Evaluation of outpatient prescriptions in a University-based healthcare facility in Ibadan

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ABSTRACT

Background: Appropriate drug utilization has a huge contribution to global reduction in morbidity and mortality. Periodic review of prescriptions at all levels of care is therefore essential.

Objective: To evaluate drug prescription pattern and practice in a university-based healthcare facility using the WHO-core prescribing indicators.

Method: A retrospective review of randomly selected outpatient prescriptions in the pharmacy unit of the University of Ibadan Health Services between 2012 and 2014 was done. Pre-piloted data collection form was used to retrieve data based on standard prescription specifications including socio-demographics, drug name and dosage regimen, and prescriber identity. Descriptive statistics were used to summarize the data.

Results: A total of 4,121 medicines were reviewed in 1200 encounters. Of these, 589 (49.1%) were prescribed for males and 611 (50.9%) for females. Patients' ages were indicated in 388 (32.3%) prescriptions (mean age =17.7years). Summary of WHO-core prescribing indicators showed the average number of medicines per encounter as 3.4, medicine prescribed by generic name (2,533; 61.5%), encounter with one or more antibiotics and injections (427; 35.6%) and (150; 12.5%), respectively.

Conclusion: Polypharmacy, low generic prescribing and overuse of antibiotics is common underscoring the need for ongoing enlightment and training of healthcare providers on rational prescribing practice and drug use.

Keywords: Out-patient prescription, University-based facility, Prescribing indicator

Evaluation des prescriptions en consultation externe dans un centre de santé universitaire à Ibadan

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RESUME

Contexte: L'usage approprié de médicaments présente une contribution énorme à la réduction globale de la morbidité et de la mortalité. L'examen périodique des prescriptions à tous les niveaux de soin est ainsi essentiel.

Objectif: Evaluer le modèle et la pratique de prescription médicale dans un centre de santé universitaire en utilisant les indicateurs de prescription de base de l'OMS.

Méthode: Un examen rétrospectif des prescriptions en consultation externe sélectionnées au hasard dans l'unité de pharmacie des Services de santé de l'Université d'Ibadan entre 2012 et 2014 fut fait. Un formulaire de recueil de données pré-piloté fut utilisé pour recueillir des données sur la base des normes de prescription, y compris les sociodémographiques, le nom du médicament et le régime de dosage, et l'identité du prescripteur. La statistique descriptive fut utilisée pour résumer les données.

Résultats: Un total de 4 121 médicaments ont été examinés en 1200 rencontres. Parmi eux, 589 (49,1%) étaient prescrits pour les hommes et 611 (50,9%) pour les femmes. L'âge des patients étaient indiqué en 388 (32,3%), prescriptions (âge moyen =17,7years). Le résumé des indicateurs prescripteurs majeurs de l'OMS a indiqué le nombre moyen de médicaments par rencontre à 3,4, les médicaments prescrits par nom générique (2 533; 61,5%), rencontre avec un ou plusieurs antibiotiques et injections (427; 35,6%) et (150; 12,5%), respectivement.

Conclusion: La poly-pharmacie, la prescription et l'usage excessif des antibiotiques est courant, ce qui souligne le besoin d'instructions et de formation continues des professionnels de la santé sur la pratique rationnelle de prescription et de l'usage de médicament.

Mots-clés: prescription en consultation externe, Centre de santé universitaire, indicateur de prescription

INTRODUCTION

Prescription is a health care program implemented by a physician or other qualified practitioners in the form of instructions that govern the plan of care of an individual patient. It authorizes a patient to be issued a medicine or therapy from a pharmacy.[1,2,3] It is important that appropriate use of medicines be achieved through proper prescribing pattern within the hospital setting.[2,3,4] However, inappropriate prescribing is known all over the world as a major problem of health care delivery [5] resulting to ineffective and unsafe treatment, exacerbation or prolongation of illness, distress and harm to the patient, and higher costs of healthcare. [6,7,8] Several studies have shown varying degrees of inappropriate prescriptions and drug use in health facilities.[8-13] Results from most of these studies show that poly-pharmacy and inappropriate prescription of antibiotics are the norm of prescribing practices. Appropriate drug utilization has a huge contribution to global reduction in morbidity and mortality with its consequent medical, social and economic benefits.[14,15] Nonetheless, as the complexity of drug therapy in terms of number of drugs available, drug regimen, the prevalence of side effects, drug interaction and incidence of co-morbidities increases[16], periodic review of prescriptions at all levels of healthcare is essential to ascertain the effectiveness and efficiency of the prescribing practices and identification of drug-related problems. Reports by WHO indicated that about 60% of antibiotics in Nigeria were prescribed unnecessarily[17] and prescribers have been shown to prescribe drugs when not indicated.[14,18,19] This study therefore aimed at comprehensively assessing the outpatient prescriptions in the pharmacy unit of a university-based healthcare centre using the WHO-core prescribing indicators. Information obtained will help in clarifying the prescribing pattern and practices, as well as making evidence-based recommendations on rational drug use.

METHODS

Study site and setting

The University of Ibadan Health Services (UIHS) categorized as a primary health care facility comprise different cadres of healthcare professionals including physicians, pharmacists, nurses, physiotherapists , optometrists, medical laboratory technologists and other ancillary healthcare workers. UIHS is the main healthcare facility within the university community to cater for students, members of staff and their family, as well as other residents living in adjoining areas. The facility is an accredited centre for National Health Insurance Scheme of the Federal Government of Nigeria. UIHS has the primary responsibility of making referral of disease condition when appropriate to the University College Hospital which is an affiliated teaching hospital to the University. Approval and permission for the conduct of the study was obtained from the UIHS management.

Study design

This study involves a retrospective review of randomly selected outpatient prescriptions in the pharmacy unit of the University Health Services for a two year period between 2012 and 2014.

Inclusion and exclusion criteria

Eligible prescriptions for reviews were those with at least two prescribed medicines per encounter and those with prescriber's name and signature as required of a standard prescription, while prescriptions with only one medicine and those with illegible prescribers' handwriting were excluded.

Data collection instrument and sampling

Pre-piloted data collection form was used to retrieve socio-demographic information including age and gender, medication information such as drug name and dosage regimen, as well as other supplementary information including prescriber's name. Eligible prescriptions were selected using systematic random sampling whereby every fifth prescription from the pool of prescription sheets in the pharmacy unit from year 2012 to 2014 was chosen for review.

Data analysis

Data were sorted, coded and entered into the Statistical Package for the Social Sciences (SPSS) version 18.0 for analysis. Drugs were classified into therapeutic classes using The Anatomical Therapeutic Chemical Classification System with Defined Daily Doses (ATC/DDD) classification.[20] The data were subsequently described using the WHO-core prescribing indicators [4,9] including average number of medicines per encounter, percentage of medicines prescribed by generic name, encounters with an antibiotic or injection prescribed, as well as medicines prescribed from the Essential Drug List (EDL). Descriptive statistics including frequency, percentage and mean ± standard deviation were used to summarize the data.

RESULTS

A total of 4,121 medicines were reviewed in 1200

prescription encounters. Of the prescriptions reviewed, 589 (49.1%) were prescribed for males and 611 (50.9%) for females. Patients' age were indicated in 388 (32.3%) prescriptions with mean age of 17.7 years. There were 195 (16.3%) aged 0-10 years; 86 (7.2%) within 11-20 years; 14 (1.2%) aged 21-30 years; 28 (2.3%) aged 31-40 years; 29 (2.4%) within 41-50 years, and 36 (3.0%) were above 50 years of age. Prescriptions which did not indicate the ages of the patients constituted 812 (67.7%). The WHO core prescribing indicator summarizing the prescribing indices in the facility is shown in Table 1. Prescription encounters with two medicines constituted 262 (21.8%) and those with three, four and five medicines constituted 418 (34.8%), 306 (25.5%) and 155 (12.9%) respectively. Also, prescriptions with six medicines were 39 (3.2%) while those with seven and eight medicines constituted 14 (1.2%) and 6 (0.5%) respectively.

Table 1: Core prescribing indicators for the facility

Prescribing indicator	Value	Reference values
Average number of medicines per encounter, (mean ± SD)	3.4 ±1.2	1.6-1.8
Number of medicines prescribed by generic name, n (%)	2,533 (61.5)	(100.0)
Encounters with an antibiotic prescribed, n (%)	427 (35.6)	(20.0-25.4)
Encounters with an injection prescribed, n (%)	150 (12.5)	(10.1-17.0)
Percentage of medicines prescribed from EDL, n (%)	4,049 (98.3)	(100.0)

The therapeutic class and profile of specific medicine showed that analgesics constituted the most frequently prescribed medicines including paracetamol (685; 16.6%) and non-steroidal anti-inflammatory drugs (NSAIDs) 259 (6.3%). This is followed by vitamins and minerals mostly vitamin C (260; 6.3%), multivitamins (171; 4.1%) and vitamin B complex (92; 2.2%). Antimalarials largely consisted of artemeter-lumefantrine combination (266; 6.5%), artemeter alone (82; 2.0), dihydroartemisinine/piperaquine combination (68; 1.7%), sulphadoxine-pyrimethamine (36; 0.9%) and artesunate/amodiaquine combination (30; 0.7%). Antibiotics were mostly penicillins (219; 5.3%) with amoxicillin (130; 3.2%) the commonly prescribed penicillins; quinolones constituted 98 (2.4%), cephalosporins (68; 1.6%) and macrolides (55; 1.3%); antihistamine comprising mostly chlorpheniramine (154; 3.7%) and loratidine (123; 3.0%); antihypertensives mostly hydrochlorthiazide/amiloride combination (82; 2.0%), lisinopril (67; 1.6%), amlodipine (62; 1.5%), and nifedipine (62; 1.5%); antidiabetes medications including metformin (47; 1.1%) and glibenclamide (34; 0.8%); and antipsychotics comprising chlorpromazine, haloperidol and fluphenazine with a proportion of 3 (0.1%) each. The details of other classes of medication prescribed are shown in Table 2.

Two hundred and eighty seven (7.0%) medicines were prescribed in 150 (12.5%) prescription encounters each including at least an injection. The details of medicines prescribed in the injectable dosage form are shown in Table 3.

Table 2: Summary of therapeutic classes of commonly prescribed medicines in the facility

Therapeutic class (n = 4121)	Frequency, n (%)
Analgesics	1000 (24.3)
Vitamins and Minerals	554 (13.4)
Antimalarials	497 (12.1)
Antibiotics	472 (11.5)
Antihypertensives	388 (9.4)
Antihistamine/antiallergics	346 (8.4)
Agents for Gastrointestinal Disorders (Antiulcer/antimotility)	238 (5.8)
Cough syrups/preparations	230 (5.6)
Antiamoebiasis	88 (2.1)
Antidiabetes	81 (2.0)
Anxiolytics	62 (1.5)
Antifungals	37 (0.9)
Anti-asthmatics (mainly salbutamol)	34 (0.8)
Vaccines (mainly tetanus toxoid)	18 (0.4)
Antipsychotics	13 (0.3)
Antihelminthics	10 (0.2)
Skeletal muscle relaxants (mainly orphenadine)	9 (0.2)
Antidepressants (mainly amytriptilline)	4 (0.1)
** Others	40 (1.0)

*** includes oral rehydration salts (32), calamine lotion (4), cerumol (3) and silver sulphadiazine (1)*

Table 3: Profile of commonly prescribed medicine in injectable dosage form

Specific medicine (n = 287)	Frequency, n (%)
Artemether	81 (28.2)
Paracetamol	73 (25.4)
Metoclopramide	30 (10.5)
Diclofenac	21 (7.3)
Promethazine	21 (7.3)
Tetanus toxoid	18 (6.3)
Vitamin B complex	13 (4.5)
Ceftriaxone	7 (2.4)
Drotaverine	5 (1.7)
Ranitidine	3 (1.0)
Hydrocortisone	3 (1.0)
Ciprofloxacin	3 (1.0)
Metronidazole	2 (0.7)
Hyoscine-N-butyl bromide	2 (0.7)
Promethazine	1 (0.3)
Chlorpheniramine	1 (0.3)
Pentazocine	1 (0.3)
Gentamicin	1 (0.3)
Diazepam	1 (0.3)

DISCUSSION

A prescription provides an insight into a prescriber's attitude to the disease being treated and the nature of healthcare delivery system in the community.[21] Using the WHO-core prescribing indicators, this study has provided insight to the prescribing practice in the university-based healthcare facility studied. The average number of medicines per encounter is an important index of determining the extent of polypharmacy in a facility.[4] Prescriptions that had

greater than three medicines were common suggesting polypharmacy practice according to various definitions of polypharmacy from previous studies [22-24] as well as considering the reference standard of 1.6 to 1.8.[4,9] Previous studies on drug use pattern in healthcare facilities also reported higher values of between 2.8 and 4.4 for the average number of medicines per encounter.[8,12-14,25,26] A lower value of 1.3 and 1.4 was reported in Zimbabwe and Sudan, respectively.[7,9,27] Studies have shown that polypharmacy practice constitutes a potential for medication errors, dispensing errors, and non-adherence to dosage regimen leading to poor therapeutic outcomes and likelihood of adverse drug reactions.[6,25,28-30] Prescribers should therefore ensure that medicines are prescribed based on rational indication using the available subjective and objective evidence, while pharmacist during dispensing should be vigilant of possible drug therapy problems including drug-drug interactions and adverse drug reactions which may be linked to polypharmacy medications.

It is noted that despite the fact that many developing countries including Nigeria have adopted and developed the national essential drug list[31], the concept of prescribing in generic names is still suboptimal. This study showed low generic prescribing compared to the reference standard, and this is consistent with previous studies on drug use in public healthcare facilities.[8,25,26,32] Prescribing in generic substantially decrease the cost of pharmaceutical care to patients, as well as ensuring uniformity of prescription interpretation and instructions by pharmacists. Generic prescribing also helps to eliminate or reduce the incidence of duplication errors or therapeutic duplication.[14]

The percentage of encounters with an antibiotic prescribed (35.6 %) is higher than the reference standard of 20.0 – 25.4%[9], nonetheless, the value in this study is lower compared to values reported in studies from Ilorin (45.0%)[8] and Kano (67.7%).[32] Other studies reported higher percentage of encounters with antibiotics including 63.0% in Sudan and 56.0% in Uganda.[7,33] The inappropriate use of antibiotics may be due to patients insisting on the antibiotics, presumptive or blind prescribing on the part of the physicians [18,19,34] and patients believing that antibiotics are more effective for treating common cold.[34-36] Misuse and overuse of antibiotics has been reported to potentially lead to antimicrobial resistance thus necessitating the use of more expensive antibiotics.[9,37]

In addition, the percentage of encounters with at least one injection was found to be within the WHO reference standard of 10.1 – 17.0%[9] possibly indicating a better approach to injection prescription in the facility. A similar finding of low prescription for injection within the WHO recommended range was also reported by Patil et al.[26] This is quite encouraging and is a prescribing practice that should be continued since rational prescription for injection is largely justified or preferred to oral medication when patient is unable to tolerate oral intake of medicine or when there is no readily available oral preparation for the indicated medicine. Also, the percentage of drugs prescribed from the Essential Drug List (EDL) was near the INRUD/WHO reference standard of 100%.[4,9] This is also commendable and these findings may imply that prescribers in the facility were probably following the current trend as well as complying with the prescribing norm in the national essential drug list.

Summarily, the profile of prescribed medicines in the facility indicated analgesics as the most commonly prescribed therapeutic drug class and paracetamol was found to be the most frequently encountered medicine. A study by Akande and Ologe[11] in Ilorin, north-central part of Nigeria also reported analgesic as the most commonly prescribed medicine in their study. Paracetamol is possibly the most widely used analgesic on account of its availability and effectiveness in relieving frequently experienced mild body pain, headache and feverish symptom. Nevertheless, chronic and irrational use should be discouraged due to its inherent hepatotoxicity potential.[38] Also of note was the prescription of different therapeutic classes of medicine ranging from antimalarials, antihypertensives, antidiabetes, anxiolytics, antipsychotics and antidepressants. Although, the study site has a primary healthcare status, it is a university-based healthcare facility comprising different cadres of qualified healthcare professionals who are competent and legally authorized to handle any prescription of therapeutic agents provided such prescriptions are guided by the standard norm and in accordance with evidence-based practice.[39] More so, the facility has institutional relationship with the University College Hospital which is an affiliated teaching hospital to the university.

Despite the useful findings from this study, it is however limited by the fact that the study only focus on core prescribing indicators, whereas other WHO indicators including facility indicator and patient care indicator are also important in ensuring comprehensive drug use evaluation of a healthcare facility. Future study may therefore need to consider this other indicators so as to ensure a far-reaching conclusion.

CONCLUSION

It could be concluded that the prescribing pattern and practice in the facility comprised poly-pharmacy, low generic prescribing and overuse of antibiotics suggesting the need for ongoing enlightment and training among healthcare providers so as to ensure rational prescribing practice and drug use. In addition, prescribing within the national EDL framework and prescriptions for injection were considerate implying continuing efforts to sustain this rational prescribing norm. Notwithstanding, there is need for ongoing periodic prescription audit and review at the facility level so as to promote rational drug use.

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REFERENCES

1. Phillips MS, Gayman JE and Todd MW (1996). ASHP Guideline on medication-use evaluation. American Society of Health-System Pharmacists. *American Journal of Health-System Pharmacists* 53: 1953-1955.
2. Pollock M, Bazaldua VO and Dobbie AE (2007). Appropriate Prescribing of Medications: An Eight-Step Approach. *American Family Physician* 75(2): 231-236.
3. Academy of Managed Care Pharmacy (AMCP) (1999). Concepts in Managed Care Pharmacy-Drug Use Evaluation. Available at http://www.amcp.org/WorkArea/DownloadAsset.aspx?id=9299 Accessed February 21, 2015.
4. World Health Organization (1993). Action Program on Essential Drugs. How to investigate drug use in health facilities: selected drug use indicators. Available at http://www.who.int/medicinedocs/en/d.../3.html. Accessed December 20, 2014.
5. Erah PO, Olumide GO and Okhamafe AO (2003). Prescribing practices in two health-care facilities in Warri, Southern Nigeria: A comparative study. *Tropical Journal of Pharmaceutical Research* 2 (1): 175-182.
6. Dean B, Barber N and Schacter M (2000). What is a prescribing error? *Quality health care* 9(4): 232-237.
7. Desalegn AA (2013). Assessment of Drug Use Pattern using WHO Prescribing Indicators at Hawassa University Teaching and Referral Hospital, South Ethiopia: A cross-sectional study. *BioMed Central (Health Services Research)* 13:170.
8. Akande TM and Ologe MO (2007). Prescription pattern at a secondary health care facility in Ilorin, Nigeria. *Annals African Medicines 6(4):186–189.*
9. Isah AO, Liang R, Quick J, Mabadeje AFB, Santoso B, Hogerzeil H, and Ross-Degnan D (2001). The Development of Reference Values for the WHO Health Facility Core Prescribing Indicators. West African Journal of Pharmacology and Drug Research 18. Available athttp://www.ajol.info/index.php/wajpdr/article/view/14718. *Accessed January 3, 2015*
10. Patel V, Vaidya R, Naik D, and Borker P (2005). Irrational drug use in India: A prescription survey from Goa. *Journal of Postgraduate Medicines* 15: 9-12.
11. Sunil K, Punam M and Madhuri K (2005). Pattern of prescription and drug dispensing. *Indian Journal of Peadiatrics* 72 (2):117-121.
12. Babalola CP, Awoleye SA, Akinyemi JO & Kotila OA (2011). Evaluation of prescription pattern in Osun State (South-west), Nigeria. *Journal of Public Health and Epidemiology* 3 (3): 94–98.
13. Adisa R, Fakeye TO and Aindero VO (2014). Drug prescription pattern and knowledge of dispensing process among health workers in primary health care facilities in Ibadan, South-western, Nigeria. *International Journal of Pharmacy Practice 22 (Suppl 1):28 – 53.*
14. Tamuno I & Fadare JO (2012). Drug Prescription Pattern in a Nigeria Tertiary Hospital. Tropical *Journal of Pharmaceutical Research* 11 (1):146 - 152.
15. Teferra A, Zeruesenay D, Asfawossen GY (2002). Prescribing pattern of drugs in medical wards of three hospitals in northwest Ethiopia. *Journal of Ethiopia Medical Practice* 4:8-13.
16. Ryan C, Ross S, Davey P and Duncan EM, Franscis JJ,Fielding S, Johnston M, Ker J, Lee AJ, MacLeod MJ, Maxwell S, Mckey GA, MaLay JS, Webb AJ and Bond C (2014). Prevalence and Causes of Prescribing Errors. The Prescribing Outcomes for Trainee Doctors Engaged in Clinical Training (PROJECT) Study. *Public Library of Science ONE* 9 (1):e79802
17. World Health Organization (2004). Promoting

rational use of medicines saves lives and money, WHO experts say. WHO 2004;10:406-415 (Press Release 29-3-2004). Available at http://www.who.int. Accessed December 20, 2014.

18. World Health Organization (1996). India's doctors warned on irrational prescribing. *Essential Drugs Monitor* 22:6
19. Oreagba IA, Olayemi SO, Mabadeje AFB, Nwoye E (2004). Assessment of rational prescribing of antihypertensive drug combinations in Lagos University Teaching Hospital. *Nigerian Journal of Health and Biomedical Sciences* 3:8-11
20. World Health Organization (WHO), (2015). The Anatomical Therapeutic Chemical Classification System with Defined Daily Doses (ATC/DDD), WHO Collaborating Centre for Drug Statistics Methodology. Available at www.who.int. Accessed February 13, 2015.
21. World Health Organization (WHO), (2003). Drug and Therapeutics Committees - A Practical Guide: Drug Use Evaluation. Available at www.who.int/medicines/areas/national_use/en/. Accessed December 31, 2014.
22. Bjerrum L, Rhosholm JU, Hallas J, Kragstrup J (1997). Methods for estimating the occurrence of polypharmacy by means of a prescription database. *European Journal Clinical Pharmacol*ogy 53 (1):7-11
23. Grant RW, Devita NG, Singer DE and Meigs JB (2003). Polypharmacy and medication adherence in patients with type 2 diabetes. *Diabetes Care* 26 (6):1408-1412.
24. Fraizer SC (2005). Health outcomes and polypharmacy in elderly individuals: an integrated literature review. *Journal of Gerontological Nursing* 31(9):4-11
25. Afify MA, Shahzad N, Tawfik N, Ibrahim IA, AbdulJaleel Z, Khan W, Mahfoz AM and Al-Ghandi SS (2015). Evaluation of drug prescription practices in private and general hospitals in Makkah, Saudi Arabia. *African Journal of Pharmacy and Pharmacology* 9 (39):966-973.
26. Patil KR, Mali RS, Dhangar BK, Bafna PS, Gagarani MB, Bari SB (2015). Assessment of Prescribing Trends and Quality of Handwritten Prescriptions from Rural India. *Journal of Pharmaceutical Sciences and Technology* 5(1):54-60.
27. Hogerzeil HV,Bino D, Ross-Degnan D, Laing RO,Ofori-Adjei D, Santoso B, Chowdhury AKA, Das AM, Kafle KK, Mabadeje AFM, Massele AY (1993). Field tests for rational drug use in twelve developing countries. *Lancet* 342:1408-1410.
28. Dean B, Vincent C, Schechter M and Barber N (2005). The incidence of prescribing errors in hospital inpatients: an overview of the research methods. *Drug Safety* 28:891–900.
29. Lesar TS, Briceland L, and Stein DS (1997). Factors related to errors in medication prescribing. The *Journal of the American Medical Association* 277:312-17.
30. Giampaolo PV and Pietro M (2009). Medication errors: prescribing fault and prescription errors. *British Journal of Clinical Pharmacology* 67(6):624-628.
31. Weerasuriya K, Brudon P (1998). Essential drugs concept needs better implementation. Essential Drugs Monitor 25/26:32-33

32. *Chedi BAZ., Abdu-Aguyel & Kwanashie HO (2004). WHO-Core Prescription Indicators: Field Experience in Public Health Facilities in Kano, Nigeria. BEST Journals 6(3):66–70.*

33. Christensen RF (1990). A strategy for the improvement of prescribing and drug use in rural health facilities in Uganda. Ugandan Essential drugs and management program. In: How to investigate drug use in health facilities. Geneva: WHO; 1993. 74(WHO/DAP/93.1).

34. Wolff JM (1993). Use and Misuse of Antibiotics in Latin America. *Clinical Infectious Diseases* 17 (2):S346-S351.
35. Peche're JC (2001). Patients' Interviews and Misuse of Antibiotics. *Clinical Infectious Diseases* 33(3):S170 –S173.
36. Gonzales R, Steiner JF, Sande MA (1997). Antibiotic prescribing for adults with colds, upper respiratory tract infections, and bronchitis by ambulatory care physicians. *Journal of American Medical Association* 1997, 278(11):901-4.
37. Carey B and Cryan B (2003). Antibiotic misuse in the community- a contributor to resistance? *Irish Medical Journal* 96(2):43-46.
38. James LP, Mayeux PR, Hinson JA (2003). Acetaminophen-induced hepatoxicity. *Drug Metabolism and Disposition* 31 (12):1499-506.
39. World Health Organization (WHO), (1994). Guide to Good Prescribing: A Practical Manual. WHO, Geneva. WHO/DAP/94.11. Available at www.who.int. Accessed December 12, 2014.