens were incorrect. In many other cases no drugs were prescribed for certain medical problems of the patients. These could have been because the prescribers were always hurrying over the patient consultations as a result of an overwhelming number of HIV/AIDS patients they need to see during the clinic days. The pressure is understandable however but not enough to be allowed to compromise patients' lives. Another important problem was the observation that too many of the patients were not also adhering to their laboratory investigations schedules. These investigations includes CD4 counts, liver function tests, kidney function tests, hematological tests etc and they are needed for the monitoring of drug therapy efficacy and safety in the patients. The implication of this is that for many of the patients, the investigations for monitoring their treatment was not always available and this falls short of recommended treatment procedures. It predisposes the patients to drug – related complications and can also compromise their treatment outcomes.

Interestingly the frequencies of occurrence of these drug therapy problems as well as those of the other drug therapy problems shown in the results above were greatly reduced after the pharmacists' intervention activities. The only exceptions were the problem of confusing / complex prescriptions which showed a relatively low reduction in the frequency of its occurrence and the problem of lack of prescribers' names/signatures on the prescriptions which rather showed very high increase in the frequency of its occurrence.

Though more studies may be needed in this area, yet the results of this study are very indicative of the imperative of a more widespread adoption of pharmaceutical care and more specifically drug therapy management roles by hospital pharmacists in Nigeria and beyond.

6. Conclusion

The study identified frequent DTPs associated HIV and other health conditions. It also showed that pharmacists' interventions in antiretroviral drug therapy through Pharmaceutical care can significantly reduce the occurrence of drug therapy problems associated with antiretroviral drug therapy.

7. Recommendations

- Regular training and mentoring of medical doctors (especially the ones on training/internship) should be enforced to minimize the incidence of prescription errors and potential DTPs. The same should be applicable to other healthcare providers so as to improve the overall quality of care offered to patients.
- Therapeutic as well as pharmaceutical audit of healthcare services should be carried out more frequently so as to detect DTPs as well as prevent them.
- Patients should also be educated on the need to report side/adverse effect as well as other problems they may encounter in the course of treatment.

Acknowledgement

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- The intern pharmacists, Pharm Damian Obiora, Pharm Cynthia Ozurumba and Pharm John Uzoma who assisted in the course of this study. We will not forget your help.
- Federal medical centre Owerri, Imo state, Nigeria (my birth and work place) for the permission to carry out this study and many other studies there and for always encouraging us the staff to carry out research studies.
- My numerous patients who endured many months of questioning, examinations and counseling. We appreciate your patience and sacrifice. It was all for your good and better health.

References

American Pharmaceutical Association (2009), "Optimizing adherence to HIV/AIDS medication regimes", Apha**,** Available at: http://www.imrus.comltmp/1964/1690/1001/p (accessed 2009).

American society of health-system Pharmacists (1996), "ASHP guidelines on a standardized method for pharmaceutical care", *American Journal of Health-System Pharmacists*, Vol. 53, pp. 1713-1716.

American Society of Hospital Pharmacists (1993), "ASHP statement on Pharmaceutical care", *American Journal of Hospital Pharmacists*, Vol. 50, pp. 1720-1723.

Christensen, D.B., Roth, M., Trygstad, T. and Byrd, J. (2003), "Evaluation of a pilot medication therapy management project within the North Carolina state health plan", *Journal of American Pharmaceutical Association,* Vol. 47 No. 4, pp. 471-83. Also available at: www.ncbi.nlm.nih.gov/m/pubm... pubmed.gov. (accessed 18 May 2013).

Cordina, M., Nurmanbetova, F.N., Kulmagambetor., I.R. and Sautenkova, N. (2008), "Pharmacy and Pharmacists' perceptions of Pharmaceutical care in Kazakhstan*", International Journal of Pharmacy Practice*, Vol. 16, pp. 41-46.

Erah, P.O. and Nwazuoke, J.C. (2002), "Identification of standards for Pharmaceutical care in Benin city", *Tropical Journal of Pharmaceutical research",* Vol. 1, No.2, pp. 55-56.

Federal Ministry of Health. (2003), *Surveillance report*, Abuja, Nigeria.

Federation of International Pharmacists'. (1998), "Pharmaceutical care", in *FIP Statement of Professional Standards* as adopted by the FIP council, Hague, Netherlands, 4th September.

Federation of international pharmacists'. (2009), "Global overview: Pharmacists density", Available at *www.fip.org/files/fip/HR/.../part1.pdf.* (accessed 21 March 2013).

Federation of international pharmacists'. (2009), "Global Pharmacy workforce and migration report", available at: *www.fip.org/files/HR/final%20report....* (accessed 21 March 2013).

Hepler, C.D. and Strand, L.M. (1990), "Drug therapy problems", available at: http://www.theannals.com/cgi/content/abstract/24/11/1093 (accessed 18 May 2013).

IPPE 4 (2012), "Drug therapy problems", available at: www.pharmacist.com/sites/default/files... and en.m.wikipedia.org/wiki/Drug_therapy-p..... (accessed 18 May 2013).

Klem, S. and Miller, D. (1998), "Michigan Pharmaceutical care model", *The Michigan pharmacist.* January Ed.

Ngwa, Y.B. and Odama, L.E. (2006), "HIV/AIDs prevention services", in Obiorah, B.A. (Ed), *GHAIN'S manual for skills certification workshop on HIV/AIDS, sexually transmitted diseases and opportunistic infections for Community Pharmacists*, Mindex, Benin Nigeria, pp. 1-23.

Nwaozuzu, E.E. and Aguwa, C.N. (2004), "Pattern and outcome of analgesic prescription and use in orthopedic patients in Nigeria", An M.Pharm research project presented to the faculty of pharmaceutical sciences, University of Nigeria Nsukka, Enugu. May 2004.

Nwaozuzu, E.E. and Aguwa, C.N. (2012), "Pharmaceutical care outcomes in antiretroviral drug therapy: A hospital Pharmacy - based intervention study", A PhD seminar paper presented to the department of clinical pharmacy and Pharmacy management, Faculty of Pharmaceutical sciences, University of Nigeria, Nsukka. Enugu. May 2012.

Obodozie, O.O. (2006), "Pharmaceutical care in HIV/AIDS", in Obiorah, B.A. (Ed), *GHAIN'S manual for skills certification workshop on HIV/AIDS, sexually transmitted diseases and opportunistic infections for Community Pharmacists*, Mindex, Benin Nigeria, pp. 222-281.

Odedina, F.T. and Segal, R. (1996), "Behavioral pharmaceutical care scale for measuring pharmacists activities", *American Journal of Health System Pharmacists*, Vol. 53, pp. 855-865.

Ogboru, O. (2012), "How to avoid drug therapy problems", available at: www.rxeconsult.com/.../How-Avoid.... (accessed 18 May 2013).

Oparah, C.A. (2004), "Pharmaceutical care: The right of the patient", *West African Journal of pharmacy*, Vol. 18, No. 1, pp 11-18.

Oparah, C.A. (2010), "The Pharmaceutical care philosophy", in Oparah, C.A. (Ed.), *Essentials of Pharmaceutical care*, Cybex, Lagos, pp. 25-35.

Oparah, C.A., Udezi, W.A. and Odili, V.U. (2006), "Nigerian Pharmacy students' attitude towards Pharmaceutical care*", International Journal of Pharmacy Education,* Winter, Issue 1.

Sokomba, E.N. and Gyang, S.S. (2006), "Pharmacotherapeutics of HIV/AIDS", in Obiorah, B.A. (Ed.), *GHAIN'S manual for skills certification workshop on HIV/AIDS, sexually transmitted diseases and opportunistic infections for Community Pharmacists*, Mindex, Benin Nigeria, pp. 102-176.

Tanna, N. (2002), "Progress made towards implementing Pharmaceutical care", *The Pharmaceutical Journal*, Vol. 269, pp. 166-169.

Tulip, S. and Campbell, D. (2001), "Evaluating Pharmaceutical care in hospitals", *Hospital Pharmacist*, Vol. 8, Nov - Dec.

Udeogaranya, P.O., Ukwe, C.V. and Ekwunife, O.I. (2009), "Assessment of attitudes of University of Nigeria pharmacy students' towards pharmaceutical care", *Pharmacy Practice (Internet)*, Vol. 7, No. 3, pp. 145-149.

Wiedenmayer, K., Summers, R.S., Mackie, C.A., Gous, A.G.S., Evarard, M. and Tromp, D. (2006), "New paradigm for Pharmacy Practice", in WHO. (Ed.), *Developing Pharmacy practice handbook: A focus on patients care*, WHO/PSM/PAR/2006.5.

Wiedenmayer, K., Summers., R.S., Mackie, C.A., Gous, A.G.S., Evarard, M. and Tromp, D. (2006), "Pharmaceutical care", in WHO. (Ed.), *Developing Pharmacy practice handbook: A focus on patients care*, WHO/PSM/PAR/2006.5.

Appendix A. Ethical approval for the study

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BSc, MPA, AHAN

Head of Clinical Services
Dr. E. C. Osuagwu
M.B;B.S, FWACS
CHIEF CONSULTANT OBST. & GYNAE

23rd November, 2009

FMC/OW/HCS.11/114

Pharm. Nwaozuzu Ezeudo
Pharmacy Department
Federal Medical Centre
Owerri.

RE: PERMISSION TO CARRY OUT RESEARCH ON THE IMPACT OF PHARMACEUTICAL CARE IN THE MANAGEMENT OF PATIENTS ON ANTIBIOTICS (ANTI-INFECTIVE) THERAPY.

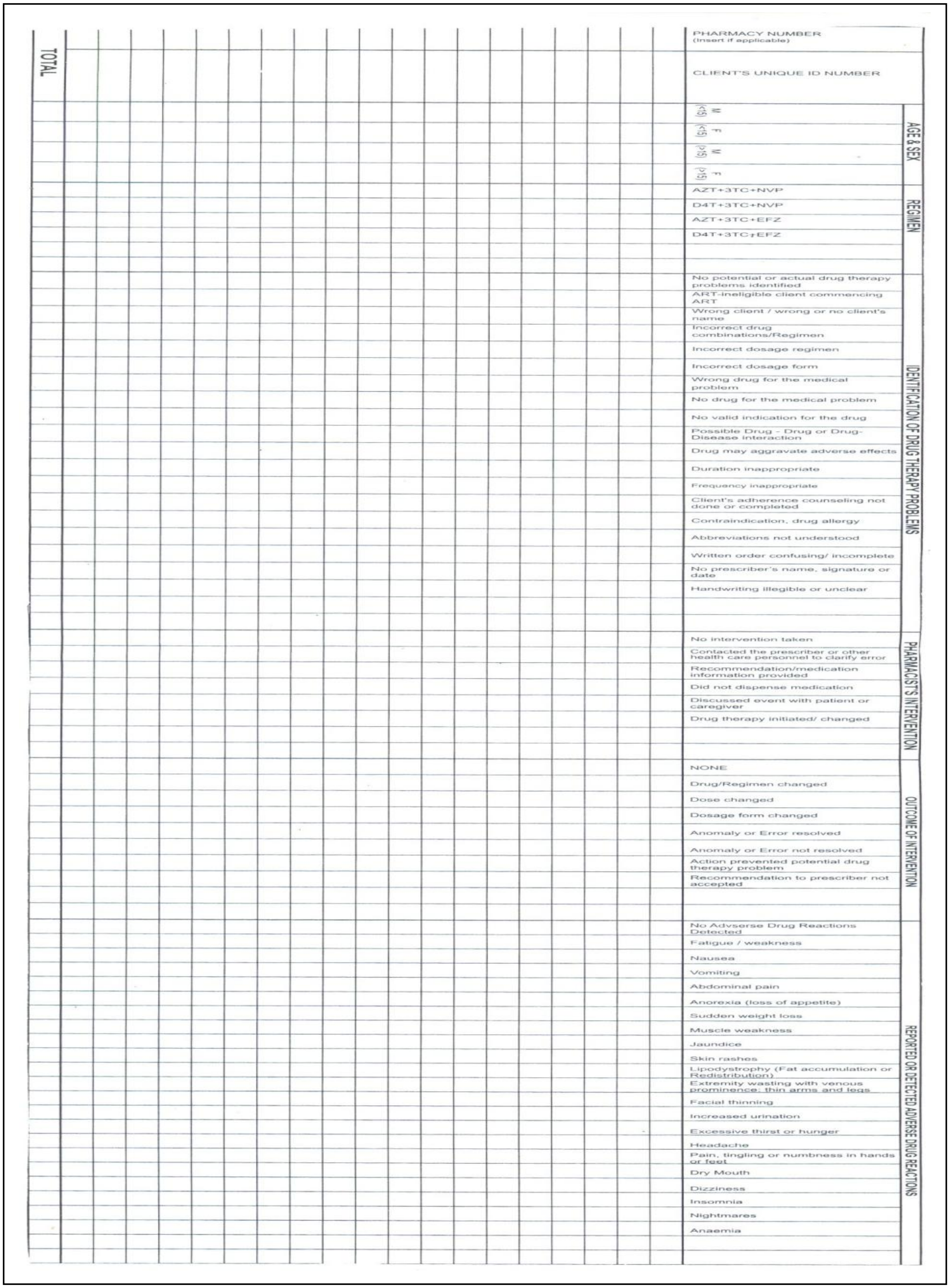
The Ethical committee acknowledges receipt of your research proposal dated 10th July 2009.

Following a meeting of the Committee held on 30th October, 2009, you have been given permission to carry out the said research.

You are also to ensure patients' confidentiality in this regard.

DR. E.C. OSUAGWU
HEAD OF CLINICAL SERVICES/CHAIRMAN ETHICAL COMMITTEE

Appendix A. Data collection form

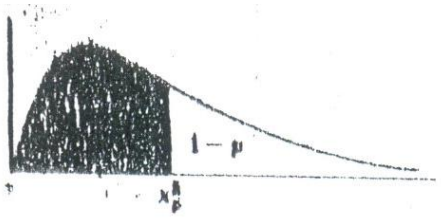


Section	Item
	PHARMACY NUMBER (Insert if applicable)
	CLIENT'S UNIQUE ID NUMBER
AGE & SEX	<15 M
	<15 F
	>15 M
	>15 F
REGIMEN	AZT+3TC+NVP
	D4T+3TC+NVP
	AZT+3TC+EFZ
	D4T+3TC+EFZ
IDENTIFICATION OF DRUG THERAPY PROBLEMS	No potential or actual drug therapy problems identified
	ART-ineligible client commencing ART
	Wrong client / wrong or no client's name
	Incorrect drug combinations/Regimen
	Incorrect dosage regimen
	Incorrect dosage form
	Wrong drug for the medical problem
	No drug for the medical problem
	No valid indication for the drug
	Possible Drug - Drug or Drug-Disease interaction
	Drug may aggravate adverse effects
	Duration inappropriate
	Frequency inappropriate
	Client's adherence counseling not done or completed
	Contraindication, drug allergy
	Abbreviations not understood
	Written order confusing/ incomplete
	No prescriber's name, signature or date
	Handwriting illegible or unclear
PHARMACIST'S INTERVENTION	No intervention taken
	Contacted the prescriber or other health care personnel to clarify error
	Recommendation/medication information provided
	Did not dispense medication
	Discussed event with patient or caregiver
	Drug therapy initiated/ changed
OUTCOME OF INTERVENTION	NONE
	Drug/Regimen changed
	Dose changed
	Dosage form changed
	Anomaly or Error resolved
	Anomaly or Error not resolved
	Action prevented potential drug therapy problem
	Recommendation to prescriber not accepted
REPORTED OR DETECTED ADVERSE DRUG REACTIONS	No Advserse Drug Reactions Detected
	Fatigue / weakness
	Nausea
	Vomiting
	Abdominal pain
	Anorexia (loss of appetite)
	Sudden weight loss
	Muscle weakness
	Jaundice
	Skin rashes
	Lipodystrophy (Fat accumulation or Redistribution)
	Extremity wasting with venous prominence: thin arms and legs
	Facial thinning
	Increased urination
	Excessive thirst or hunger
	Headache
	Pain, tingling or numbness in hands or feet
	Dry Mouth
	Dizziness
	Insomnia
	Nightmares
	Anaemia
	TOTAL

Appendix C. Chi – square distribution table

APPENDIX C

Percentile Values (χ^2_p) for the Chi-Square Distribution with ν Degrees of Freedom



ν	$\chi^2_{.005}$	$\chi^2_{.01}$	$\chi^2_{.025}$	$\chi^2_{.05}$	$\chi^2_{.10}$	$\chi^2_{.25}$	$\chi^2_{.50}$	$\chi^2_{.75}$	$\chi^2_{.90}$	$\chi^2_{.95}$	$\chi^2_{.975}$	$\chi^2_{.99}$	$\chi^2_{.995}$	$\chi^2_{.999}$
1	.0000	.0002	.0010	.0039	.0158	.102	.455	1.32	2.71	3.84	5.02	6.63	7.88	10.8
2	.0100	.0201	.0506	.103	.211	.575	1.39	2.77	4.61	5.99	7.38	9.21	10.6	13.8
3	.0717	.115	.216	.352	.584	1.21	2.37	4.11	6.25	7.81	9.35	11.3	12.8	16.3
4	.207	.297	.484	.711	1.06	1.92	3.36	5.39	7.78	9.49	11.1	13.3	14.9	18.5
5	.412	.554	.831	1.15	1.61	2.67	4.35	6.63	9.24	11.1	12.8	15.1	16.7	20.5
6	.676	.872	1.24	1.64	2.20	3.45	5.35	7.84	10.6	12.6	14.4	16.8	18.5	22.5
7	.989	1.24	1.69	2.17	2.83	4.25	6.35	9.04	12.0	14.1	16.0	18.5	20.3	24.3
8	1.34	1.65	2.18	2.73	3.49	5.07	7.34	10.2	13.4	15.5	17.5	20.1	22.0	26.1
9	1.73	2.09	2.70	3.33	4.17	5.90	8.34	11.4	14.7	16.9	19.0	21.7	23.6	27.9
10	2.16	2.56	3.25	3.94	4.87	6.74	9.34	12.5	16.0	18.3	20.5	23.2	25.2	29.6
11	2.60	3.05	3.82	4.57	5.58	7.58	10.3	13.7	17.3	19.7	21.9	24.7	26.8	31.3
12	3.07	3.57	4.40	5.23	6.30	8.44	11.3	14.8	18.5	21.0	23.3	26.2	28.3	32.9
13	3.57	4.11	5.01	5.89	7.04	9.30	12.3	16.0	19.8	22.4	24.7	27.7	29.8	34.5
14	4.07	4.66	5.63	6.57	7.79	10.2	13.3	17.1	21.1	23.7	26.1	29.1	31.3	36.1
15	4.60	5.23	6.26	7.26	8.55	11.0	14.3	18.2	22.3	25.0	27.5	30.6	32.8	37.7
16	5.14	5.81	6.91	7.96	9.31	11.9	15.3	19.4	23.5	26.3	28.8	32.0	34.3	39.3
17	5.70	6.41	7.56	8.67	10.1	12.8	16.3	20.5	24.8	27.6	30.2	33.4	35.7	40.8
18	6.26	7.01	8.23	9.39	10.9	13.7	17.3	21.6	26.0	28.9	31.5	34.8	37.2	42.3
19	6.84	7.63	8.91	10.1	11.7	14.6	18.3	22.7	27.2	30.1	32.9	36.2	38.6	43.8
20	7.43	8.26	9.59	10.9	12.4	15.5	19.3	23.8	28.4	31.4	34.2	37.6	40.0	45.3
21	8.03	8.90	10.3	11.6	13.2	16.3	20.3	24.9	29.6	32.7	35.5	38.9	41.4	46.8
22	8.64	9.54	11.0	12.3	14.0	17.2	21.3	26.0	30.8	33.9	36.8	40.3	42.8	48.3
23	9.26	10.2	11.7	13.1	14.8	18.1	22.3	27.1	32.0	35.2	38.1	41.6	44.2	49.7
24	9.89	10.9	12.4	13.8	15.7	19.0	23.3	28.2	33.2	36.4	39.4	43.0	45.6	51.2
25	10.5	11.5	13.1	14.6	16.5	19.9	24.3	29.3	34.4	37.7	40.6	44.3	46.9	52.6
26	11.2	12.2	13.8	15.4	17.3	20.8	25.3	30.4	35.6	38.9	41.9	45.6	48.3	54.1
27	11.8	12.9	14.6	16.2	18.1	21.7	26.3	31.5	36.7	40.1	43.2	47.0	49.6	55.5
28	12.5	13.6	15.3	16.9	18.9	22.7	27.3	32.6	37.9	41.3	44.5	48.3	51.0	56.9
29	13.1	14.3	16.0	17.7	19.8	23.6	28.3	33.7	39.1	42.6	45.7	49.6	52.3	58.3
30	13.8	15.0	16.8	18.5	20.6	24.5	29.3	34.8	40.3	43.8	47.0	50.9	53.7	59.7
40	20.7	22.2	24.4	26.5	29.1	33.7	39.3	45.6	51.8	55.8	59.3	63.7	66.8	73.4
50	28.0	29.7	32.4	34.8	37.7	42.9	49.3	56.3	63.2	67.5	71.4	76.2	79.5	86.7
60	35.5	37.5	40.5	43.2	46.5	52.3	59.3	67.0	74.4	79.1	83.3	88.4	92.0	99.6
70	43.3	45.4	48.8	51.7	55.3	61.7	69.3	77.6	85.5	90.5	95.0	100	104	113
80	51.2	53.5	57.2	60.4	64.3	71.1	79.3	88.1	96.6	102	107	113	116	125
90	59.2	61.8	65.6	69.1	73.3	80.6	89.3	98.6	108	113	118	124	128	137
100	67.3	70.1	74.2	77.9	82.4	90.1	99.3	109	118	124	130	136	140	149

Source: E. S. Pearson and H. O. Hartley, *Biometrika Tables for Statisticians*, Vol. 1 (1966), Table 8, pages 137 and 138.