Clinical Pharmacy in Nigeria: Issues, Challenges and the Way Forward

By

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Quick Summary of Lecture

The profession of pharmacy has undergone series of changes in terms of philosophy and practice as it seeks to meet the dynamics of societal expectations and changes in the legal/regulatory standards as well as technology of healthcare provisions. This lecture attempts to describe the stages in the evolutionary process from product to patient orientation, the scope and functions of the clinical pharmacist, highlighting drug therapy problems (DTPs) as negative patient outcomes that arise in the course of treatment of medical conditions and which can cause death, increase direct cost of therapy and reduce the quality of life. The causes and examples of DTPs were outlined, with empirical evidence, the impact and benefits of clinical pharmacy were highlighted indicating that the present situation of clinical pharmacy was sub-optimal.

Summaries of some selected phytotherapy and clinical studies to illustrate the lecturer's contribution to the world of knowledge through research findings in clinical pharmacy were concisely discussed. The clinical studies were grouped into pharmaceutical education and practice, public health pharmacy, pharmaceutical care in chronic diseases like diabetes, hypertension and HIV/AIDs, and acute diseases such as malaria. This lecture also stressed on the drug treatment for both uncomplicated and severe malaria for children, adult non-pregnant and pregnant females based on the

recommended National treatment guidelines and highlighted some cautionary measures during treatment.

Challenges to clinical pharmacy were articulated within the context of all the role players in healthcare system which includes the government, healthcare professionals, including pharmacists, professional bodies, regulatory bodies and the hospitals. A number of recommendations on the way forward have been made. These include a transformational change to pharmaceutical care; approval of the Pharm.D curriculum for the professional degree for pharmacy nationwide by the federal government through the NUC; support legislative and regulative changes by PCN and other regulatory bodies to update the scope of practice for all pharmacists to meet with global challenges; direct Federal Ministry of Health to compel all teaching hospitals to adopt e-prescribing and e-dispensing platform as benchmark for prescription management; provide adequate funds to support research, postgraduate education, staff development, exchange programs, capacity building, specialized residency training, preceptor development and well articulated continuing professional development and update other infrastructure and materials needed to train clinical pharmacists in universities and teaching hospitals; and need for all healthcare professionals, including clinical pharmacists coming together with a clear and common goal of meeting patients' requirements for effective and more accessible services, optimizing the benefits gained from their medications and decreasing DTPs; and a take home message for the audience.

CLINICAL PHARMACY – THE ISSUES, CHALLENGES AND WAY FORWARD

PROTOCOL

The Vice Chancellor, Prof. Benjamin ChukwumaOzumba
Deputy Vice Chancellors and Principal Officers of the University
President of the University of Nigeria Alumni Association and other officers present
Deans of Faculties
Directors of Institutes and Centers
Heads of Departments and Coordinators of Units
Distinguished Professors
Past Inaugural Lecturers of the University of Nigeria, Nsukka
Heads of Administrative Units
Distinguished Academics and Astute Administrators
Serving and former Vice Chancellors of Universities and Rectors of Polytechnics
My Lords, Spiritual and Temporal
His Royal Highnesses here present (Royal Fathers)
Chiefs, Elders and Traditional Prime Ministers
Gentlemenfrom the 4th Estate of the Realm
Distinguished ladies and gentlemen
Great lions and lionesses

1.0 INTRODUCTION

I am delighted and feel privileged to deliver the 98th inaugural lecture of University of Nigeria before this esteemed audience. It is also an honor to deliver the lecture on "**Clinical Pharmacy"**, the youngest of all the disciplines in Pharmacy. This lecture is a particularly significant event because from records available, this is the first inaugural lecture from a professor of Clinical Pharmacy by training in Nigeria.

In a special way, I thank the Vice Chancellor for giving me the opportunity to share with this August assembly my clinical experience and contribution to the world of knowledge through research findings and other academic/professional activities in my chosen field of specialization.

In starting this lecture, let me first pay homage to whom it is due and put things in proper perspective. So I wish to express my profound gratitude and respect to the man who taught me this science-based, evidence driven and patient-oriented discipline. I am talking of a man of unequalled academic prowess; a man who is the pathfinder and major contributor to the understanding of Clinical Pharmacy in this country more than any other single human being. He is Professor Cletus Nze Aguwa, the first full-fledged Professor of Clinical Pharmacy by training in Nigeria. It was from the moment I encountered this bulldozer of a man that my journey into the discipline of Clinical Pharmacy started. As my teacher and mentor, God used him to move me from being "shaky hands", characterized by fear of holding experimental animals in pharmacology laboratory, stage fright and timidity during clinical case presentations in class and in the hospital during clinical rotation in those early days of my training as aclinical pharmacist to now he refers to me as 'expert'. The journey started from phytotherapy research to clinical research and then he moved to

writing books to practically support Clinical Pharmacy education and practice in tropical Africa. Though retired, he is not tired and has continued to influence not just my work but the philosophy, ethics and research output of allclinical pharmacists in all areas of clinical research. Prof. Nze Cletus Aguwa, Sir, may the good Lord grant you more healthy retirement years. Amen.

The topic of today's lecture is **"Clinical Pharmacy: the issues, challenges and way forward"**. My interest in Clinical Pharmacy was provoked by the need to change the direction of my research from a product-based to a more patient oriented field, hence my choice for pharmaceutical services and pharmacy practice. The choice of mydoctoral thesis "**Evaluation of the quality of pharmaceutical services in Nigeria's tertiary hospitals**" has sustainedthat researchinterest and publications in this exploding discipline of pharmacy practice that applies evidence-based therapeutic guidelines, evolving sciences, emerging technology and relevant legal, ethical, sociocultural, economic and professional principles to assume responsibility and accountability for managing medication therapy in all patient settings.

Ladies and gentlemen, permit me to digress a little on the area and topic of my Ph.D research. When I presented my Ph.D proposal/progress seminar, many of the senior colleagues who attended the seminar did not see anything"pharmaceutical sciences" in the topic because it was not "experimental" in nature. At the end of the seminar, it took over an hour for those present to accept the topic as suitable for a Ph.D in Pharmacy. I recall that Professor D.S. Obikeze of the Faculty of Social Sciences who was one of my consultants in Social Science research design and statistics spent so much time explaining and enlightening my senior colleagues about the emerging area of social/applied research in pharmacy. It was uncommon and outside the traditional bench work/laboratory experiments everyone was used to.

Though this research was an uphill task as I became a guinea pig before new grounds could be broken, I learnt from that experience that there is no limitation or barrier that can stop one from becoming all that God wants one to become, except the limitations, such a person places on him or herself. It might interest this esteemed audience to know that the stone the builders rejected turned out to be the chief cornerstone of the house as that thesis produced the first Ph.D in Clinical Pharmacy in Nigeria.

I must also let you know that this breakthrough has paved the way for more postgraduate research areas in Clinical Pharmacy/Pharmacy Practice research. The department of Clinical Pharmacy offers and successfully graduates students (Masters and Doctoral) in areas of Pharmacoepidemiology, Pharmacoeconomics, Pharmacy Education and Practice, Pharmaceutical Care and Pharmacokinetics. The department has also trained young faculty members from over six pharmacy schools in Nigeria namely: University of Jos, Ahmadu Bello University, Nnamdi Azikiwe University, University of Uyo, Niger Delta University, University of Port Harcourt and pharmacists from tertiary hospitals too numerous to count.

Mr. Vice-Chancellor, in this lecture, I shall discuss Clinical Pharmacy issues, my contributions to clinical pharmacy education and research, the challenges to clinical pharmacy and the way forward, with focus on Nigeria. I have used my research findings, findings from my research group and contributions from other related studiesto explore/buttress my points. It is hoped that this lecture will greatly enhance the knowledge and appreciation of Clinical Pharmacy in Nigeria.

2.0 CLINICAL PHARMACY – THE ISSUES

The following issues of relevance to clinical pharmacy will be discussed.

- The evolution of clinical pharmacy
- Clinical Pharmacy defined
- The clinical pharmacist
- The impact/benefits of clinical pharmacy
- Empirical evidence

2.1 Evolution of Clinical Pharmacy

The profession of pharmacy has undergone a series of changes in terms of philosophy and practice as it seeks to meet the dynamics of societal expectations and changes in the legal/regulatory standards as well as technology of health care provision. History is relevant to understanding the past, defining the present and influencing the future. Thus to describe the present and influence the future of pharmacy, it is important to examine the past. In the evolutionary process, there has been an uneven adoption of a new practice model as opportunities emerge, rather than a series of abrupt changes in practice occurring simultaneously throughout the profession and across the globe (Hepler, 1987; Higby, 1997). Below are the stages in the evolution of the profession from product to patient orientations (Holland and Nimmo, 1999).

- ***Apothecary Model***: Pharmacists entered the twentieth century as "apothecarists". In this first stage, pharmacists made patent medicines according to their own recipe in small quantities. They also prescribed these medicines and sold them from their dispensaries. Both the drug product and the service process provided were valued. Patients came to the pharmacist for the medication itself and for advice and guidance on its selection and use. At that time, the pharmacist had a clearly defined social value.

• ***Compounding Model:*** Around 1945, there was an industrial revolution. This revolution saw a phenomenal growth in the manufacturing industry that took over extemporaneous production of drugs in the pharmacies or apothecaries. Pharmacists then moved to compounding, where they mixed medicines that had already been manufactured, according to prescription doses and guiding patients to self-care.

• ***Distribution Model:*** In the third stage, the main function of pharmacists diverged, depending on the setting of practice. There was an increased availability of manufactured drugs and the 1951 Durham Humphrey Amendment to the 1938 United StatesFood, Drug and Cosmetic Act introduced the "prescription-only" legal status of medicines, thereby limiting who could prescribe and advice on the use of medicines. This confined community pharmacists to dispensing;hence community pharmacy became a channel of distribution for the pharmaceutical industry. Hospital pharmacists functioned primarily in a support role for the management of drug products. Their daily activities were more varied than those of the community pharmacists and included distribution, management, large volume compounding, teaching of nurses, and participation in Pharmacy and Therapeutics Committees. As in community practice, the emphasis was on the drug product and no longer the patient.

• ***Clinical Pharmacy Model:*** Clinical pharmacy originated from the US in the 1960s in response to the societal need to improve the use of medicines. This evolution was led by initiatives in the hospital sector which enabled schools of pharmacy to make shifts in the graduate education of pharmacists. In this practice model, community pharmacists resumed providing drug information by

way of advice and medication counseling, providing consultations on generic substitution and non-prescription drug use. While physicians maintained responsibility for medication therapy outcomes, hospital pharmacists provided a valuable supporting service founded in their specialized knowledge of the action and use of medications. The adoption of the clinical pharmacy practice model is viewed as the beginning of social value for hospital pharmacists. This stage was the re-emergence of patient oriented pharmacy and its pharmacists performed clinical functions.

• ***Pharmaceutical Care Model:*** Professionals do not merely perform functions but take responsibilities for functions that they perform and those performed under their supervision. Helper and Strand (1990) defined pharmaceutical care as "the responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life". These outcomes are curing a disease, eliminating or reducing symptoms, arresting or slowing a disease process, and preventing a disease or symptoms. Clinical pharmacy embraces the philosophy of pharmaceutical care.The major difference between the two care models being "taking the responsibility" which makes the pharmacist accountable for his actions (see Table 1). To achieve pharmaceutical care, pharmacists cooperate with patients and with other health care professionals in designing, implementing and monitoring a care plan aimed at preventing and resolving drug therapy problems(DRPs).

Table 1: Differences between traditional drug dispensing and pharmaceutical care

Traditional drug dispensing	Pharmaceutical care
Focus on dispensing the medicine	Focus on patients' management and outcomes with the drug treatment
Patients' education and counseling concentrate on technical advice.	In addition to technical advice, the pharmacist is educating the patient to practice the drug treatment in everyday life.
No monitoring of the outcomes of drug treatment	The pharmacist is finding methods to monitor the outcomes of drug treatment.
DRPs would emerge if the patient complains about them	The pharmacist is actively and systematically identifying possible problems in the drug treatment
No responsibility for the drug treatment	The pharmacist takes responsibility that the drug treatment goal will be achieved

Source: Azuka C. Oparah: Models of Pharmacy practice in: Essentials of pharmaceutical care, 2010 p. 8

Don Francke outlined the events that led to the development of clinical pharmacy in the US. Clinical pharmacy was developed in response to the societal need to improve the use of medicines.The awareness and recognition of medication errors, the need to monitor adverse effects of drugs, unit-dose distribution system of dispensing and drug information were the most important clinical

functions that led to the development of Clinical Pharmacy. The programs developed affected a few graduate students but had no effect on those in the undergraduate studies (Francke, 1974). The main events took place in the hospitals and other institutions, but because the early clinical pharmacists were postgraduate residents in University teaching hospitals, it was natural that the schools of pharmacy become grounds of contention. It became clear to educators in the schools of pharmacy that their academic programs needed a drastic change if they must graduate pharmacists with confidence to join the medical team. In spite of the odds against the movement, it successfully survived and became visible in all directions. During the critical stage of the evolutionary process, the US Government by Act of Congress gave capitation grant to schools of pharmacy offering undergraduate clinical orientation in their curriculum (McLeod, 1976).

The extension of clinical training of pharmacists became formalized through Doctor of Pharmacy (Pharm.D) programs emerging first in California and subsequently in states, such as, Michigan and Kentucky that were early adopters of Clinical Pharmacy. In the 1990s, Pharm.D became the entry qualification to study pharmacy in the US and in major schools of pharmacy in Canada in 2007 (Koleba*et al.*, 2006). The North American programs now include clinical rotations built into the final or penultimate years of a five to six year vocationally oriented degree. The paradigm shift move spread to other countries like Canada, United Kingdom (UK), Europe, Australia and African countries, including Zimbabwe, Ghana and Nigeria.

In the UK, hospital pharmacists saw themselves as drug information advisers emerging from pharmacy-based drug information centers. It was not until after more than 10 years of

describing themselves as ward pharmacists that they felt comfortable adopting the US concept of Clinical Pharmacy with the formation of the UK Clinical Pharmacy Association. Pharmacy education in UK was extended to 4 years (plus one year pre-registration training) in 1997 in response to the change and the need to harmonize to a five year education in Europe. A limited expansion of clinical teaching in the pre-graduate years has followed (Sie*et al.,* 2003).

In Nigeria, there were many discussions, seminars and workshops locally, nationally and internationally on Clinical Pharmacy in the 1980's. The debates and discussions for and against clinical pharmacy pioneered by pharmacists in academia drew the attention of the National University Commission (NUC) and the Pharmacists Board of Nigeria (PBN) now Pharmacists Council of Nigeria (PCN). By the 1990's the discussions on Clinical Pharmacy gathered such momentum that the NUC gave directive to universities to introduce uniform clinical courses in Faculties of Pharmacy in Nigeria. In 1992, seven Deans of Pharmacy Schools were sponsored for an eleven-day trip to the UK and the US. The main purpose of their trip was to observe and get the hands-on experience on how Clinical Pharmacy education and practice were implemented. On return the two teams submitted a report to the Minister of Health. Their recommendations included that each School of Pharmacy in Nigeria should establish a full department of Clinical Pharmacy and Pharmacy Administration in order to implement the full clinical program, teaching, practice and research. Also, that effort should be made to alleviate acute shortage of clinical science staff, and provide other necessary infrastructure and service units in the hospitals, that the Ministry of Health should give clinical pharmacy training and practice full support, including funding (Aguwa, 2012).

2.2 Clinical Pharmacy Defined

The American College of Clinical Pharmacy most recently defined Clinical pharmacy as "the health science discipline in which pharmacists provide patient care that optimizes medication therapy and promotes health, wellness and disease prevention" (ACCP, 2008). Succinctly put, it is "the area of pharmacy concerned with the science and practice of rational medication use". The practice of Clinical Pharmacy embraces the philosophy of pharmaceutical care; it blends a caring orientation with specialized therapeutic knowledge, experience, and judgment for the purpose of ensuring optimal patient outcomes. As a discipline, Clinical Pharmacy also has the obligation to contribute to the generation of new knowledge that advances health and quality of life.

Clinical pharmacy generally comprises three keywords, namely: patient care, professional skills and professionalism. Patient care (now more appropriately termed direct patient care – DPC) comprises optimization of medication therapy, health promotion, wellness and disease prevention, pharmaceutical care, therapeutic knowledge and outcome assurance and assessment. Professional skills incorporate competencies in clinical judgment, experiences and the generation of new knowledge. Lastly, professionalism in clinical pharmacy entails a caring orientation by the clinical pharmacist with emphasis on best ethical behavior, respect, confidence and effective communication with patient and other health care attendants.

The emergence of Department of Clinical Pharmacy and Pharmacy Management in University of Nigeria, Nsukka (UNN)

In the department of Pharmacology and Toxicology where I was employed in September, 1990, we had full complement of clinical

courses for the establishment of the department of Clinical Pharmacy and Pharmacy Management, but clinical pharmacy was an area of specialization. In 1991, I joined Prof. Aguwa as a trainee clinical pharmacist to take our students to hospitals for clinical rotation. The Faculty of Pharmaceutical Sciences, UNN by this bold step became the second school of Pharmacy in Nigeria (after the University of Benin) to take students to hospitals for clinical rotation. I am glad to say that the first Lady of this University – Pharmacist Mrs. ChineloOzumba was one of the pioneer students who had the hands-on experience on clinical rotation.Some staff from two other Nigerian Schools of Pharmacy visited and joined us two years later to gain some training experience. Eight years later, specifically in March 1999, the Department of Clinical Pharmacy and Pharmacy Management was established, and to the glory of God, I became the First Acting Head of Department.

2.3 The Clinical Pharmacist

Clinical Pharmacists provide care to their patients/clients in all health care settings for promoting patient health. They practice both independently and in consultation or collaboration with physicians and other health care professionals, making it clear that they are members of an autonomous profession within their scope of practice, y*et al*so function as members of a cooperative health care team (ACCP, 2008). The clinical pharmacist's application of evidence and evolving sciences points out that clinical pharmacy is a scientifically rooted discipline; the application of legal, ethical, social, cultural, and economic principles serves to remind us that clinical pharmacy practice also takes into account societal factors that extend beyond science. By stating that clinical pharmacists assume responsibility and accountability for achieving therapeutic goals, the definition makes it clear that they are called upon to be more than consultants.

Scope of functions: The clinical pharmacist

- Assesses the status of a patient's health problems and determines whether the prescribed medications are optimally meeting the patients' needs and goals of care.
- Evaluates the appropriateness and effectiveness of the patients' medications
- Applies pharmacokinetic knowledge to design dosage regimens and provide therapeutic evaluations and recommendations.
- Supervises all drug distribution activities for drug use control and patient safety.
- With the aid of patient medication profile, monitors patients' response to drugs.
- Interviews, takes medication history and counsels patients.
- Advises patients/clients on selection of over the counter(OTC) drugs.
- Evaluates the drug literature.
- Recommends treatment for mild, self-limiting diseases.
- Certifies for admixture compatibilities and stability.
- Educates the public on drugs.
- Supports the health care team's efforts to educate patients on other important steps to improve or maintain health, such as exercise, diet and preventive steps like immunization
- Provides objective, evidence-based drug information service and manages treatment of poisoning.
- Teaches in pharmacy and medical schools.
- Conducts clinical research.
- In collaboration with the patient and other care givers takes the responsibility of identifying potential and actual drug therapy problems (DTPs), develops and implements interventions to resolve the actual DTPs, prevent the potential DTPs and evaluates the intervention and follows up (pharmaceutical care).

Drug therapy problems (DTPs) are negative patient care outcomes that can cause death, increase direct cost of therapy, induce/prolong hospitalization, reduce the quality of life and patient satisfaction.DTPs are not medical problems but they arise in the course of treating medical problems and hence compound the problems being treated. DTPs are classified in Table 2 below.

In summary, the clinical pharmacist must build competencies in:

- Clinical problem solving and decision making
- Assessing patient-specific medical problems
- Evaluating patient-specific drug therapy and therapeutic problems
- Identifying treatment options and designing a comprehensive drug therapy plan for patient-specific problems
- Collaborating with patients, caregivers and other healthcare professionals
- Monitoring patients in the health care setting (ACCP, 2008)

Table 2: Classes of DTPs, their causes and examples

DTPs	Cause	Examples
Unnecessary drug therapy	a) No medical indication	Antibiotic e.g. tetracycline or ampiclox after taking "Nkwobi"
	b) addiction/recreation drug use	Use of diazepam, Lexotan®, Ephedrine Syrup, Rohypnol®.
	c) Non-drug therapy more appropriate	Using antibiotics in infantile diarrhea.
	d) Duplicative therapy	Paracetamol andphenylbutazone; (Moduretic®) and
	e) Treating avoidable ADRs	

		(Esidrex®) Levofloxacin – induced tendonitis in the elderly.
Wrong drug	a) Dosage form inappropriate	Chloroquine, artemether, quinine injections for uncomplicated malaria
	b) contraindication present	ACEIs for hypertension in pregnancy
	c)Drug not indicated for condition	Quinine hydrochloride injection for abortion
	d) More effective drug available	Brinerdine for hypertension in sexually-active adult.
Dosage too low	a) Wrong dosage	One dose ampiclox or metronidazole (Flagyl®) for loose stools after taking "Nkwobi" or "Isi-ewu." One dose chloroquine for malaria.
	b) Frequency inappropriate	2 Tabs of Artemether-lumefantrine 20/120 for adults daily instead of 4 Tabs twice daily for uncomplicated malaria. One dose ampiclox or metronidazole once daily one dose gentamicin 80mg injection per day.
	c) Duration inappropriate	Antibiotics e.g. ampiclox or

		ciprofloxacin for less than 5 – 7 days.
	d) Drug interaction	Contraceptive failure with barbiturates and oral contraceptives. 250mg aminophylline injection in an asthmatic smoker
Dosage too high	a) Wrong dose	Two tabs of paracetamol plus 2 Tabs of diclofenac by Okada riders.
	b) Frequency inappropriate	Above medication > three times daily
	c) Duration inappropriate	ACTs for > 3 days
Drug interaction	a) Pharmacodynamic b) Pharmacokinetic	Alcohol+ metronidazole, Phenytoin + Isoniazide, Phenytoin+ Rifampicin
Adverse Drug Reaction	a) Unsafe drug for patient	Flagyl ® + disulfiram, methadone + diazepam,lyrica + celebrex in patient with liver dysfunction
	b) Allergic reaction	Cephalosporins + penicillins
	c) Drug interaction	Lithium chloride + thiazide diuretics, gentamicin + cephatothin. Phenylbutazone + oral anticoagulants.
	d) Undesirable effect	Steven Johnson's

		syndrome with Nevirapine
Inappropriate adherence	a) Generic drug substitution	Lisinopril for (Zestril®) metronidazole for (Flagyl®)
	b) Inadequate knowledge of drug use.	Ampiclox for common cold
	c) Dose not indicated	"Mix for me one dose" – about different drugs
	d) Cannot afford drug product	Ceftraxone for minor infection in poor patients. Nexium ® instead of metronidazole for poor patients.
	e) Drug product not available	Nitroprusside or Digibind in a local health centre for patient.
	f) Does not understand instructions	Take 2 Tabs 3 times daily??
Needs additional drug therapy	a) Untreated condition	Opportunistic infection in HIV-infected patients
	b) Synergistic therapy	ACEIs + diuretics in CHF patients.
	c) Prophylactic therapy	IPT with SP, Folic acid in sickle cell patients.

2.4 Impact and benefits of Clinical Pharmacy education and practice

Milestones in the changing roles and in the preparation of pharmacists for these roles have been the establishment of Clinical Pharmacy in the United States hospitals and the Pharm.D as a professional entry qualification, postgraduate clinical pharmacy education in UK and elsewhere, notably Asia and Australia; hospital pharmacist specialization across the wide range of medical specialties; the clinical teaching of pharmacists, the introduction of pharmaceutical care (the heart of Clinical Pharmacy) as a factor in public health; changes in schools of pharmacy – with professor of pharmacy practice and a shift to patient teaching (Hudson *et al.,* 2007).

In the developed countries that have established organized health care systems, tremendous progress has been made in expanding the opportunities available for pharmacy graduates.

Hospital pharmacy which is the showcase of the clinical and professional practice has unlimited expansion. As a result, the staff strength and budget of many hospital pharmacy departments have increased astronomically.Present hospital pharmacy services include: clinical pharmacokinetic services, unit dose distribution, intra-venous additive service, drug information services, code blue teams (emergency drug service), total parenteral nutrition, drug use evaluation, adverse drug reaction reporting, and computer services. Some clinical pharmacists with the required expertise in some hospitals have prescribing authority and manage the drug therapy regimens of patients receiving anticoagulants, antihypertensives, diabetic and anti-lipid therapy. The US government mandated monthly medication reviews in extended care facilities and thus caused enormous expansion. In the area of Pharmacy and Medical education, Clinical Pharmacy has made great impact. The college of pharmacy employed 1374 full-time faculty with Pharm.D or MS degrees and additional 2301 adjunct part-time Faculty to help provide the experiential training to students (Aguwa, 2012). In

addition many colleges of medicine have clinically trained Pharmacists as members of their staff to participate in the education of medical students. Some universities have employed Faculty with Pharm.D degrees to educate physicians, participate in clinical research activities and serve as consultants of medical schools.

Pharmaceutical care is a concept that is relevant to patient populations and has become an accepted term at policy making levels in some European countries because it has clear public health implications (Scottish Executive, 2002). Since 1990, hospital pharmacists have been increasingly orientated to developing a combined hospital and community pharmacy approach to serving patients.

Clinical Pharmacy has also opened new practice opportunities for community pharmacists and in recent years, new services from community pharmacists in the developed countries include: home health care, consultant pharmacy, home antibiotic therapy, medication reviews (Krass and Smith, 2000, Carter, 2004; Wang, 2007), special services to terminally-ill patients, adherence support to elderly patients (Krass and Smith, 2000, Bellington, 2003), methadone services to drug misusers, support to chronic psychiatric patients now moved from hospital and living in the community, a major role in anti-smoking campaigns, and support to promotion and support of nicotine replacement within public health strategy. In Scotland, community pharmacists have agreed to a new contract with the government to provide patient-centered services. Pharmacists are to be re-reimbursed not only for dispensing but for:

- Prescribing for minor ailments
- Chronic disease management, including medication supplies to patients, adherence and safety monitoring.

Pharmacists in the UK have developed roles working directly with community physicians in health centers in ways that make those roles analogous to the hospital clinical pharmacist roles working with clinical specialties(Macgregor *et al.*, 1996; Mullen and Hassel, 2003). This new form of Clinical Pharmacy practice emerging in primary care is reflected in primary care pharmacy specialists being employed to play a liaison role in implementing improved medicines management by working with community physicians, community pharmacists, hospital pharmacists and medical specialists.

Clinical Pharmacy has also exerted some influence in the pharmaceutical industry as well. Before, pharmacists were employed mainly as marketing and sales representative in the pharmaceutical industry. With the availability of clinically trained pharmacists, many opportunities have emerged, especially in the area of pharmaceutical research. Researchers with Pharm.D degrees are participating in clinical drug trials, drug design and monitoring.

It is almost two decades ago that the clinical pharmacy movement was ushered in Nigeria and some other African countries. The schools of pharmacy in Nigeria having succumbed to the pressure for change having revised their academic curriculum to incorporate clinical courses and topics like communication skills, pharmaceutical care, pharmacoeconomics and pathophysiology, from year three to five. Many of the schools have full-fledged department of Clinical Pharmacy which is a requirement of accreditation by the National Universities Commission. Even though it is only one school of pharmacy in Nigeria that is presently offering a six-year program leading to Pharm.D, many other schools have revised their curriculum waiting for the acceptance and approval by the NUC. The impact of Clinical Pharmacy in Nigeria and the West African region has resulted in

production of many clinical pharmacists with Pharm.D, M.Pharm, Ph.D and Fellowship of the West African Postgraduate college of Pharmacists. In Ghana, Pharm.D was started in 2012 as a 6 to7 year course being offered by the Kwame Nkrumah University. The Pharm.D program has been adopted as a professional entry qualification during the recent Pharmacy Education Summit held in Lagos, Nigeria by all the stakeholders. The program is also a standard practice in many other third world countries including Kenya, Tunisia, Algeria, Pakistan, Nepal, Philippines and India. Many clinical pharmacists are engaged in applied/outcome research to contribute to the generation of new knowledge that advances human health and quality of life.

In Nigerian hospitals, especially teaching hospitals, some little impact has been made. Some of our teaching hospitals, for example the University of Nigeria teaching hospital, Ituku/Ozalla have established drug information (DI) services and render these services to other health professionals.On an individual basis and as a direct response of the DI unit, periodic alerts on drug use, adverse effects and current information on use of several drugs are periodically published. The alerts are placed on notice boards in specific areas of the hospitals. Pharmacists attend pharmacy or medical ward rounds and some of them follow up in-patients with particular focus on their medications. Many have undergone postgraduate clinical training/residencies in various specialties and have become fellows of the West African Postgraduate College of Pharmacists. These fellows are involved in the education and mentoring of pharmacy students. In some of these teaching hospitals, weekly seminars and patient education sessions are organized and some have become members of some key hospital committees e.g. cardiothoracic unit where they render specialized clinical services. Nevertheless, the truth is that at the moment, there is no organized or recognized clinical pharmacy practice in

our health institutions as obtained in other countries especially developed countries.

Community pharmacists comprise a significant percentage of the pharmacy workforce in Nigeria and are one of the most preferred destinations for graduating pharmacy students (Ubaka *et al*., 2013). Although community pharmacists are involved in some elements of clinical practice, like their hospital counterparts, it is not organized with respect to cooperation with other members of the health care team. Many of them monitor blood pressure, determine blood glucose, educate and monitor drug therapy, treat several self-limiting diseases and refer patients to specialist physicians. A significant number also participate in workshops, conferences and continuing education seminars that deal with clinical pharmacy topics.

Empirical evidence

1. Although pharmacotherapy can be beneficial in the elderly, it can also lead to DRPs including untreated indications, drug use without an indication, improper drug selection, sub-therapeutic dosage, overdose, medication error, medical non-adherence, drug interactions, ADRs, adverse drug withdrawal events and therapeutic failure. Hanlon *et al*., 2004 assessed the impact of clinical pharmacy services on DRPs and health outcomes in persons aged 65 years and above after pharmacists' interventions were identified through searches of MEDLINE (1970 – Mar, 2003), the Cochrane Database of Systematic Reviews and International Pharmaceutical Abstracts (1966 – Mar, 2003). The literature review included 14 randomized controlled studies in the home health setting, hospital discharge with home follow up, clinic, community pharmacy and long term care facilities. The results of the studies provided considerable evidence that clinical

pharmacists' interventions reduced the occurrence of DRPs in the elderly.

2. Lipton *et al*., 1992 studied the impact of clinical pharmacists' consultations on geriatric drug prescribing by physicians in a prospective randomized controlled trial of patients 65 years of age and over. The patients were discharged on three or more medications for chronic conditions from a 450 – bed community hospital. The pharmacists provided consultation to experimental patients and their physicians at hospital discharge and at periodic intervals for three months post-discharge. Using a standardized tool, a physician – pharmacist panel blinded to study group assignment of patients, evaluated the appropriateness of prescribing for a random sample of 236 patients. The results showed that 88% of patients had at least one or more clinically significant drug problems and 22% had at least one potentially serious and life-threatening problem. Drug therapy problems were divided into six categories: 1) inappropriate choice of therapy, 2) dosage, 3) schedule, 4) drug interactions, 5) therapy duplication and 6) allergy. Experimental patients were found to be less likely to have one or more prescribing problems in any of the categories ($p = 0.05$), or in the appropriateness ($p = 0.02$), or dosage ($p = 0.05$) categories. A summary score, measuring the appropriateness of patients total drug regimen, indicated that the experimental patients' regimens were more appropriate than those of controls ($p = 0.01$). The findings of the study revealed that clinical pharmacists can improve the appropriateness of geriatric drug prescribing in outpatient settings

3. Kiel and McCord (2005) evaluated the pharmacist impact on clinical outcomes in a diabetes disease management program via collaborative practice. Medical records of 157 patients enrolled in the diabetes management program between June 2003 and April 2004 were retrospectively reviewed. Data collected included

baseline and follow-up values for glycosylated hemoglobin (HbA_{1c}) and lipids as well as frequency of adherence to preventive care, including annual foot and eye examinations and daily aspirin therapy.

Results showed that for patients with both baseline and follow-up data, the mean HbA_{1c} reduction was 1.6% (n=109; $p<0.001$). For patients with an initial HbA_{1c} of >8.5%, the mean reduction was 2.7% (n=57; $p<0.001$). The percentage of patients with HbA_{1c} ≤7.0% increased from 19% to 50% at follow-up ($p<0.001$). The mean low density lipoprotein (LDL) observed was 16mg/dL (n=73; NS) and the percentage of patients with LDL values ≤100mg/dL increased from 30% at baseline to 56% at follow-up ($p<0.001$) and the number of patients with annual eye and foot examinations increased by 27% ($p<0.05$) and 15% ($p<0.05$) respectively. The percentage of patients taking daily aspirin increased from 42% at baseline to 80% at follow-up ($p<0.01$). The authors concluded that pharmacist – coordinated diabetes management program was effective in improving clinical markers for enrolled patients.Significant improvements were observed in HbA_{1c} and LDL values as well as the frequency of adherence to preventive care.

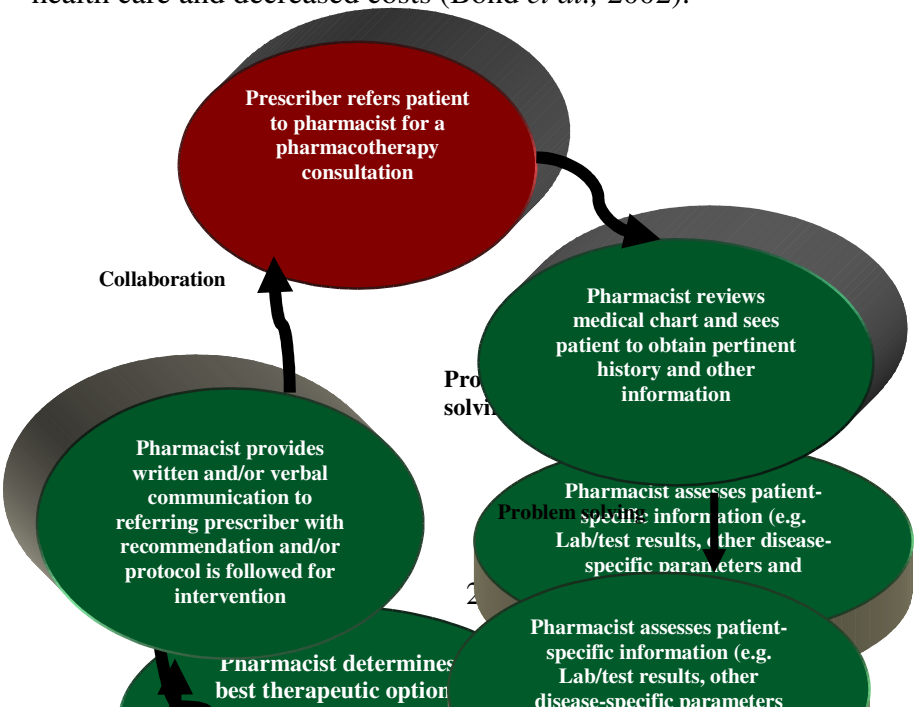
4. Bond and Raehi (2007) assessed the impact of clinical pharmacy services and pharmacy staffing on hospital mortality rates. A database was constructed from 1998 Med PAR, American Hospital Associations' Annual Survey of Hospitals and National Clinical Pharmacy Services databases consisting of data from 2,836,991 patients in 885 hospitals. Data from hospitals that had 14 clinical pharmacy services were compared with data from hospitals that did not have these services. Levels of hospital pharmacists staffing were also compared. A multiple regression analysis, controlling for severity of illness was used.

Results showed that seven clinical pharmacy services were associated with decreased mortality rates: pharmacist – provided drug use evaluation (4491 reduced deaths, p = 0.016), pharmacists – provided in-service education (10,660 reduced deaths, p = 0.037), pharmacist-provided adverse drug reaction management (14, 518 reduced deaths, p = 0.012), pharmacist – provided drug protocol management (18,401 reduced deaths, p = 0.017), pharmacist participation on the cardiopulmonary resuscitation team (12,880 reduced deaths, p = 0.009), pharmacist participation on medical rounds (11,093 reduced deaths, p = 0.021), and pharmacist–provided admission drug histories (3,988 reduced deaths, p = 0.001). Two staffing variables, number of pharmacy administrators/100 occupied beds (p=0.037) and number of clinical pharmacists/100 occupied beds (p=0.023), were also associated with reduced mortality rates. The authors concluded that the number of clinical pharmacy services and staffing variables associated with reduced mortality rates increased from two in 1989 to nine in 1998. The impact of clinical pharmacy on mortality rates mandates consideration of a core set of clinical pharmacy services to be referred in US hospitals.

5. While errors can occur in drug prescribing, dispensing and administration systems in hospitals, clinical pharmacy services do provide a check and balance against adverse drug events, if they are available. Indeed, Australian Safety and Quality Council noted that provision of clinical pharmacy service is a key strategy to reduce medication incidents. This perspective was further strengthened by an economic assessment of clinical services for 24,866 inpatient episodes in eight Australian public hospitals that identified that pharmacists initiated 1,399 changes to drug therapy or patient management and 1.1%of the changes were life saving (Bond *et al.,* 2002). In 16 studies conducted over a five year period,**Schumock *et al.,* 2003** reported that the results of most of

the studies provided evidence of economic benefit of Clinical Pharmacy Services. The Society of Hospital Pharmacists of Australia stated that all patients should have access to appropriate Clinical Pharmacy services as part of hospital based care because these services reduced the incidence of ADEs. However, due to lack of understanding about the benefits of clinical pharmacy and or lack of financial resources available to fund the services, not all patients have access to them. This situation according to the society was compounded by acute shortage of pharmacists working in hospitals (**SHPA, 2002**).

6. A US hospital study documented that 429,827 medication errors and 16,965 medication errors that adversely affected patient care outcomes occurred in the 1081 and 900 study hospitals respectively. Every dollar invested in clinical pharmacy services resulted in a cost reduction of US $16.70. The benefits were reported to include reduced length of hospital stays, ADRs, infection rates, law suits, drug and poison information, number of personnel to care for patients and thus increase the efficiency of health care and decreased costs (Bond *et al.,* 2002).



3.0 MY RESEARCH STORY

Mr. Vice-Chancellor, distinguished ladies and gentlemen, in this section I present some selected studies to illustrate my contributions and those of other researchers to the world of knowledge through research findings in the discipline of clinical pharmacy. My research works span through various aspects of pharmaceutical sciences and clinical pharmacy and are broadly classified into:

- Phytotherapy studies
- Clinical studies

3.1 Phytotherapy studies

Phytotherapy is the study of the use of extracts of natural origin as medicines or health promoting agents. Modern phytotherapy following the scientific method is considered to be the study of the effects and clinical use of herbal medicines. According to DaSilva*et al.*2002, the use of herbs to treat diseases is almost universal among non-industrialized societies. The World Health Organization (WHO) estimates that 80 percent of the population of some Asian and African countries presently used herbal medicine for some aspects of primary health care. Studies in the United States (US) and Europe have shown that their use is less common in clinical settings but has become increasingly more in recent years as scientific evidence about the effectiveness of herbal medicine has become more available (http://www.traffic.org/medicinal_plants/). Pharmaceuticals are very expensive for most of the world's population, half of which live on less than US$2 per day. In comparison, herbal medicines can be grown from seed or gathered from nature for little or no cost (DaSilva*et al.*, 2002).

The exact pathogenesis of ulcer continues to elude scientists and medical researchers, but a common ground has been proposed. Ulcers are produced when any factor causes an imbalance between the protective factors (mucus and bicarbonate) and aggressive factors (acid and pepsin) in the stomach (Del Valle *et. al.*, 2003;

Ojewole, 2004). Such factors could range from natural causes (gastric cancer), infections (*H. pylori*), lifestyle (drugs – Non-steroidal Anti-inflammatory Agents (NSAIDs), alcohol, stress, and cigarette smoking) (Berardi and Welage, 2005). Current treatment of ulcers in developing countries has been largely suppression of pain, with little or no strategy aimed at a cure. Herbal medicine is fast emerging as an alternative treatment to available synthetic drugs for treatment of ulcer, possibly due to lower costs, availability and perceived effectiveness.

Aspilia Africana C.D. Adams (Compositae) has been reported in literature to possess antimicrobial, hemostatic and anti-inflammatory activities (Okoli*et al.*, 2007). In south-eastern Nigeria, the leaves of this plant are claimed to be effective in the treatment of stomach ache and bleeding ulcers especially when taken as an aqueous decoction. We evaluated the anti-ulcer activity of the aqueous leaf extracts of this plant in comparison with omeprazole and sucralfate which are standard cytoprotective agents. The results of our study showed that the aqueous leaf extract of *A. Africana* possessed significant and dose-dependent antiulcer activity and so justified the claimed folkloric use (Ukwe *et al.,*2010a). The methanolic extract of *Picralimanitida* seeds was also investigated for its claimed anti-ulcer activity. The findings indicated that the seed extracts of *P. nitida* possessed potent antiulcer properties (Adibe *et al.*, 2010).

The plant *Picralimanitida*is widely used in West Africa for the treatment of ailments – as a remedy for all types of fever, for wound healing, ulcer, trypanasomiasis and for malaria. In one of our studies on this plant, we evaluated the hypoglycemic effect of the aqueous seed extract of *P. nitida* using alloxan-induced hyperglycemic rabbits. The pharmacological investigation of the extract showed that the plant extract caused significant reduction in the blood sugar levels in hyperglycemic rabbits. In the alloxan-induced diabetic rabbits, the extract produced marked reduction in blood sugar level within one hour post administration which reached its peak action by the sixth hour post administration. We concluded that *P. nitida* though a crude drug, exhibited a faster

onset of action and more persistent in hyperglycemic situation than the standard drug tolbutamide. This finding qualified the plant extract to be used in ethnomedical diabetic management.

Ukwe and Aguwa (2006a) investigated the effects of herbal medicines on the outcome of pregnancy in 1,620 pregnant mothers in four health centers around Nsukka. The objectives of our study were to determine the incidence/prevalence and reasons for use of herbal medicines during pregnancy, identifying the specific plant materials used and the probable adverse effects to the fetus and mothers. The results obtained showed that the majority of the women (90.43%) took herbal medicines concurrently with routine antenatal drugs like vitamins and ferrous sulfate. Some of the reasons for taking herbal medicines included to ensure retention of pregnancy, to reduce the weight and "head size" of the fetus and have pain-free labour and vaginal delivery. Some of the identifiable remedies included; stem-bark of "Dogonyaro" macerated in water or alcohol, and Tetrapleura (Oshobo) fruit decoction. A total of 250 deliveries had complications which included placenta previa, prolapsed cord, severe hemorrhage and prolonged resuscitation. We concluded that the use of herbal medicines in this study had adverse effects on the outcome pregnancy and recommended intervention strategies to reduce these negative outcomes which border on education specifically targeted on the herbalists, traditional birth attendants and the nurses.

Some of our other published researches done in phytotherapy are presented in Table 3.

Table 3: Some researches in phytotherapy/natural remedies

S/No	Title of Study	Result	Reference
1.	Pharmacological and toxicological study on methanol extract of *P. staudtii*	Methanol extract of *P. staudtii* had smooth muscle relaxant, antispasmodic and anti-ulcer activity	Aguwa and Ukwe, 1991

2.	Pharmacological studies of active principles in the leaves of *P. staudtii*	*P. staudtii* leaves contained triterpenoidssaponins, flavonoids and alkaloids which possessed significant anti-spasmodic and muscle relaxant activity. Also reduced blood pressure of anaesthetized cats. Justify traditional use for treatment of gastro-intestinal disorders in man.	Aguwa and Ukwe, 1996
3.	Gastro intestinal activities of *Sterculiatragacantha* leaf extracts	Aqueous and methanolic extracts of *S.tragacantha* showed significant anti-ulcer activity in rats ulcer induced by indomethacin, stress and reserpine.	Aguwa and Ukwe, 1997
4.	Preliminary evaluation of the antiulcer activity of aqueous extract of *Stylochitonbarteri* in rats	Aqueous extract of *S. barteri* was effective against experimentally induced gastric ulcers in rats. Provided confirmation of claimed medicinal benefits by herbalists and their patients in treatment of gastrointestinal disorders	Ukwe, 1998

5.	Evaluation of anti-ulcer activity of aqueous stem-bark extract of *Hymenocardiaacida*	Glycosides, saponins and tannins in the plant extract demonstrated dose-dependent and significant anti-ulcer activity	Ukwe, 2004
6.	Anti-ulcer activity of aqueous leaf extract of *P. americana*	Flavonoids, saponins, and tannins in plant extract possessed significant anti-ulcer activity in rats and justified its use as natural remedy.	Ukwe and Nwafor, 2004
7.	Evaluation of the anti-ulcer activity of aqueous root extract of *P. staudtii*	Extract produced significant and dose dependent anti-ulcer activity against experimentally induced ulcers and justified use in traditional medicine.	Ukwe, 2005
8.	Antiulcer properties of aerial parts of *F. mooreana*in experimental animals	Extracts significantly protected rats against ulcers induced by different ulcerogens and finding of study justified use in the treatment of peptic ulcer in Nigerian folk medicine	Ukwe and Nwafor, 2006
9.	The anti-inflammatory effects of the aqueous extract of root of *D. gangeticum*	Findings verified the pharmacological basis of claims by herbal medicine practitioners.	Udeogaranya, Okonta and Ukwe, 2006

		Aqueous extract of *D. gangeticum* compared favourably to aspirin.	
10.	The anti-inflammatory effects of aqueous extract of the whole plant of *P. amarus*	Findings of study confirmed use of plant extract in treatment of acute inflammation	Ukwe *et al*., 2006a
11.	Evaluation of the antiulcer activity of *O. subscorpioidea*	Root extracts of the plant possessed anti-ulcer properties against ulcers produced by necrotizing agents by possible cytoprotective mechanism	Ukwe *et al*., 2010b
12.	Anti-ulcer activity of roots of Zapotecaportoncensis (*Fam. Fabiaceae*)	Results showed that root extract of the plant possessed significant and dose-dependent ulcer inhibition which corroborated its possible cytoprotective effect	Ukwe *et al.*, 2010c
13	Hypoglycemic activity of leaves of *Acanthus montanus*in rats	The study suggested that the methanolic extract of the plant possesses a hypoglycemic effect	Ukwe and Ubaka, 2011

3.2 Clinical studies

The clinical research group of the department has increased in productivity majorly due to its research collaboration with hospital

and community pharmacists and physicians. I have used a combination of postgraduate and residency teaching with practice research to help develop new patient services. The clinical pharmacists in the academia have founded the clinical role model mainly through hospital pharmacy. The hospital environment has more easily provided a suitable learning environment with ready access to clinical data and multi-disciplinary cooperation. Conducting quality research has been evidently difficult for clinical pharmacists in our department because ideally our Faculty does not belong in Nsukka campus, but God has been our "Ebenezer".

3.2.1 Pharmacy education and practice

Pharmacy schools in Nigeria generally offer a five year program for a Bachelor of Pharmacy degree. However, there is only one school of pharmacy whichoffers a six-year Doctor of Pharmacy program inclusive of an extra year of residency and experiential training for pharmacy students. But as earlier mentioned, Pharm.D has become the professional entry qualification in many other countries such as the US and Canada.

In a quest to improve the implementation of pharmaceutical care in Nigeria, authors have suggested that pre-service training of pharmacy students on the philosophy and contents of pharmaceutical care be taught during the undergraduate curriculum. As a first step, our research group conducted a preliminary pre- and post- assessment survey. The study evaluated the attitudes of final year pharmacy students towards pharmaceutical care before and 8 weeks after a clinical clerkship course. Findings from the study showed that the clerkship course improved students' attitudes towards areas concerning professional duty and the authors recommended that other areas not improved be emphasized by preceptors (Ubaka *et al.*, 2012).

We went further beyond measuring students' attitudes towards pharmaceutical care to evaluate pharmacy students' preparedness to provide pharmaceutical care when they get into practice. The clinical clerkship course was first modified to reflect the current

teaching methodologies of clerkship in contemporary pharmacy education. Pharmacy students were asked their readiness to provide different PC services just before the commencement of the modified clerkship course and after its conclusion. Results of the study revealed that the students' preparedness to provide PC services improved over the course of clerkship course (Ubaka and Ukwe, 2015)

To further improve the performance of pharmacy students in the country, we assessed different cognitive constructs that might influence academic performance of pharmacy students. The nationwide, multi-center survey has been accepted for publication in the prestigious 80-year old journal, *American Journal of Pharmaceutical Education*. The study entitled,"Cognitive determinants of academic performance in Nigerian Pharmacy Schools", was conducted among 1,613 students in seven schools of pharmacy. The cognitive factors measured included test anxiety, academic competence, test competence, time management and strategic study habits. The results showed that pharmacy students with higher performances tended to be less anxious, were academically competent and efficient time managers (all, $p \leq 0.002$). Female students were more likely to employ better study habits than their male counterparts ($p < 0.001$). We concluded that test anxiety, academic competence, test competence and time management skills significantly influence performance in Nigerian pharmacy students and could also help discriminate between students who score low compared to high grades. The study further demonstrated the significant effects of age, gender and marital status on test anxiety, time management and studying habits (Ukwe *et al*., 2015).

3.2.2 Pharmaceutical Services

Pharmaceutical services, an indispensable component of any healthcare service are assets in the nation's development as wealth is created by accessing them. Comprehensive pharmaceutical services have been developed and rendered in many countries

around the world in teaching as well as community hospitals. The dividends of clinical pharmacy services have also been well documented. The impact of the services on DTPs and rational use of drugs in patient care cannot be overemphasized. In one of our works, we evaluated the quality of pharmaceutical services in Nigeria's teaching hospitals with the main objective of determining the impact of clinical pharmacy development in Nigeria. The study purposefully chose eleven (11) federal government owned teaching hospitals, two from each of the five health zones South-east, South-west, South-south, North central, North west and one from the North east zone. These hospitals are primarily funded by the Federal Government and some are centers for medical and pharmaceutical excellence. The results of the study revealed the following:

- Key clinical pharmacy services like drug therapy monitoring, clinical pharmacokinetic service, intravenous drug delivery, drug use evaluation and outcome research were not rendered in almost all the teaching hospitals.
- Patient medication profile was not used except by pharmacists in two hospitals who use it for monitoring inpatients only.
- Patient education and counseling were rendered verbally by the majority of pharmacists only during dispensing but there were no private counseling rooms for such services in almost all the hospitals.
- Except in two teaching hospitals, the majority of the other hospital pharmacists do not participate in medical or pharmacy rounds and have no direct contact with the inpatients, but their opinion is sometimes sought regarding drug related problems.

We concluded that comprehensive pharmaceutical services were yet to be developed and rendered in Nigeria's teaching hospitals and that though some services were rendered, the quality was low and unsatisfactory. Hospital pharmacists may perform better if they are provided with improved conditions of service, adequate infrastructure and funding(Ukwe and Aguwa 2007).

In another related study, we investigated the knowledge and attitudes of pharmacists in Nigeria's tertiary hospitals toward the reporting of adverse drug reactions (ADRs). The results showed that most of the respondents (85.71%) were not aware of any organized ADR reporting in Nigeria's tertiary hospitals. Although 93.50% of the pharmacists agreed that it was necessary to report ADRs, a very insignificant proportion (5.10%) had actually done so in the previous year. There appeared to be a relationship between ADR reporting and the length of practice and work load. We concluded that there was need for continuous effort to promote ADR reporting and pharmacovigilance in our tertiary hospitals (Ukwe and Aguwa, 2006b).

3.2.3 Drug utilization studies

Cutaneous ADRs to drugs are among the most frequent complications of therapy. Severe drug-induced cutaneous reactions include the Stevens Johnson syndrome (SJS) and toxic epidermal necrosis (TEN), two related mucocutaneous disorders with high rate of morbidity and potential mortality. Ukwe *(2005)* published a case report of a 15 year old female of Nigerian origin who was admitted to Bishop Shanahan hospital, Nsukka for painful ulcers in her mouth, skin eruptions, targetoid lesions located mostly in the head, chest, trunk, erythemous papules and bullae. Erosions in oral mucosa and lips, severe conjuctival were also detected.

Her medical history was non-revealing as that was her first hospital admission. The patient (through the mother) denied being treated for any medical condition with any agent. One week prior to admission, the patient complained of body pains and headache. She went and bought two tablets of "buta" (phenylbutazone) which she ingested at the "chemist". Five days later her conjunctivae became swollen and painful. Skin and mucous membrane eruptions developed. The next day, the bullous eruptions had covered her eyes, neck, mouth, breast, abdomen, thighs and back. She began to experience visual disturbances, difficulty in breathing and opening her mouth. At this point, she was rushed to the hospital. Physical examination of the patient on admission

revealed erosions and crusts on the lips. The lesions were bullous and later ruptured oozing out fluid and blood. The vital signs were: temperature 38.5^{o}C; pulse 100, respiration 30 and blood pressure 100/60 mmHg. The clinical diagnosis of SJS was made by the consulting physician. Laboratory investigations, including complete blood count, liver function test, erythrocyte sedimentation rate, urine analysis and chest x-ray were all within normal limits. The patient was managed with pharmacotherapy which included potent intravenous antibiotics, hydration with dextrose 5% in saline, promethazine, intravenous cimetidine, multiple vitamins, analgesics, Vitamin C and later prednisolone. The patient gradually improved and after four weeks of hospital care, she was discharged in good condition.

SJS is a hypersensitivity reaction which may develop abruptly, and infections and drugs especially nevirapine(an anti-retroviral drug), penicillins, phenytoin, barbiturates, sulfonamides, rifampicin, phenylbutazone and salicylates are frequently implicated as etiological factors (Dahl, 1990; Frieden, 1996;Yalcin and Karaduman, 2000; Ukwe and Ekwunife, 2012). However, in some of the cases reported, proof that a specific agent is responsible for the syndrome is difficult, especially when many medications have been used by the patients. In this case, phenylbutazone popularly known as “buta” which the patient claimed was the only drug she purchased and ingested at the “chemist” store might be associated with this adverse drug reaction, but the only simple but dangerous way to prove this might be to re-challenge the patient with phenylbutazoneto observe whether there would be a re-occurrence, but this might be hazardous to the patient. Skin biopsy might be critical for accurate and definitive diagnosis, but it is not usually an emergency department procedure, and in this case it was not performed. Phenylbutazone, a drug that has been banned in many countries of the world due to its serious adverse effects is still very available at all nooks and crannies of Nigeria. This might be attributed to the serious drug distribution problems encountered. Moreover, many Nigerians practice irresponsible self-medication and ADRs resulting from such practices are neither reported nor

documented. This was the first case report of SJS associated with phenylbutazone in the hospital. SJS associated with indigenous herbs was reported in 1981. The author concluded that rapid recognition of severe reactions to drugs is essential, because prompt withdrawal of the causative drug is the most important action to decrease morbidity and mortality. Education and counseling of patients by clinical pharmacists on what drugs they cannot take, calling on the pharmacist whenever they start a new prescription and on the dangers of irresponsible self-medication might be steps in the right direction.

Hypertension is a silent killer and is a frequently encountered chronic medical condition. It is one of the most significant risk factors for cardiovascular morbidity and mortality. Developing economies like Nigeria struggle to maintain a qualitative healthcare sector and usually find it difficult keeping up with international standards of medical care. Hypertension management is for life but many including some healthcare providers do not know this fact. We evaluated the pattern of antihypertensive drug prescribing in outpatients aged 18years and above attending the hypertensive clinic of University of Nigeria Teaching Hospital (UNTH). The results showed that 19.7% of patients had diabetes and 14.3% had hypertensive heart disease co-morbidities respectively. Of the 19.7% that were diagnosed of diabetes, only 8.0% knew they were diabetic and were on antidiabetic drugs. The average number of antihypertensive drug per patient was 2.63 ± 0.92 and 90% of the patients were prescribed more than one drug in their last visit. The study concluded that hypertension in UNTH was being treated with more than one drug in most patients, especially the elderly. Lisinopril and hydrochlorthiazide were the most prescribed drugs and there is an increasing trend of prescribing angiotensin converting enzyme inhibitors (ACEIs), diuretics and fixed-dose combination formulations (Ukwe and Ubaka, 2012).

The policy of permitting self-care of minor illnesses often results in misuse/abuse of drug in Nigeria. We examined the scope of misuse/abuse of some OTC analgesics by people treating pains of

minor illnesses. Randomly selected adults presenting at community pharmacies, government hospitals and clinics in Federal Capital Territory (FCT) Abuja with pains of minor illnesses were involved in this cross-sectional survey. The results showed that 20.65% of respondents on acetaminophen (paracetamol) and ibuproten exceeded the maximum dose per day, while 30.45% suffered ADRs resulting from drug overdose. A quarter used analgesics once daily, 17.84% twice daily and 14.72% thrice daily, 16.03% of whom were combined analgesic misusers/abusers. Although 10.1% of respondents agreed that analgesic misuse/abuse was risky, 66.03% were not aware of the risks involved. About 33.33% of respondents remained indifferent and 28.59% took analgesics for ailments unrelated to their indications. We concluded that the status of most OTC analgesics be changed to prescription only medications sold by pharmacists rather than retail outlets (Okpalugo *et al.,* 2010). The public is strongly encouraged to seek non-pharmacological methods of pain relief before using analgesics.

3.2.4 Public health pharmacy

Globalization, urbanization, trends towards unhealthy diets, obesity, sedentary lifestyles and unhealthy habits are public health problems resulting in an increased burden of chronic non-communicable diseases such as diabetes, cardiovascular and lung diseases, cancer and psychiatric disorders and their associated risk factors. Balanced diets are no longer considered in the diets of children as most mothers feed their children with fast foods and artificially flavoured drinks. Public health is concerned with prevention of ill-health at three levels. Primary prevention involves activities and actions aimed at preventing people from contacting a disease, while secondary and tertiary prevention are important to reduce complications, morbidity, disabilities and death as well as improve the quality of life of individuals. The community pharmacist is a key primary care provider recognized by WHO and provides screening services that actively improve the health of individuals and communities. Health promotion,an integral part of

pharmaceutical care, which is a public health strategy has been defined operationally as a style of pharmacy practice in which the clinical pharmacist teams up with individuals and communities to improve their health status (WHO, 1997; Pharmaceutical Society of Australia, 2006). Whenever and wherever a pharmacist takes actions or provides services that actively improve the health of individuals and communities thereby empowering them to have increased control over their health, he is involved in health promotion. Health promotion activities may sometimes be drug-related but the majority of activities do not necessarily have to do with medications.

Population Group	Health promotion Activities
Infants and Pre school	Promoting and encouraging immunization/ immunization advocacy. Determination of immunization needs. Promoting proper handling and storage of vaccines. Ensuring availability of good quality vaccines. Immunization delivery/vaccine administration. Promoting breast feeding, resolving obstacle to adoption of breast feeding by mothers, resolving problems associated with breast feeding. Resolving teething problems. Providing guidance on infant feeding, formula feeding, weaning diet, proper infant nutrition, and safe use of medicines.
School Age, Adolescents and Teens	Promoting dental health, promoting good nutrition at home and in school. Promoting sugar-free products. Encouraging increased physical activity. Determination of adolescent immunization status and promoting appropriate immunization in this age group. Promoting safe sex practices

	including abstinence. Providing and encouraging emergency contraception. Substance abuse reduction. Stop smoking services. Chlamydia screening and treatment. HIV/AIDS education-encourage screening, counsel cases, promote adherence to HAART where appropriate.
Female population, Child bearing age and others	Promoting breast feeding, folic acid supplementation, family planning. Encourage breast self-examination, breast cancer awareness, calcium/vitamin D supplementation, pap screening (cervical smear), and osteoporosis awareness.
Elderly	Encourage self-care, Teach self-management of chronic diseases in collaboration with physicians. Promote adherence to medication. Increase awareness of and provide mobility aids, incontinence aids etc. Promote proper nutrition.
General Population	Obesity management, promote healthy eating, increase physical activity. Teach stress reduction techniques. Promote, advocate adult immunization. Vaccinate adults. Education on travel health. Sign posting to other health care experts/services.

Table 4: Pharmacy health promotion activities among different population groups

Source: Azuka C. Oparah: Models of Pharmacy practice in: Essentials of pharmaceutical care, 2010 p. 141

As the most easily accessible healthcare provider, who in many cases is the first point of contact with the healthcare system, the community pharmacist is especially suited for health promotion activities. He enjoys the confidence of members of the public as many persons both healthy and sick consult community pharmacists on daily basis for advice on a wide range of health issues, including medication related problems.

Ukwe, *(2007)* carried out a study of Enugu community pharmacists' activities in primary health care delivery to describe and evaluate the quality of their involvement in health promotion in line with global current trends of pharmacy practice. Results revealed that the respondentsscored 3.22 on a 4-point scale on their involvement in advising and educating patients. On assessing the quality of their involvement in health promotional activities, they had a total mean score of 2.58 indicating a slightly satisfactory performance. The study concluded that community pharmacists in Enugu participate in primary health care delivery and have been fairly involved in health promotional activities.

Primary healthcare delivery, a corner-stone strategy for the attainment of level of health that will permit socially and economically productive life has health promotion as an integral part (Oparah and Arigbe-Osula, 2002). It is well recognized that community pharmacists belong to this level of health system and as such play a major role in providing clinical/pharmaceutical services to both the sick and healthy public. Proper integration of community pharmacists into primary healthcare program will improve the quality of health in the country. Ukwe *et al*, 2006 evaluated the involvement of community pharmacists in the pharmaceutical care of hypertensive patients in Federal capital territory, (FCT) Abuja. All the community pharmacists in FCT Abuja at the period of study were included in the survey. The

results revealed that community pharmacists in FCT, Abuja provide pharmaceutical care to hypertensive patients. About 70% of them recognized hypertension based on consistently elevated blood pressure reading as specified by JNC-7 report. The pharmacists detected and resolved DTPs like wrong drug prescribed for patients, dose too high to be safe, unfavorable drug interactions, drug affecting sexual and social function and inappropriate adherence. They actively participated in advising patient on lifestyle modification. We concluded that community pharmacists in FCT, Abuja were actively involved in the pharmaceutical care of hypertensive patients.

Lastly in our public health pharmacy researches, we evaluated the level and predictors of discriminatory attitudes of pharmacy students and pharmacists towards people living with HIV/AIDS (PLWHA). Pharmacists had less negative perceptions than students towards PLWHA, and having a poor knowledge of HIV/AIDS and the level of professional training among pharmacists were associated with discriminator attitudes towards PLWHA (Ubaka *et al*., 2014)

3.2.4 Pharmaceutical care in chronic diseases

3.2.4.1 Diabetes mellitus

Diabetes is a chronic progressive endocrinological disorder of carbohydrate, protein and lipid metabolism characterized by elevated levels of glucose in the blood due mainly to absolute insulin deficiency (in Type1) or relative deficiency and insulin resistance (in Type2). Globally, the number of people with type 2 diabetes is rising rapidly. This rise is associated with population growth, economic development, ageing populations, increasing urbanization, dietary changes, obesity, reduced physical activity and changes in other lifestyle patterns (WHO, 1994; King *et al*; 1998). In Africa with a diabetes census of 15 million, cases are expected to almost double over the next 20 years.Sadly, about 81.2% of people in the region do not even know they are living with the disease (International Diabetes Federation, 2012). In Nigeria with a national prevalence of 4.83%, over 3 million people

are currently living with diabetes. Diabetes is one of the major causes of morbidity and mortality; it has a significant impact on the patients' quality of life, productivity and involves enormous health costs for virtually every society. One in twenty adult in developing countries have diabetesrelated complications (Roglic *et al*., 2005), with Africa having the highest mortality rate due to diabetes. Complications due to diabetes such as retinopathy, nephropathy, neuropathy and atherosclerotic changes are implicated in disability, increased cost of care, reduced quality of life and death. Most of these medical problems can however be prevented with proper self-care as emphasized in the standard treatment guidelines of Nigeria (FMOH, 2008). For effective management of diabetes, patients must be actively involved in their care. According to Inzucchi(2011), a well informed patient will have the best advantage to attain and maintain glycemic and cardiovascular risk factor control.

We assessed the knowledge of self-care practices, as well as factors responsible for such knowledge among Type 2 diabetes patients in two states of Nigeria. The findings of the descriptive cross sectional survey revealed that diabetes self-care knowledge was generally high among the population studied. Educational status, monthly income, duration of diabetes and negative attitude to disease condition predicted knowledge level (Jackson *et al*., 2014).

Several randomized controlled studies have shown that pharmaceutical care interventions developed and implemented by clinical pharmacists in collaboration with other healthcare team members improve the quality of care of both ambulatory and hospitalized patients with a variety of chronic diseases such as hypertension, dyslipidemia, diabetes and in the management of major risk factors for cardiovascular disease prevention. In one of our studies, we investigated the clinical and humanistic outcomes of pharmaceutical care interventions in Type 2 diabetic patients attending the outpatient Diabetology clinic of the Federal Medical Centre, Abakaliki. Intervention group patients received pharmaceutical care from the clinical pharmacists, whereas the

control group patients received their usual care from the hospital.The primary outcome measure chosen was change in glycosylated hemoglobin (HbA_{lc}).Results showed that there were reductions in mean values ± standard deviation (at baseline vs. 6 months) of BMI (kg/m^2) [29.94 ± 5.36 vs. 27.97 ± 3.96], HbA_{lc} (%) [9.07 ± 2.58 vs 7.16 ± 1.61], LDL-C (mg/dL) [91.14 ± 55.54 vs. 58.42 ± 56.87] and 10 years CHD risk (%)[12.79 ± 9.01 vs. 10.33 ± 7.06] in the intervention group vs. control group respectively. About 82.6% of DTPs were resolved in the intervention group patients. Counterfeit medication problems accounted for about 22.5% of the causes of ADR therapy problems resolved in the intervention group patients. We concluded that pharmaceutical care instituted resulted in better glycemic and lipid control, reduced cardiovascular risk scores and improved quality of life in Type 2 diabetes patients over a six-month period in the intervention group patients (Ukwe *et al*., 2013a).

A related study comparing the effects of an additional pharmaceutical care (PC) intervention versus usual care (UC) on clinical outcomes of Type 2 diabetes patients in Nigeria was conducted in two University teaching hospitals. The study was a randomized, controlled and longitudinal study with a 12-month patient follow-up. The additional pharmaceutical care included a step-wise approach; setting priorities for patient care, assessing patients' specific educational needs and identification of DTPs; development of a comprehensive and achievable pharmaceutical care plan in collaboration with the patient and the doctor, implementation of this plan, monitoring and review of the plan from time to time. At the end of 12 months, there were significant reductions in the following clinical outcomes (control vs intervention group); HbA_{lc} (%)and fasting glucose (mg/dL) (both $p< 0.0001$). The additional pharmaceutical care intervention resulted in beneficial improvement of the clinical outcomes over usual care in the following areas: HbA_{1c}, glycemic control, blood pressure control, and lipid profile. The findings of the study indicated a convincing rationale for improving the standards of

care for patients with Type 2 diabetes through pharmaceutical care intervention (Adibe *et al*., 2014).

Chronic medical conditions like diabetes can impact multiple dimensions of health-related quality of life (HRQoL) and increase the risk of heart disease and stroke. Because comorbidities are prevalent in diabetes, it is unlikely that the HRQoL associated with diabetes would be limited to the condition itself. Indeed, the presence and severity of complications or comorbidities have been associated with depression, anxiety, and impairment on multiple dimensions of HRQoL in diabetes. The complex nature of diabetes management prompted the Nigerian Ministry of Health to come up with a standard treatment guideline to streamline the process of diabetes management and what service the patients should receive. We evaluated the impact of pharmaceutical care (PC) intervention on HRQoLof patients with Type 2 diabetes.

The study was a randomized, controlled study with a 12-month patient follow-up. A total of 110 patients were randomly assigned to each of the "intervention" (PC) and "control", usual care (UC) groups. Patients in the UC group received the usual/conventional care offered by the hospital. Patients in the PC group received UC and additional PC for 12 months. Results showed that the overall HRQoL (0.86 ± 0.12 vs 0.64 ± 0.10; $P < 0.0001$) and single attributes except "hearing" functioning of the patients were significantly improved at 12 months in the PC intervention arm when compared with the UC arm. We concluded that the addition of PC to UC improved the quality of life in patients with Type 2 diabetes (Ukwe *et al*., 2013b).

3.2.4.2 Hypertension

In a study on hypertension, we evaluated the effects of pharmaceutical care program on blood pressure and quality of life of patients who visit a Nigerian community pharmacy. Hypertensive patients visit community pharmacies to refill their prescriptions and thus community pharmacists have the potential to institute a pharmaceutical care process which comprises the detection, prevention and resolution of drug therapy problems

(DTPs). The single site study was carried out in Port Harcourt, River State and the largest oil producing state in Nigeria. The 10-month study comprised five months of usual care and another 5 months of pharmaceutical care (PC). During the first five months of usual care period, recruited patients had contact with the pharmacy to refill their prescription or to measure their blood pressure (BP). The fifth month of usual care was used as baseline. PC was instituted for another five months after the usual care utilizing the stipulated steps of good PC practice. During this period, patients also had face-to-face, goal directed medication and lifestyle counseling once every month and were provided with an educational material. They were taught how to take BP readings and encouraged to buy BP measuring apparatus. Patients who smoked were encouraged to quit smoking and all patients were encouraged to indulge in aerobic exercise, particularly to take at least 30 minutes walk at least three times a week. Adherence to salt restriction and medication was also promoted, andalcohol moderation recommended. Clinical and medication-related data were sent to the patient's physician as the need arose. Positive results were obtained in the various outcome measures. After PC implementation, more of the patients exercised frequently. Many of them became aware of salt restriction and they complied well. Evidence from clinical trials have shown that systolic BP reductions of 2-8mmHg can be achieved with restricting sodium intake to ≤2.4g/day. The subjects also complied with alcohol moderation. We concluded that PC program for hypertensive patients from a community pharmacy in Port Harcourt, Nigeria produced beneficial reduction in blood pressure and improved their health related quality of life (Ekwunife *et al*., 2008).

3.2.4.3 HIV/AIDS

HIV/AIDS is a major public health problem, especially in sub-Saharan Africa where the greatest burden of the disease is felt. About 35.3 million people live with HIV infection globally, out of which 25 million reside in sub-Saharan Africa. Nigeria has the third largest number of people living with HIV/AIDS (PLWHA) after South Africa and India. The last surveillance report of

HIV/AIDS put a national prevalence rate at 4.1% in 2010. There is uneven national spread of HIV infection in the country with Kebbi state having the least (1.0%) and Benue state the highest (12.7%) of the 36 states. Females account for 58% of the HIV cases while the distribution among age groups showed that younger people (15-34 years) accounted for about 68% of the national HIV prevalence (FMOH, 2011). At present antiretroviral therapy (ART) is the only modality of treatment to prolong life and improve the quality of life of PLWHA. However for ART to be effective, it requires life-long use with high level of adherence and so adherence to ART is apparently the greatest challenge to the individual patient and it determines the success of an ART program. Several studies have shown that pharmacists' intervention lead to improved outcomes and decreased costs in HIV-infected patients. Patient satisfaction to pharmaceutical care service has been considered an important component when measuring health-outcomes and quality of care, and a satisfied patient is more likely to develop a deeper and long lasting relationship with his healthcare provider, leading to improved adherence, continuity of care, and ultimately better health outcomes. We assessed HIV-infected patients' satisfaction with pharmaceutical services in six ART treatment centers in south-eastern Nigeria in HIV-infected patients between the ages of 15 and 65. The results showed that there was a high level of patient satisfaction with the pharmaceutical services provided to HIV-infected patients in the six treatment centers and that married respondents were more highly satisfied than the unmarried and the divorced (Okoye *et al*., 2014). In another study on HIV/AIDS, we evaluated the implementation of post exposure prophylaxis (PEP) and prevention of mother-to-child transmission (PMTCT) guidelines by retrospectively reviewing the data of patients who accessed PEP and PMTCT services from the APIN-CDC clinic of the University of Nigeria Teaching hospital Ituku/Ozala, Enugu. The results showed that 33 individuals were enrolled into PEP during the study period. About 57.58% of the enrollees were due to occupational exposure, 6.06% of them were due to non-

occupational exposure and 36.36% did not have the nature of their exposure indicated. The majority of the PEP cases (69.7%) received zidovudine + lamivudine (AZT + 3TC) as anti-retroviral therapy. Only one out of the 33 enrollees had the HIV antibody test conducted at the first, third and sixth months of the commencement of the PEP, and none of the enrollees was later enrolled into HAART after the PEP. Three hundred and seventy three (373) pregnant women (with a mean age of 30.22 ± 4.88) were enrolled into PMTCT and 367 children who resulted from the pregnancies were also enrolled. Ten ART regimens were used for the mothers, with AZT/3TC/NVP, TDF/3TC + NVP and AZT/3TC + EFV accounting for 80%. Their pre-PMTCT status significantly ($p< 0.05$) determined the regimen received by the pregnant women. At the end, 2.18% of the infants tested positive for HIV DNA-PCR.We concluded that APIN/CDC clinic UNTH implemented the PEP and PMTCT according to the stipulated standard guidelines and the findings indicated effective prophylaxis against HIV/AIDS. Nevertheless advocacy was recommended to improve the follow-up rate of PEP enrollees and the adherence level of the PMTCT enrollees (Ukwe and Isah, 2014).

Because drug adherence is a crucial determinant in the success or failure of highly active antiretroviral therapy (HAART), in one of our studies, we examined the knowledge and use patterns of some HAART regimens in the management of Human Immunodeficiency Virus (HIV) disease. Randomly selected HAART-experienced people living with HIV/AIDS presenting at five government hospitals in Abuja and the healthcaregivers involved in a non-experimental cross-sectional survey. The results obtained showed that knowledge of the accurate use of HAART-regimens was low amongst the respondents and healthcare givers. Management of new infections with high viral load, metabolic complication and HAART-failure was poor.Surrogate marker follow-up seemed very low (20%), and respondents' beliefs and knowledge of the disease socio-demographics and dosage form of antiretrovirals(ARVs) strongly influenced adherence. Problems of

mal-dosing/combining of regimens and drug interactions were resolved and 58.49% of respondents were non-adherent. We concluded that readiness to initiate HAART was assessed independent of motivation, and the adverse drug events (ADEs) of ARVS were not documented at pharmacovigilance centres. The inadequate knowledge of the proper use patterns of HAART-regimens seen in both respondents and healthcare givers calls for better diagnostic and educational tools to prevent further mismanagement of the ARVs, slow viral mutation and halt HAART regimen failures plaguing the Nigerian populace (Ukwe *et al*., 2010d).

3.2.5 Pharmaceutical care in malaria

Malaria is a major public health problem and a negative factor in the socioeconomic development, particularly in sub-Saharan Africa. It results in significant medical and socio-economic burden in endemic regions of the world. For example, it has been reported that about 300 – 500 million clinical cases of malaria occur every year, resulting in over one million deaths, particularly in under five year old children. Every 30 seconds that ticks, a child dies of malaria in Africa. Where malaria thrives, people suffer and economies are drained. Malaria thwarts children's cognitive development and education, and adults' ability to make a living and care for their families. At a country level, it impacts on trade, tourism and foreign direct investment (WHO, 2004b). Over 50 million pregnancies are threatened by falciparum malaria.Falciparum malaria is an important contributor to maternal morbidity and perinatal morbidity and mortality. In areas of Africa with stable malaria transmission (e.g. Nigeria), P. falciparum infection during pregnancy is estimated to cause as many as 10,000 maternal deaths each year, contributes to approximately 2 to 5% of maternal anemia, 8 to 14% of all low birth weight infants (an important contributor to infant mortality), and 3 to 8% of all infant deaths. In Nigeria, malaria accounts for 50% of all outpatient visits, 10 to 30% of all hospital admissions (FMOH, 2004). The role of clinical pharmacists in the treatment, control

and prevention of malaria can never be overemphasized. The hospital, community, academic and administrative pharmacists all play important roles in ensuring that the unacceptable burden of malaria is reduced drastically in our environment through the regular supply of good quality drugs, insecticide treated nets (ITNs), efficacy monitoring, awareness campaigns and other malaria related public healthcare program.

Treatment of malaria

Before presenting our research works on malaria, it is pertinent to state that malaria has continued to be a major public health problem because everybody diagnoses and tries to treat it but not many treat it appropriately. Drug treatment option for malaria is based on whether the patient has acute uncomplicated or severe malaria. Uncomplicated malaria is defined as symptomatic malaria without signs of severity or evidence of vital organ dysfunction. In acute falciparum malaria there may be a continuum from uncomplicated to severe malaria, especially when there is a delay in treatment or when not adequately treated. Sometimes, however, especially in children, severe malaria may develop very rapidly. A patient with severe falciparum malaria may present with confusion or drowsiness with extreme weakness. In addition, the following may develop:

- Cerebral malaria defined as unarousable coma not attributable to any other cause in a patient with falciparum malaria.
- Generalized convulsions, severe normocytic anemia, hypoglycemia, metabolic acidosis with respiratory distress, fluid and electrolyte disturbances, acute renal failure, acute pulmonary edema, circulatory collapse, shock, septicemia, abdominal bleeding, jaundice, hemoglobinuria, high fever and hyper-parasitemia.

The recommended anti-malarial treatment for acute uncomplicated falciparum malaria in Nigeria is artemisinin-based combination therapy (ACT). This is because of the high level of treatment failures due to growing resistance to the limited number of antimalarial drugs available. ACTs take advantage of the rapid

blood schizontocidal properties of artemisinin and the long half-life of the partner drug e.g. lumefantrine.

For children and adult non-pregnant, the recommended ACTs are: Artemether-lumefantrine (20mg/120mg respectively), a 3-day six-dose regimen, based on body weight. Artemether-lumefantrine should be taken with fatty meal to ensure maximal bioavailability and concurrent administration with Vitamin C should be avoided.

For pregnant women, the National treatment guideline recommends the use of quinine for the management of both uncomplicated and severe malaria in all trimesters, especially in the first trimester while ACTs are to be used for uncomplicated malaria both in the second and third trimesters (FMOH, 2005).

In one of our studies in 1995, we evaluated the incidence of concurrent malaria and respiratory infections and the pattern of drug therapy at a community hospital. During the one year period of study, 600 pediatric patients were admitted of which 260 with average age of two years qualified for drug therapy evaluation. Results showed that both illnesses occurred in 34.1% of patients. A combination of chloroquine and antibiotics, especially cotrimoxazolewas favoured and found useful. We concluded that addition of antibiotics which formed part of a standard therapy for malaria in this hospital was not necessary since most of the patients from the laboratory test results did not have infection (Aguwa and Ukwe 1995). In a related study, we carried out drug utilization study of antimalarialsfor the treatment of hospitalized children under five years in eleven secondary healthcare centers in south-eastern Nigeria. Our results showed that chloroquine was mostly used for treating severe malaria in children less than five years despite the recommendation of a switch to parenteral quinine and/or artemisinins by the National Treatment Policy (Ukwe *et al*, 2008). A similar study was carried out with the objectives of describing the trend in the use of antimalarials for the treatment of pregnant women in health facilities in south-eastern Nigeria between 2000 and 2006. The adherence to the 2005 National Antimalarial Treatment Policy was assessed. Results showed non-adherence to the National Treatment Policy as chloroquine was

mostly prescribed for the treatment of severe malaria despite the recommendation for a change to quinine and parenteral artemisinins (Ukwe *et al*., 2010e). A comparative study of quinine and artemether in the treatment of severe malaria in Nigerian children was conducted in Federal Medical Centre, Birnin Kudu, Jigawa state. Ninety children between 6 months and 12 years of age presenting with fever (>37.5^{o}C) and P. falciparum infection cases with one or more general danger manifestation of severe malaria were included in the study. Results showed that mortality was lower in quinine group (13.0%) than artemether (15.9%) (P = 0.049). The parasitemia clearance on day 3 by quinine and artemetherwas 98.8 and 99.0% (p = 0.422) respectively, while on day 14 it was 100% for both medicines. Fever clearance by quinine and artemetherwas 87.7 and 90.0% respectively on day 3 but increased to 100 and 96.4% (P = 0.72) respectively on day 14. About 71.74% of the patients in the quinine and 61.76% of patients in the artemethergroup spent less than one week in the hospital. We concluded that although quinine prevented mortality to a greater extent than artemetherin this study, other non-fatal measures of disease activity indicated some similarity between the treatments. Using artemether as an alternative to quinine does not only provide alternative chemotherapy against severe malaria but should also help to preserve the other drug against the ever-emerging antimalarial drug resistance by reducing exposure of either drug to parasites (Aguwa *et al*., 2010).

We conducted a prospective study aimed at comparing the cost-effectiveness of Artemether-lumefantrine (AL) with Artesunate-amodiaquine (AAQ) and Dihydroartemisinin-piperaquine (DAP) for treatment of uncomplicated malaria in University of Nigeria Medical Centre, Nsukka. The subjects included all outpatients who presented with uncomplicated malaria within the study period and treated presumptively based on clinical symptoms. They were grouped into three groups corresponding to the ACT prescribed to them. In terms of cost of treatment, the study revealed thatfrom the providers' perspective, DAP had the least cost, followed by AAQ and then AL. The cost of treatment of an episode of malaria with

AL and AAQ were almost twice that of DAP. Incremental cost effectiveness ratio (ICER) was used to measure the additional cost that was required in order to achieve a superior health. We concluded that Dihydroartemisinin-piperaquine fixed dose combination (DAP) was the most cost-effective regimen for the treatment of uncomplicated malaria in University Medical Centre indicating that there could be greater resource savings with the use of DAP in relation to AL and AAQ (Ukwe *et al*., 2010f).

In furtherance of the previous study on the comparative effectiveness of ACTs, we evaluated the therapeutic efficacy of artemether-lumefantrine for the treatment of uncomplicated *Plasmodiumfalciparum* malaria in three hospitals from three different Local Government areas in Enugu state. The prospective study was carried out for a period of 15 months and out patients who presented with symptoms compatible with acute uncomplicated malaria, and with positive laboratory test result for malaria and who were above six years were enrolled. The patients received 3-day complete regimen with AL. Patients were monitored and their blood samples were evaluated by nested polymerase chain reaction (PCR) and real time PCR for identification and quantification of *P. falciparm* on days 0, 3, 7, 14, and 28. Results showed that there was significant decrease in patients' temperature from day 0 to day 28. Data from real time PCR showed no early treatment failure.About 3.4% of the patients had late clinical failure, 25.4% had late parasitological response while 75.1% had adequate clinical and parasitological response respectively. We concluded that AL may rapidly reduce temperature in malaria patients but may not clear parasitemia in such a rapid manner; hence there may be danger of emerging resistance to AL in Enugu state, Nigeria (Ayogu *et al*., 2014).

Igboeli *et al* (2014) assessed the knowledge and practice pattern of malaria prevention and control in pregnancy by healthcare providers within the context of focused antenatal care (ANC). The study was carried out in a total of 22 health facilities in Enugu state that offer ANC services and included one tertiary hospital, seven secondary hospitals, nine primary hospitals and five private

hospitals. Results showed that many providers had high knowledge of malaria in pregnancy and diagnosis was mainly by symptom recognition (90.3%). Treatment of uncomplicated was mainly with ACTs both in the 1st (38.1%), 2nd and 3rd (48.7%) trimesters respectively. Severe malaria was also treated with ACTs (24.8%) by the majority of the providers. Quinine the recommended drug of first choice was used by only a few providers (7.1%) in treating 1st trimester uncomplicated malaria and severe malaria (16.8%), Sulfadoxine-Pyrimethamine (SP) was mostly used by the providers (77.9%) for malaria prevention while proguanil (25.4%) was usually given as an alternative to SP. SP was given by directly-observed treatment by 55.8% of the providers while only 18.6% actually withheld folic acid supplementation for the recommended two weeks following SP administration. Other ANC-malaria in pregnancy (MIP) integrated services rendered by the providers were iron folate supplementation (79.6%), Insecticide-Treated-Net (ITNs) provision (77.0%) and deworming (26.5%). We concluded that although the level of knowledge of the providers on MIP was high, there was sub-optimal delivery of current best practices especially in the area of drug prescriptions for both treatment and prevention (Igboeli *et al*., 2014).

4.0 CHALLENGES TO CLINICAL PHARMACY PRACTICE

In spite of significant global achievements in the areas of healthcare policies and best practices in patient care, clinical pharmacy practice in Nigeria has been affected by a number of challenges which have continued to contribute negatively to optimizing drug therapy outcomes for Nigerians through patient-centered care. Nigeria, in principle, took an official position towards patient oriented pharmacy practice in 1988 when a policy statement of the Federal Ministry of Health adopted clinical pharmacy as a strategy in rational drug use. As of today, there is not yet an official statement or policy on pharmaceutical care

philosophy. Some of the challenges to clinical pharmacy practice are discussed in this section.

4.1 Legislation,regulation and liability

The Pharmacists Council of Nigeria (PCN) is the parastatal of the Federal Government legally established by Act Cap P17, LFN, 2004 and charged with the responsibility among others, of regulating and controlling pharmacy education, training and practice in all aspects and ramifications. The premises where pharmaceutical services are carried out include manufacturing, importation, distribution and wholesale outfits, community pharmacies, hospital pharmacies, and patent and proprietary medicines vendors' shops. They are regulated through the processes of inspection, approval for registration and annual licensure of the premises. But recently there have been arrangements by some state governments and some tertiary institutions to commercialize their hospital pharmacies through Public/Private Participation (PPP) which tend to promote commerce to the detriment of professionalism. These arrangements breach existing pharmacy laws and the Councils' Code of Ethics for Pharmacists (PCN, 2013).

Most private hospitals and clinics in Nigeria do not have pharmacists in their employ. The physicians have assistants that dispense medications without labels so that the patient or community pharmacist will not know the name of the drugs. This is a method of ensuring that the patient returns to the clinic when the drugs are fully utilized. But we know that this cannot happen in any developed country or even some smaller African countries as it has many disadvantages. A non-labeled dispensed medication is dangerous, especially to the patient if toxicity, adverse reactions or allergy occurs. In such situation it is only the physician who prescribed and dispensed (in some cases) the medication can save the patient's life. The physician always feels offended when a pharmacist or an enlightened patient wants to know the name or information about his prescription. To them, the patient and the drugs are his property. Similarly, most doctors in the community

do not request information on drugs from the pharmacist. This uncoordinated practice has a negative impact on patient care in terms of cost, satisfaction, adherence and quality of care. An ex-President of NMA was asked whether the Pharmacists Council of Nigeria should inspect pharmacy units of hospitals, including private ones. He replied that the PCN is only empowered to regulate licensed and registered pharmacists as these are the only group of professionals under their regulatory ambit and they are not empowered to regulate the practice of medical doctors and dentists or hospitals owned by them (Adeoye, 2013). The question is: *how will the PCN regulate the registered and licensed pharmacists who work in both public and private hospitals and clinics without inspecting the pharmacy units of these hospitals where pharmaceutical services are rendered?* The scripture tells us that we shall know the truth and it shall set us free. As Aguwa (2013) noted, to these doctors in Nigeria and elsewhere, *"pharmacists are not your enemies; your enemies are disease, human suffering, adverse drug reactions and high cost of medical care."*

Community pharmacy practice in Nigeria is also facing numerous challenges which may be partly due to the chaotic drug distribution channels in the country. There are several open drug markets, patent and proprietary medicine shops (some unlicensed) that sell all classes of drugs and poisons against national pharmacy laws. There is a reportedly high incidence of substandard and counterfeit medicines imported into the country by *"sacred cow"* non-pharmacists and some unscrupulous *"bad eggs"* in the pharmacy profession. Traditional healers who are now known to embed orthodox drugs in their preparations are seen to pose a challenge to clinical practice. Proper legislation, regulation and making sure that erring persons are liable to their actions would make pharmacists practice to the full extent of their knowledge and training.

4.2 Non-establishment of practice sites/clinical roles

The non-establishment of practice sites at the various areas of clinical pharmacy practice may constitute a setback to clinical practice, especially where there is no legislation and regulation. In some pharmacy schools, there are no full-fledged departments of clinical pharmacy and even in the faculties that have the departments, the number and quality of clinical staff is not adequate. Development for postgraduate studies both for staff development and advances or specialized level of clinical practice is below acceptable standards. No one can give what he does not have. Pharmacy students need to have experiential training (Clerkship) in the wards of teaching/tertiary hospitals and have similar exposure at community pharmacies and model pharmacies in the faculties under the guidance of their lecturers/other hospital clinical pharmacists who serve as preceptors. Academic obstacles also exist due to non-commitment by those concerned to the implementation of the Pharm.Dcurricula for the first degree in Pharmacy nationwide. Because the number and quality of the clinical staff pharmacists is not adequate, there may not be role models to mould students into being clinical pharmacists who would be motivated and interested on rendering pharmaceutical care services.

In the hospitals, clinical roles/specialties are not legally established. For example in UNTH, the fellows of the West African Postgraduate College of Pharmacists render clinical pharmacy services on individual basis, mainly out of interest and commitment. There are no organized specialty units like the drug therapy monitoring, pediatric, oncology, geriatric, and cardiothoracic specialties as obtained in other developed countries. This may be due to limited confidence in Clinical Pharmacy roles as a result of limited clinical education and training such as specialized residencies. I am also not aware of any organized pharmacovigilance or poison/drug information centers established in any of the federal teaching hospitals in Nigeria. This is a very serious challenge to clinical pharmacy practice as the consequences on the healthcare of Nigerians are enormous.

Despite compelling research that illustrates that healthcare systems improve when hospital pharmacists are included in inter-professional care teams, pharmacists continue to be under-utilized in hospitals. What these pharmacists require is adapted clinical training programs to enhance patient-centered care.

Although clinical pharmacy has opened new practice opportunity for community pharmacists in developed countries and in recent years, services like home antibiotic prescribing for minor ailments, adherence support to elderly patients, anti-smoking campaigns, and support to promotion and support of nicotine replacement within public health strategy (Carter, 2004; Wang, 2007), clinical pharmacy has virtually no visible presence in community practice in Nigeria. The consequences are obvious: only a minority of citizens even know of the existence of clinical pharmacists. Sometimes having met one, usually in the hospital, a patient will mistake the clinical pharmacist for a physician or nurse. There is little public demand in community practice for clinical pharmacy perhaps because people cannot demand what they have never imagined. Patients/clients are not empowered in decision-making about their health and pharmacists do not play prominent role in health promotion, disease prevention and chronic disease management. Marketing pharmaceutical care and in particular therapeutic outcomes monitoring would do the most to meet societies need for improved outcomes of drug therapy and is pharmacists' greatest professional opportunity.

4.3 Losing our professionalism?

Professionalism includes the full breath of skills required to be a competent clinical pharmacy practioner and entails developing professional attitudes and behaviors necessary to delivering quality patient care. Professionalism is the main driving force for ethical conduct in pharmacy (Noordin, 2011), and ethical decision making by the clinical pharmacist is at the soul of responsible provision of drug therapy. One important aspect of professionalism is altruism or selfless commitment to serve the best interests of the patient above your own. Pharmaceutical care involves not only medication

therapy and decisions about medication use in individual patients but also encompasses clinical judgments about medication selection, dosages, routes and methods of administration, medication therapy monitoring and provision of medication-related information and counseling to patients (ASHP, 1993). Hospital pharmacists in Nigeria, especially those in public hospitals are expected to be involved with decisions on which drugs to include on their hospital formulary and on entire drug use in the hospital. Unfortunately, more often than not, the decision of which brand of drugs to buy in most of these hospitals is influenced by the pharmaceutical companies through their various medical representatives. The method of drug promotion/marketing adopted by these pharmaceutical companies under the guise of informing health professionals about new drugs is sometimes unethical and inappropriate and may promote irrational prescribing by physicians (Oshikoya *et al*., 2011). This may negatively influence the brands of drugs that pharmacists procure for their hospitals. This culture, un-ethical conduct and attitude of pharmacists that reinforces their perception must change for the vision of best clinical practice to be realized. According to Mohandas Gandhi*"we must become the change we want to see in the world."*

In the community settings, pharmacists employ young school leavers as supportive staff, widely referred to as "pharmacy attendants" or "locum pharmacists". These pharmacy attendants lack the relevant knowledge and competence to perform clinical judgmental roles that ought to be the exclusive preserve of the clinical pharmacist. Some community pharmacists under the excuse that they have numerous commitments have left their pharmacies under the management of the support staff who recommend and dispense medicines at will. There are community pharmacies with no pharmacist on duty till evening hours. Whatever happens during the period of absence of the pharmacist is a great risk to both the patients/clients and the image of the profession. Some non-pharmacists with available capital have registered their premises with the licenses of *greedy* pharmacists

("Register and Go" or "R and G") who are never on duty. These community pharmacies most often than not, engage in various unethical practices, after all the owners have no profession to defend.

4.4 The Politics of healthcare

In the hospital sector, the availability of drugs is vital. Drugs are prescribed by doctors; purchased, stored, distributed and dispensed by pharmacists; administered by nurses to inpatients; and applied by physiotherapists for physical therapy. If drugs are rationally utilized with proper inventory control, they serve as a useful source for the generation of revolving funds for the hospital. Drug and Therapeutic Committees are set up in hospitals, especially teaching hospitals, with a pharmacist as the secretary, to select the essential drugs to be listed in the hospital formulary. Clinical pharmacy practice faces enormous challenges in the hospital sector. The preferable cyclic structure (Figure 2)in which the patient is the focus is not observed and practiced in many hospitals. In these hospitals, some members of the healthcare – usually doctors see themselves as being the pinnacle of the pyramid with the patients at the base. This pyramidal structure (Figure 3) is a cankerworm that does no one (the health professionals, the patients and the public) any good. But most importantly, it is not beneficial to the patients as the doctors assume positions of "small gods" who treat the patients as their personal property and receive little or no inputs from other members of the healthcare team. The roles of pharmacists in these hospitals are therefore limited to the traditional dispensing of drugs and inventory management. The design of such pharmacies does not favor adequate patient counseling as drugs are dispensed through pigeon holes. Also, the pharmacy practice is mainly product-oriented as records kept in the pharmacy are those of drug stock excluding medication profiles which should be an essential component of comprehensive pharmaceutical services.

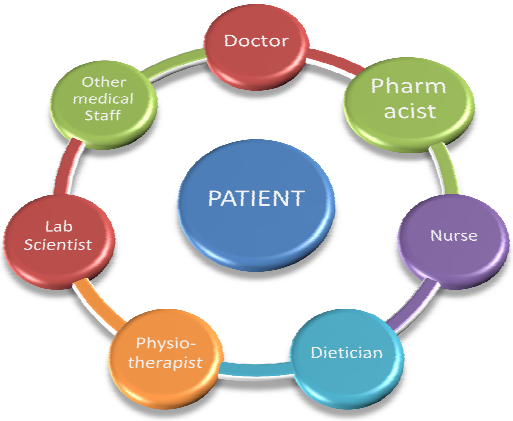


Figure 2. The cyclical structure for effective health care delivery by all health professionals

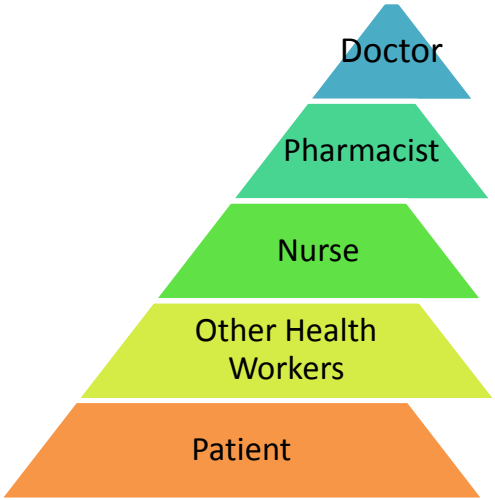


Figure 3: The pyrimidal structure for hospital settings where the patient is the "sufferer"

The politics of the healthcare system in Nigeria has led to unnecessary power tussles which have resulted to incessant strike actions. In all these, the patients are at the receiving end. In November 2013, the ex-president of the Nigeria Medical Association (NMA) was interviewed. He insisted that physicians were best suited to head teaching hospitals claiming that there was an unnecessary equality beauty contest and unholy quest for the doctor's leadership authority (Adeoye, 2013). Doctors are signatories to the Hippocratic Oath, but it may be true that Hippocrates would be very uncomfortable in his grave or wherever he is, seeing what is happening in the Nigerian health sector today. Nigerian doctors seem to be complaining less about their salaries but on relativity. This unhealthy competition describes their salaries in comparison to those of other health professional. Thus, there have been series of strike action by health workers: doctors (NMA), National Association of Resident Doctors (NARD) and other health professionals such as Joint Health Sector Union (JOHESU) (Ibeh, 2014).

There is also the politicization of healthcare in this country with leaders being ever ready to endorse laws, policies and programs that remain unimplemented for several years. System-related constraints include patient demand, acceptance by other members of the healthcare team, access to patients' records and re-imbursement (Rovers *et al*., 2003). In New Zealand, the government encourages pharmaceutical care and pays money for each pharmaceutical care plan submitted. In Australia, pharmacists are paid for providing pharmaceutical care to patients in nursing homes, domiciliary settings and at the hospital/community interface (Mason, 2001).

Inter professional obstacles may hinder pharmaceutical care services, for instance, lack of collaboration between pharmacists and other healthcare professionals. This in-house fighting may cause pharmacists to be viewed as rivals rather than members of the same healthcare team.The Apostle Paul in his epistle to the Romans and Corinthians stressed the need of unity in diversity. He said that *"we have different gifts according to the grace given us*

by God and the body is a unit though it is made up of many parts. Though all its parts are many with different functions, they form one body, so it is with Christ. He concluded that the eye cannot say to the hand, I don't need you. On the contrary, those parts of the body that seem to be weaker are indispensable."

4.5 Inadequate or Incompetent pharmacy workforce:

Many resource-limited countries including Nigeria do not have the critical number of qualified personnel for universal coverage. In Nigeria, although the production of pharmacists has expanded in recent years, the problem of imbalance in their distribution still persists and so there is inadequate number of clinical pharmacists in all the healthcare settings and even in the academia. As pharmacists assume the increased responsibilities demanded in new roles, they must also make a corresponding commitment to improve their professional competence. In the past decade, there have been vast changes in the practice of pharmacy. Keeping knowledge and skills up to date and addressing new concepts in the delivery of clinical pharmacy services have been major challenges for pharmacists. Healthcare professionals including clinical pharmacists are expected to meet patients' requirements for better and more accessible services, optimizing the benefit they gain from their medications and reducing DRPs, while making the best use of pharmacist's skills and knowledge within a multidisciplinary team.

Competence is the first and most fundamental responsibility of clinical pharmacists and must be reinforced throughout the years of practice. Maintaining competence throughout a career during which new and challenging professional responsibilities will be encountered is an ethical requirement for all healthcare professionals. The pharmacy degree is not an end point but the attainment of a standard. In the International Pharmacy Federation (FIP) statement on Good Pharmacy Education, it is stated that continuing professional development must be a life-long commitment for every practicingpharmacists (FIP, 2006).

4.6 Other challenges

Other challenges include lack of leadership, innovations, clinical developments and patient safety.

4.6.1 Leadership is important to initiate and sustain the wind of progressive changes. *"Never doubt that a small group of thoughtful committed citizens can change the world; indeed it's the only thing that ever has"* – Margaret Mead. Strong leadership is the foundation of any successful organization. Perhaps it is time for our professional body to explore the potential of current technology as a means of communication to ensure visions are clearly delivered and understood. Our leadership skills need to be sharpened by analyzing the root of the problem and finding the most appropriate solution within the limitation.

4.6.2 **Innovations:** When was the last time we pharmacists initiated something new like educating the public by creating awareness of the negative self care practices and not taking proactive steps to their right to knowing the names, doses and potential side effects of every prescribed or recommended medicines.*When was the last time we challenged ourselves to do something out of the norm?*

4.6.3 **Clinical developments:** In the scientific world where evidence based is the only communicative language, we must be more than just a commentator. Pharmacists in Nigeria should be looking across the boundaries and grab the opportunities to be hands-on-in research. It is high time for us to be loud professionally; otherwise, we will always be the profession that has a history of rewarding clinical experience with management that does not reach any extraordinary potential.

4.6.4 **Patient safety:***Are we really pharmacovigilant in Nigeria*? Problems relating to use of medications in current healthcare include medication safety and abuse of prescription and non-prescription medications. To make matters worse, we do not have national or local drug-use database as other developed countries do. In the US the Centre for Disease and Control reported that in

2004 alone, unintentional drug poisoning was the second leading cause of death due to unintentional injury, claiming the lives of 19,838 individuals. Also abuse of prescription and non-prescription medications among teens is increasing. Such trends in Nigeria have remained unreported or not documented. It is also evident that teens and youths are turning away from street drugs and using prescription drugs to get "high". The case of use of Rohypnol® by some *youths for ritual killing of a lady is a case in point.* These suggest the need for enhanced educational efforts geared at young people as well as their parents. A poison control centre if available may be a medical facility that is able to offer immediate, free, and professional treatment, recommendation and help over the telephone just in case of exposure to poisonous or risky substances. I am not aware of anyone in Enugu state as whole.

5.0 THE WAY FORWARD

From the forgoing, my choice of the topic for today's lecture with focus on Nigeria has been justified. Clinical Pharmacy seeks to optimize drug therapy outcomes for Nigerians through patient-centered care. The various challenges to this vision have been articulated. What I believe still remains to be done is for me to proffer some solutions and/or recommendations on the way forward. These include:

1. There should be a transformational change to pharmaceutical care.
2. The federal government having satisfied itself that it needs clinical pharmacy should through the NUC approve the Pharm.D curriculum for the first professional degree in pharmacy nationwide. This will have propensity for national development and change the way future pharmacists are being produced.
3. The PCN and the committee of Deans of Pharmacy Schools must be committed to the implementation of the Pharm.D curricula.

4. All healthcare professionals including clinical pharmacists must come together and have a clear and common goal of meeting patients' requirements for better and more accessible services, optimizing the benefits they gain from their medications and decreasing DRPs.
5. The Federal Government should support legislative and regulative changes by PCN and other necessary regulatory bodies to update the scope of practice for all pharmacists to meet with global challenges. Also, the Federal Government should through the Federal Ministry of Health compel all teaching hospitals to adopt e-prescribing and e-dispensing platform as benchmark for prescription management.
6. Through information and communication technology, there should be integration of e-prescribing and drug information service in hospital and community pharmacies.
7. Government should provide adequate funds to support research, postgraduate education, staff development, exchange programs, capacity building, specialized residency training, preceptor development, well articulated continuing professional development and update other infrastructure and materials needed to train clinical pharmacists in universities and teaching hospitals.
8. Poison/Drug information centers should be established in or near all teaching hospitals in the country.
9. There should be visible presence of clinical pharmacy practice in community pharmacies and the pharmacists recognized as primary healthcare providers.
10. Innovative continuing professional development must be a life-long commitment for every practicing pharmacist.
11. Clinical pharmacists must strive to empower patients in decision-making about their health and play a prominent role in health promotion, disease prevention and chronic disease management.
12. In addition to the several contributions of the University administration, the college of medicine and the faculty of pharmaceutical sciences to the clinical clerkship rotation of

final year pharmacy students, they still need to do more. The University in partnership with private/public organizations and philanthropic individuals should provide funds and logistics for clinical rotation of students to UNTH in the short term and provision of accommodation of final year pharmacy students at Ituku/Ozala during the period of clinical rotation in the long term.

Take home messages –

1. ***The first step to education is awareness, the next is acceptance.***
2. ***It is your fundamental human right to know the: names, dose, dose interval and duration of every medicine your doctor recommends to you: Be inquisitive; Ask your doctor or the clinical pharmacist.***
3. ***It is your fundamental human right to know the potential side effect of every medicine you are about to take or are taking: consult the clinical pharmacist.***
4. ***Do not share your medicines with any other person even if both of you have similar symptoms: consult your doctor or the clinical pharmacist.***
5. ***When taking ACTs for uncomplicated malaria – avoid concurrent administration with Vit C. It may cause therapeutic failure.***
6. ***As much as it is possible avoid skin formulations e.g. creams, lotions etc. which contain hydroxyquinone and propylene-glycol. They may have toxic effect on your skin and kidney respectively in the long run.***

7. ***Ask the clinical pharmacist on any bugging issue on medicines e.g. drug-drug interaction, drug-food interactions or adverse effects.***
8. ***Avoid concurrent administration of orthodox and herbal/complimentary medicines.***
9. ***If you are hypertensive or diabetic, do not stop your medicines because you no longer experience the symptoms: consult your doctor or the clinical pharmacist.***
10. ***Life has no duplicate and health is wealth, so take positive steps towards your health.***

6.0 CONCLUSION

It was Nelson Mandela who said that "education is the most powerful weapon which can be used to change the world", and Malcolm S. Forbes said that "education's purpose is to replace an empty mind with an open mind". As I end this lecture, I do hope I have been able to bring the series of evolutionary changes of the pharmacy profession from the apothecary model to the present pharmaceutical care level and the scope and functions of the clinical pharmacist to the fore of this lecture. This implies that the present situation of clinical pharmacy in Nigeria is not optimal. But that goal is feasible if we determine to attain it. This lecture has highlighted the impact and benefits of clinical pharmacy and given pointers to where Nigeria can exploit. I have discussed concisely my modest contributions to research in clinical pharmacy. I have also examined the challenges within the context of the Federal Government, all the healthcare professionals, the regulatory bodies and the public. Against this backdrop, it is our conviction that with the recommendations proffered, we have been able to state the way forward for the practice of this noble profession.

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INAUGURAL LECTURES
OF THE UNIVERSITY OF NIGERIA, NSUKKA

1. **Prof. K. Nzimiro – 1976**
   Title: The Crisis in the Social Sciences: The Nigerian Situation

2. **Prof. Chika Okonjo – 1976**
   Title: Economic Science, Imperialism and Nigerian Development.

3. **Prof. K. S. Hegde, Vet. Medicine – 1977**
   Title:

4. **Prof. D. I. Nwoga – 1977**
   Title: Visions Alternatives: Literary Studies in a Transitional Culture.

5. **Prof. J. A. Umeh – 1977**
   Title: Land Policies and Compulsory Acquisition of Private Land for Public Purposes in Nigeria.

6. **Prof. D. C. Nwafo – 1984**
   Title: The Surgeon as an Academic

7. **Prof. G. E. K. Ofomata – 1985**
   Title: Soil Erosion in Nigeria: The views of a Geomorphologist.

8. **Prof. E. U. Odigboh – 1985**
   Title: Mechanization of cassava production and processing: A Decade of Design and Development.

9. **Prof. R. O. Ohuche – 1986**
   Title: Discovering what Learners have attained in Mathematics.

10. **Prof. S. C. Ohaegbulam – 1986**
Title: Brain Surgery: A Luxury in a Developing Country like Nigeria.

11. **Prof. I. C. Ononogbu – 1998**
Title: Lipids: Your Friend or Foe.

12. **Prof. V. E. Harbor-Peters – 2001**
Title: Unmasking some Aversive Aspects of Schools Mathematics and Strategies for averting them.

13. **Prof. P. O. Esedebe – 2003**
Title: Reflections on History, Nation Building and the University of Nigeria.

14. **Prof. E. P. Nwabueze – 2005**
Title: In the Spirit of Thespis: The Theatre Arts and National Integration.

15. **Prof. I. U. Obi – 2006**
Title: What have I done as an Agricultural Scientist? (Achievements, Problems and Solution Proposals).

16. **Prof. P. A. Nwachukwu – 2006**
Title: A Journey through the Uncharted Terrain of Igbo Linguistics.

17. **Rev. Fr. Prof. A. N. Akwanya – 2007**
Title: English Language learning in Nigeria: In Search of an Enabling Principle.

18. **Prof. T. UzodinmaNwala – 2007**
Title: The OtontiNduka Mandate: From Tradition to Modernity.

19. **Prof. J. A. Ibemesi – June 2007**
Title: From studies in Polymers and Vegetable oils to Sanitization of the Academic System.

20. **Prof. Obi U. Njoku – June 2007**
Title: Lipid Biochemistry: Providing New Insights in our Environment.

21. **Prof. Humphrey Assisi Asobie – July 2007**
Title: Re-inventing the Study of International Relations: From State and State Power to Man and Social Forces.

22. **Prof. Aloy Emeka Aghaji – July 2007**
Title: Prostate Cancer: Coping with the Monster in a Third World Setting.

23. **Prof. Eunice A. C. Okeke – August 2007**
Title: Making Science Education Accessible to All.

24. **Prof. Chibuike U. Uche – August 2007**
Title: The Future of the Past in Banking

25. **Prof. Ossie O. Enekwe – September 2007**
Title: Beyond Entertainment: A Reflection on Drama and Theatre.

26. **Prof. Onyechi Obidoa – September 2007**
Title: Life Does not Depend on The Liver: Some Retrospectives, Perspectives, and Relevance in Xenobiosis, Chemoprevention and Capacity Building.

27. **Prof. Okechukwu Ibeanu – 2008**
Title: Affluence and Affliction: The Niger Delta as a Critique of Political Science in Nigeria.

28. **Prof. Damian Ugwutikiri Opata – 2008**
Title: Delay and Justice in the Lore and Literature of Igbo Extraction.

29. **Rev. Fr. Prof. Elobuike Malachy Nwabuisi – 2008**
Title: Education for What?

30. **Prof. Michael C. Madukwe – 2008**
Title: Practice Without Policy: The Nigerian Agricultural Extension Service.

31. **Prof. Anthony N. Eke – 2008**
Title: Delay and Control in Differential Equations: Apogee of Development.

32. **Prof. Joe Sonne Chinyere Mbagwu – 2008**
Title: From Paradox to Reality: Unfolding the Discipline of Soil Physics in Soil Science.

33. **Prof. Inno Uzoma Nwadike – 2008**
Title: Igbo Studies: From the Plantation of West Indies to the Forest lands of West Africa, 1766 – 2008.

34. **Prof. Benjamin Chukwuma Ozumba – 2008**
Title: Improving Maternal Health in Developing Countries: The Nigerian Experience.

35. **Prof. Henrietta Nkechi Ene-Obong – 2008**
Title: Nutrition Science and Practice: Emerging Issues and Problems in Food Consumption, Diet Quality and Health.

36. **Prof. Amarauche Chukwu – 2008**
Title: Using Neglected Local Raw Materials in Developing High Level International Health Manpower.

37. **Prof. Samuel Ogbonna Enibe – 2008**
Title: Engineering Systems Analysis and Optimization.

38. **Prof. Michael Ifeanyi Uguru – 2008**
Title: Crop Genetics and Food Security.

39. **Prof. Alex I. Ikeme (KSM) – 2008**
Title: Poly-Functional Egg: How can it be Replaced?

40. Prof. Chukwuma C. Soludo – 2008
Title: Financial Globalization and Domestic Monetary Policy: Whither the Economics of the 21st Century.

41. Prof. Josephine Ifeyinwa Okafor (Mrs) – 2008
Title: Fungal Diseases: A Serious Threat to Human Existence in Recent Times.

42. Prof. C. C. Agu – 2008
Title: Understanding the ABC of the Financial System.

43. Prof. Polycarp E. Chigbu – 2009
Title: Semi-Latin Squares and Related "Objects": Statistics and Combinatorics Aspects.

44. Prof. Reuben U. Okafor – 2009
Title: 4-circle Base Triangular Model in Ageing and Death Education.

45. Prof. Francisca Nneka Okeke – 2009
Title: Geomagnetic Research in Physics: The Journey So Far.

46. Prof. Clara Ikekeonwu – 2009
Title: Language and Gender in Nigeria: Perception, Pattern and Prospects.

47. Prof. Fabian C. Okafor – 2009
Title: The Varied Roles of Snails (Gastropod Molluscs) in the Dynamics of Human Existence.

48. Prof. Denchris Nnabuike Onah – 2009
Title: The Elegance and Success of Trypanosomes as Parasites: Immunological Perspective.

49. Prof. Grace Chibiko Offorma – 2009
Title: Curriculum across Languages.

50. Prof. Doris Ukanwamaka Egonu – 2010
Title: Illiteracy in a Century-Old Education System: The Challenge of Adult Education in Nigeria.

51. Prof. Uchenna Mariestella Nzewi – 2010
Title: It's all in the Brain: Of Gender and Achievement in Science and Technology Education.

52. Prof. Beatrice A. Okeke-Oti – 2010
Title: They have Dignity and Worth and Therefore Need Restoration.

53. Prof. Ernest Onwasigwe – 2010
Title: Paediatric Ophthalmology: Past, Present and Future.

54. Prof. Chika Onwasigwe – 2010
Title: Disease Transition in Sub-Saharan Africa: The Case of Non-Communicable Diseases in Nigeria.

55. Prof. Rich Enujioke Umeh – 2010
Title: River Blindness: An Insight into Community Directed Management of Endemic Diseases.

56. Prof. Eric C. Eboh – 2011
Title: Agricultural Economy of Nigeria: Paradoxes and Crossroads of Multimodal Nature.

57. Prof. George O. S. Amadi – 2011
Title: Political Jaywalking and Legal Jiggery-Pokery in the Governance of Nigeria: Wherein Lies the Rule of Law?

58. Prof. Ola Oloidi – 2011
Title: The Rejected Stone: Visual Arts in an Artistically Uninformed Nigerian Society.

59. Prof. Felicia N. Monye (Mrs) – 2011
Title: The Consumer and Consumer Protection in Nigeria: Struggles, Burdens and Hopes.

60. **Prof. Goddy Chuba Okoye – 2011**
Title: Enhancing Healthy Human Life Through Bioengineering and Rehabilitation Medicine.

61. **Prof. James C. Ogbonna – 2011**
Title: Biotechnology and the Future of Human Existence.

62. **Prof. Ngozi M. Nnam – 2011**
Title: Adequate Nutrition for Good Health: Is Our Environment Nutrition Friendly?

63. **Prof. Joseph C. Okeibunor – 2011**
Title: Health Services for the Poor by the Poor: Lessons for Addressing the Diverse Social Problems in Nigeria.

64. **Prof. Okwesili Fred C. Nwodo- 2012**
Title: From Water Beyond Wine to Longevity.

65. **Prof. Fab Obeta Onah- 2012**
Title: Engaging the Challenges of Human Resource Management in Public Organisations in Nigeria.

66. **Prof. Emmanuel Onyebuchi Ezeani- 2012**
Title: Delivering the Goods: Repositioning Local Governments in Nigeria to Achieve the Millenium Development Goals (MDGs).

67. **Prof. Malachy Ikechukwu Okwueze - 2012**
Title: Religion: Indeed the 'Opium' of Life?

68. **Prof. Emmanuel Chinedum Ibezim- 2012**
Title: Exploring the Exciting World of the Wonder Agents called Drugs.

69. **Prof. Patience Ogoamaka Osadebe - 2012**
Title: From the Lab. Bench Through the Gardens to the Apothecary: Journey So Far.

70. Prof. Ifeoma Maureen Ezeonu – 2012
Title: People vs Bacteria: Bacteria Innocent Until Proven Guilty.

71. Prof. Chika Njideka Oguonu-2012
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82. Prof. Basil Chukwuemeka Ezeanolue - 2014 Title: Hear the Voice

83. Prof. Ifeoma Pamela Enemo – 2014
Title: Dangerous Families In Nigerian Law: A National Albatross?

84. Prof. Christopher Okeke Tagbo Ugwu – 2014
Title: The Demise of the African God/s: Fallacy or Reality

85. Prof. Bernard Obialo Mgbenka - 2014
Title: Clariid Catfish Aquaculture: a Panacea for Quality Animal Protein Security

86. Prof. Benjamin Sunday Chudi Uzochukwu - 2014
Title: Accelerating the Achievements of Health-Related Millennium Development Goals: Social Determinants of Health approach and Mainstreaming Health in All Policies

87. Venerable Prof. Samuel Obiajulu Ike - 2014
Title: The Matter of the Heart

88. Prof. Chimdi Memnofu Chuka-Okosa - 2014
Title: Beyond Vision

89. Prof. John ChikaMbah - 2014
Title: "The Control of Impurities In The Quality Control of Pharmaceutical Dosage Forms".

90. Prof.Emmanuel Rapuluchukwu Ezeome - 2015
Title: Cancer in Nigeria: Surviving the Emerging Epidemic

91. **Prof.Anthony Amaechi Attama - 2015**
Title: The Road to Nanomedicines

92. **Prof. Aloysisu-Michaels Okolie - 2015**
Title: Global Political Economy and Development of Underdevelopment: Different People, Same Market and Glorification of Poverty

93. **Rev. Canon Prof. Jacob Okwuchukwu Onyechi - 2015**
Title: Formulating Medicines Round the Globe: Lessons for the Growth of the Pharmaceutical Industry in Nigeria

94. **Prof. Roseline Chinwe Onah - 2015**
Title: "Poor Government Budget Implementation in Nigeria: Who is to Blame"?

95. **Prof. Ifeoma Isabella Ulasi** - 2015
Title: Kidney Solution: Nature or Nurture

96. **Prof. Henry A. Onwubiko - 2015**
Title: Ultrasensitive Detection of Corrupt Prions and Diagnosis of their Neurodegenerative Infectious Diseases:***Mad Cow Disease***in Cattle**,** ***Scrapie*** in Sheep and***CJD***in Humans

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Title: **Transportation Development in Nigeria: The Journey So Farand The Way Forward**