Preamble

The Vice Chancellor, Principal Officers of the University, distinguished colleagues, my highly esteemed audience, ladies and gentlemen. It is my pleasure to welcome you to the **405th** Inaugural Lecture of Obafemi Awolowo University, Ile-Ife.

The inaugural lecture is titled, *"Beyond Counting, Pouring and Sticking: Managing Pharmacy Operations for Quality Service"* This is the second inaugural lecture in the field of Pharmacy Administration from the Department of Clinical Pharmacy and Pharmacy Administration, and I am deeply grateful to God for the privilege of standing before you today to deliver the lecture. It is such a great opportunity which I do not take for granted. Permit me to start my lecture with this reflective verse from the Bible: *"O Lord, I know that the path of a man is not in himself; It is not within the limited ability of man, even one at his best, to choose and direct his steps in life" Jer. 10:23 (AMP).* This inspired statement underpins my fortuitous journey into academics and my odyssey in Pharmacy Administration.

My Career in Academics

I was admitted to a 5-year Pharmacy programme at the University of Benin, Benin City, Nigeria and graduated with B.Pharm. (Hons) degree, in 1979. As a young academic enthusiast, I joined the Faculty of Pharmacy of the then University of Ife (now Obafemi Awolowo University, Ile-Ife) in 1982, after a three-year work experience as a hospital pharmacist. I obtained an MSc. Pharmaceutics in 1984 but was stuck in an academic procedural limbo for a while due to lack of staff on the ground to supervise my Ph.D. programme in tabletting technology at the faculty. As an academic on the staff list and having waited on end with no prospect of moving ahead on my career trajectory, I registered for the MBA programme in the Faculty of Administration, and this ignited my interest and enhanced the competence to teach Pharmacy Administration courses, a significant and compulsory component of pharmacy curriculum in the faculty. This marked a watershed in my career path, and I resolved to launch fully into

Pharmacy Administration as a discipline. In a bid to get grounded in this Social and Administrative component of Pharmacy, I enrolled for relevant programmes in three other Faculties within this university. Thus, apart from the MBA, I obtained another postgraduate degree (M. Phil.) in the Faculty of Administration, MPH in the Faculty of Clinical Sciences, and Ph. D in the Faculty of Technology. My academic sojourn in this great citadel of learning, and the quest for knowledge to advance my career led me to engage in relevant Faculties of the University where I obtained five postgraduate qualifications. These postgraduate degrees were not for mere adventure, but an endeavour to acquire the necessary skills to confidently chart the path and demands of the new discipline of Pharmacy Administration in Nigeria.

Mr. Vice Chancellor, sir, I am pleased to announce that eventually I became the first female professor of Pharmacy Administration in West Africa. Moreover, to date, this is the only University in Nigeria where Pharmacy Administration as a sub-discipline of Pharmacy is taught up to the Ph.D. level. The programme has become well entrenched in the system, and it has benefited several pharmacists from different practice settings. In fact, one of our products is a Reader in Pharmacy Administration and the current Acting Head of the Department. My deep appreciation goes to Professor Wilson Erhun, the first Professor of Pharmacy Administration in the Department, for his vision and doggedness in working assiduously to get the programme approved; I am glad to be a part of this success story. Furthermore, I am privileged to have been able to demonstrate the robustness of pharmacy training and its multifaceted boundary relations with other significant disciplines in the university.

It is generally accepted that the core disciplines of pharmacy are rooted in the basic sciences. Such courses include pharmaceutics, pharmaceutical chemistry, pharmacology, pharmacognosy and pharmaceutical microbiology; these are well-established sub-disciplines of the pharmaceutical sciences. The same cannot be said of the new evolving social and administrative-oriented

disciplines. Social and administrative pharmacy is used loosely to describe a collection of different interests, which outline the social aspects of pharmacy; sometimes labelled social pharmacy, other times administrative pharmacy but also pharmacy administration. The broad discipline is founded on the principles of social sciences and organisational theory and has as a central interest in the beliefs, values and behaviours that people display in relation to medicine use and ill-health at the individual and organisational levels, taking cognisance of the business component of pharmacy practice (Meng and Liu, 2004).

My academic journey at the University started in the Department of Pharmaceutics where I obtained MSc. Pharmaceutics (1984) with a focus on tabletting technology in which area I taught and carried out research activities as a Lecturer grade II. I was fortunate to have a dutiful academic mentor, then Dr. T.A. Iranloye (late Professor T.A. Iranloye) who was of tremendous assistance as I explored the unfamiliar terrain of academics. While under his supervision, we examined some pharmaceutical factors in relation to tablet formulations. Specifically, the effects of local excipients (gum exudates and talc samples) were assessed as formulation factors in tabletting. Three of our studies in tabletting technology (Boyinbode and Iranloye, 1986; Boyinbode and Iranloye, 1987; Afolabi and Ige, 1993) showed that some of the samples had properties comparable with conventional excipients and the research findings were published in reputable pharmacy journals. However, the academic mentorship was short-lived as the desire for career progression compelled Dr. Iranloye to leave the faculty for a professorial chair at the University of Jos. His exit left me orphaned academically for a while, and in the waiting period I registered for MBA programme at the Faculty of Administration and concluded successfully in 1987. Before I graduated from the programme, the Faculty of Pharmacy found a ready resource in me since 1986 to teach Pharmacy Administration courses which are integral components of the curriculum. With this, I was teaching assigned courses in Pharmaceutics including dispensing practicals and at the same time responsible for the two main Pharmacy

Administration courses in the faculty. Eventually, the main thrust of my research activities shifted from Pharmaceutical Technology to Pharmacy Administration which I have engaged in for about four decades now. In 1999, it became imperative for me to move to the newly created Department of Clinical Pharmacy and Pharmacy Administration, as a Senior Lecturer in Pharmacy Administration.

My academic studies in Pharmacy Administration have been devoted to quality improvement of pharmacy operations with a view to enhancing pharmacists' role in the management of medicines and their involvement in public health activities; such professional role is highly integral to improving the quality of healthcare (Barber *et al*., 1994). Pharmacists are well-trained and highly trusted healthcare professionals, but their skills are extremely underutilised in terms of deliverable expertise. Hospital pharmacy practice appears to be the most visible area of the profession with dispensing activities being the hallmark of gauging the pharmacists' relevance in healthcare. Now to the question: **"Are pharmacists stuck counting, pouring and sticking?"** This is a metaphorical expression to describe the extrinsic activities involved in dispensing prescriptions to a patient – **counting** pills, **pouring** liquid dosage form and **sticking** a label on the container. However, there is more to the training and professional competence of a pharmacist as an invaluable healthcare professional. The desire to explore innovative strategies to improve pharmacy operations in a bid to incorporate other patient care activities and public health initiatives into the basic dispensing functions informed my research activities in Pharmacy Administration for almost four decades.

Mr. Vice Chancellor, sir, I think it will be relevant to say a word on the changing face of pharmacy and the extended role of pharmacists in healthcare services.

The changing face of pharmacy practice
Pharmacy profession has evolved from the conventional and traditional product–focused approach to an extended patient-focused care over the years. In the past century, pharmacists were

more preoccupied with compounding of medicinal products, but with advances in manufactured medicines, the pharmacist's role has extended significantly to embrace more direct patient care and public health activities. This extended role calls for the participation of pharmacists in the broader healthcare team, working for the provision of improved patient care and public health initiatives, thus contributing to the achievement of global sustainable development goals, in terms of universal health coverage. In a bid to match up with this advancement, the role of today's pharmacists needs to be expanded to include pharmaceutical care concepts along with the social component, making the pharmacist a healthcare professional rather than a medicine seller in a commercial enterprise. There is the need for a paradigm shift from product-focus to patient-centred pharmacy operations. Pharmacists are trained to create, transmit, and apply new knowledge based on cutting-edge research in the pharmaceutical, clinical, social and administrative sciences. They are exposed to the technical and soft skills essential for collaboration with other healthcare professionals in order to enhance the people's quality of life through teamwork. With this evolving role, it becomes imperative for pharmacy schools to review the training curriculum, along with an appropriate staff complement, to reflect desirable competencies required for the changing role of the pharmacist. In this regard, the Pharmacy Council of Nigeria (PCN) has made a considerable impact in her regulatory functions in pharmacy education in Nigeria. Currently, undergraduate curriculum in all schools of pharmacy in Nigeria has been upgraded to the 6-year Doctor of Pharmacy degree (Pharm. D).

Pharmacists' Extended Role in the Health System
Pharmacists are valuable resources in promoting the efficiency of the health system, and their role has evolved substantially in recent decades. Expanding pharmacists' role beyond dispensing of medicines, involving them in direct patient care and public health as part of a multidisciplinary team has helped to cut or reduce costs by preventing medication-related illnesses and encouraging use of

cost–effective medications in notable hospitals in both developed and developing economies (Schumock, *et al*., 2003; Pande *et al*., 2013). The use of medicines crosses all disciplines, and with the burgeoning number available to treat diseases, along with increased potency of these trusted remedies, opportunities for problems related to medication misuse have escalated. Medicines of different dosage forms are front-line medical treatments and thousands of such are currently available in the marketplace. Today, medication-related problems are a major cause of hospitalisation and illnesses, and even death in some instances, with attendant humongous cost estimates annually. Pharmacists play a major role in preventing and resolving these problems, which may have negative economic impacts. They provide cost-effective services and clinical interventions which have been shown to reduce the risks of potential adverse drug events and improve patient outcomes. Specific areas of their training include drug discovery and dosage formulations; clinical trials and therapeutic drug monitoring; medication reconciliation and patient counselling, provision of medicine information services and the management of medicine supply. However, in some environments, including Nigeria, pharmacist training and skills are grossly underutilised.

The Pharmaceutical Care Model
A growing number of healthcare experts advocate the "pharmaceutical care" approach in which pharmacists work with physicians, nurses, other healthcare providers and patients to identify, prevent, and resolve medication-related problems. In this model of care, pharmacists have a key responsibility for recommending effective medications, ensuring that patients receive the correct medicines and dosage, counsel patients so they understand how to take their medications, monitor to ensure the effectiveness as intended and liaising with other providers on appropriate pharmacotherapy. Indeed, pharmacists get involved in patient care and public health in a proactive way, going far beyond the stereotypical **"counting, pouring and sticking"** of conventional prescription dispensing. The pharmacists' extended

role not only helps to enhance the quality of patient care but also saves money by addressing medication-related problems before they escalate.

The Discipline of Pharmacy Administration
Administration is the work of managing an organisation's resources and various assets. Professionals in this field work to ensure that businesses and organisations are run effectively, efficiently and profitably; this is a balancing act that requires knowledge and skills in a range of disciplines. They need basic knowledge in the management of human resources, marketing, finance and information technology. Furthermore, quantitative skills are essential along with some level of 'soft skills' such as communicating ideas, persuasion and influencing others, giving feedback and making effective and informative presentations.

There is a critical need for highly skilled health–system leaders to navigate today's complex challenges in healthcare and empower their teams to succeed together. Pharmacy Administration, as a relatively new sub-specialty area of pharmacy, seeks to fill this gap and to prepare capable health-system leaders by expanding their pharmacy administration knowledge and developing highly effective leadership skills. The postgraduate programme we offer in Pharmacy Administration strives to enlighten, differentiate and position graduates to guide solutions needed to meet the mounting demands for better healthcare practices and safe medication use.
The purpose of Pharmacy Administration as a field of study is to enhance the safe and effective delivery of medicines and pharmaceutical services; as such, it seeks to equip practitioners with technical knowledge and problem-solving skills to assume positions of responsibility and leadership.

This sub-specialty provides an in-depth knowledge of the principles and practice of pharmacy to advance human health and the health systems, in addition to a deep understanding of critical business, analytical and communication skills applicable to all levels of supervisory or administrative positions, patient care and

collaborations in the health team. Essentially, the discipline focuses on improving the practice and profession of pharmacy; developing strategies to support others in the profession, advocating for the growth and development of pharmacist–provided services, developing pharmacy practitioners, and liaising with senior leadership and stakeholders on behalf of practicing pharmacists.

Pharmacy Administration draws knowledge from other disciplines - mostly from the management sciences, which provide the relevance, but also, respectively from sociology and psychology which provide an understanding of the social context of medicine use and the tools for evaluation of some phenomena. As an area of specialisation, pharmacy administration requires the integration of knowledge from these disciplines other than the pharmaceutical sciences. The elements of this discipline consist of topics in the Principles and Theories of Management, Health-System Pharmacy Operations, Healthcare Financing, Human Resource Management, Medicine Supply Chain Management, Medication Safety and Quality Improvement.

Pharmacy administration has many faces, but at a basic level it provides leadership and support to pharmacists in any practice setting. It exists in community pharmacy, health-system pharmacy (at the hospital and corporate level), government ministries and departments; regulatory agencies and a variety of other practice areas such as pharmaceutical public health and pharmapreneurship. Basically, pharmacy administration is concerned with the management and organisation of pharmaceutical services, including medicine use and distribution, drug utilisation review, and medicine information services. Studies in this field often involve the use of economic and management theories to analyse relevant issues. Unique attributes that pharmacy administration programme imparts include skills in communication, financial and leadership management, an understanding of legal and regulatory issues, and continuous quality improvement methods. It also prepares pharmacists for leadership positions in any practice

setting, supporting them to develop robust collaborative practice agreements, and it imparts demonstrable skills to ensure that the value of pharmacist–provided services is understood by a variety of healthcare stakeholders. Obviously, these noble and trusted roles are yet to be fully actualised in our environment.

My research activities in Pharmacy Administration
My research activities in pharmacy administration are focused on the evaluation of pharmacy operations, with regard to current practices and the application of innovative strategies to enhance the quality of pharmaceutical services in healthcare. Technology options and the use of management sciences are explored for quality improvement of these activities. Considerations are given to client feedback as a measure of service quality with special attention to the design and validation of instruments to measure client satisfaction, patient response to waiting lines, adherence to dispensed medications and comprehension of medicine information leaflets. In view of the foregoing, my research efforts in Pharmacy Administration may be categorised into four major areas:
1. Operations Management of Hospital Pharmacies;
2. Effective use of Technology in Pharmacy Operations;
3. Pharmaceutical Services in Public Health, and
4. Enhancing Service Quality in Community Pharmacies.

1. OPERATIONS MANAGEMENT OF HOSPITAL PHARMACIES
Operations management of pharmacies is a discipline of management that integrates scientific or quantitative principles to determine the most efficient and optimal methods for pharmaceutical services in patient care. Pharmaceutical care is a key piece of these services in the hospitals, and this care component describes patient-focused clinical activities such as patient education and counselling, medication review and provision of medicine information. However, with the current level of busyness of hospital pharmacists in managing medicine logistics and dispensing functions, they have little time left to devote to

patient care functions. In a bid to improve performance metrics and enhance the quality of pharmacists' activities in the hospitals, studies were conducted to examine the effect of various management principles and strategies on the work system, using the model of tertiary health institutions in Nigeria. This should minimise administrative inefficiencies of excess overhead costs and staff burnout.

Daily activities and internal processes in the pharmacy were reviewed, and service design thinking was employed to locate possible administrative or logistics burdens and other elements cutting into staff time. Service design thinking for process improvement requires solutions synthesising multidisciplinary knowledge, and this procedure identified areas that could free up hours for direct patient or client services by the pharmacists.

The objectives were to establish the need for process improvements in the pharmacy work system and to design possible metrics to assess these improvements. In order to accomplish these tasks, processes within the work system were documented and analysed, using the technique of Value Stream Mapping (VSM). This technique involves documentation of the process's material and information flows to identify waste and delay points. It helps to identify inefficiencies and bottlenecks, leading to better patient outcomes and process improvement. Flow charts and check sheets were then employed in the problem definition and analysis.

Value stream mapping can be used to improve any process where there are repeatable steps, such as in the logistics of medicine distribution in hospital pharmacies. In healthcare, VSM ensures that patients are effectively treated with high-quality care and minimal delay. Using the VSM technique, **Afolabi** and Erhun (2003) examined the dispensing procedure and operational problems related to patient waiting times as prescriptions were filled in three tertiary hospitals. Workflow analysis highlighted the sequence of tasks involved in these operational activities; the sub-

components of a typical out-patient dispensing process are presented in Table 1.

Table 1: Procedural elements for outpatient dispensing

i.   Initial patient contact and information collection
ii. Payment at the cashier's desk
iii. Submission of prescription and dispensing
iv. Obtain and package medication
v.   Final clerical processing and cleaning

i.   Long patient queues in hospital pharmacies
Pharmacy Administration is applied research, and as such, studies in the field grow from practical problems experienced in concrete social reality. For instance, in Nigeria hospitals, patients physically wait in lines (queues) to fill their prescriptions; this observation informed our investigations of dispensing procedure and identification of possible operational problems that may lead to excessive patient waiting times at the pharmacies (**Afolabi** and Erhun, 2003).

Patient waiting time (patient queues) has been defined as "the length of time from when the patient entered the pharmacy with a prescription to the time the patient actually received their medications and left the pharmacy" (Worley and Schommer, 1999). A patient's experience of waiting can radically influence their perceptions of service quality. Previous studies showed that the overall satisfaction of patients with pharmaceutical services was closely related to their satisfaction with waiting time (Lin, Jang, Lobas *et al.,* 1999). Long waiting time was given as a reason why some patients did not fill their prescriptions in a particular pharmacy (Somani *et al.,* 1982). These findings serve to illustrate the significance of waiting time on pharmacy services and patronage.

Patients are attended to at various units within the hospital, but almost invariably, a high percentage of outpatients would

eventually converge at the hospital pharmacy for their medicine needs. These patients leave the physicians' consulting clinics and other units at various times, thus constituting a random arrival rate at the pharmacy where dispensing activities take place sequentially. Queues form when the rate of patient arrival at the pharmacy is greater than the service rate; however, excessive patient waiting time undermines pharmacy efficiency. Such delay leads to patient dissatisfaction, which may eventually result in loss of patronage in a competitive healthcare system. It may also lead to poor patient compliance with instructions given at the pharmacy. Therefore, it becomes imperative to carry out a systematic study on patient waiting times in hospital pharmacies, with a view to identifying factors that affect queuing and recommending ways to minimise the delay (**Afolabi** and Erhun, 2003; **Afolabi** *et al., 2010*).

Dispensing of prescriptions forms the core of pharmacists' activities at the hospitals in Nigeria, but considerable delays in the process result in long patient queues. **Afolabi *et al.* (2010)** examined the dispensing procedures with a view to identifying aspects of the process design (task elements) that contributed to patient delays and to provide quantitative data relevant to the improvement of these operations in the pharmacies.

To this end, we sought to find answers to the following research questions in the context of a hospital pharmacy in Nigeria:

a. What are the procedural elements of prescription filling in a pharmacy, i.e., the dispensing procedures – of **'counting, pouring and sticking'**?
b. What time may be attributed to the process and delay components of these dispensing operations?
c. What is the average patient waiting time in the pharmacy?
d. Are patients favourably disposed towards the dispensing procedures?
e. What are possible operational problems that may lead to excessive patient waiting times?

Data were collected by direct observation of dispensing workflow and a time study of the procedural elements using a checklist to record the task components. A 3-hour period was spent each day for 15 days, and the time block was sampled within the eight-hour daily work period for a pharmacist in the hospital, bearing in mind the pattern of activities on a daily basis. The average waiting time for prescription filling in the pharmacies ranged between 10-31 minutes, but about 75% of this time accounted for patient delays. In other words, most of the patient waiting time in the pharmacy was caused by delay components of the dispensing procedure (Tables 1-3; Figs. 1a & 1b). The study showed the extent of patient dissatisfaction with the queue experiences and their limited access to the pharmacist. We therefore recommended a redesign of the pharmacy work system in order to minimise the delay points.

ii. Flow chart and time elements of dispensing operations

Table 1 highlights the procedural elements for outpatient dispensing of prescriptions in a typical hospital pharmacy. Figures 1a & 1b present the process and delay components of dispensing activities. Similarly, Tables 2 and 3 present the time distribution of these components in three hospitals. Further outlines of the process flow charts for out-patient dispensing procedures are shown in Figure 2.

Fig. 1a: Staff process chart for out patient dispensing operations at OAUTHC

Fig. 1b: Delay and process chart for out patient dispensing at OAUTHC

Table 2: Observed Time Distribution between Processing and Delay Components for each task of the dispensing process at OAUTHC

COMPONENTS OF DISPENSING PROCEDURE	Time spent (min.)			
	Processing		Delay	
	Mean	%	Mean	%
Patient wait for attendant to collect prescription	*	*	0.76	4.45
Attendant takes prescription for billing	0.15	0.88	*	*
Prescription placed on dispensing table for billing	*	*	0.44	2.57
Pharmacist bill and review prescription	0.62	3.63	*	*
Billed prescription placed on dispensing table for attendant	*	*	0.60	3.51
Attendant takes prescription to patient	0.18	1.05	*	*
Patient takes prescription to cashier	0.14	0.82	*	*
Patient wait on queue for payment	*	*	8.68	50.79
Cashier collects money, issue receipt and record	1.42	8.31	*	*
Patient collect receipt and prescription; and takes them to attendant	0.18	1.05	*	*
Patient wait for attendant to collect receipt and prescription	*	*	0.56	3.28
Attendant takes prescription and receipt to pharmacist	0.12	0.70	*	*
Prescription and receipt placed on dispensing table for pharmacist to fill	*	*	0.58	3.39
Pharmacist fills prescription	1.38	8.07	*	*
Drugs placed on dispensing table for attendant	*	*	0.86	5.03
Attendant takes drug to patient, instruct and dispense	0.42	2.46	*	*
Total	4.29	25.10%	12.80	74.90%

Total patient waiting time = 17.09min.
* = Nil

Table 3: Observed Time Distribution between Processing and Delay Components for each task of the dispensing process at UCH and LTH

COMPONENTS OF DISPENSING PROCEDURE	Time spent (min.)			
	LTH		UCH	
	Process min.	Delay min.	Process min.	Delay min.
Pharmacist reviews and bills prescription.	1.43	*	0.50	*
Patient takes prescription to cashier for payment	*	0.83	*	0.13
Patient waits on queue for payment	*	1.37	*	19.25
Cashier collects money and issues receipt	1.00	*	1.92	*
Patient returns billed prescription to the pharmacy	*	1.53	*	0.25
Pharmacist dispenses prescription	1.63	*	1.13	*
Pharmacist gives drugs to patient and counsels as needed.	2.30	*	7.63	*
Total	6.36. (63.03%)	3.73 (36.97%)	11.18 (36.29%)	19.63 (63.71%)

	LTH	UCH
Total patient waiting time =	10.09min.	30.81min.

* = Nil

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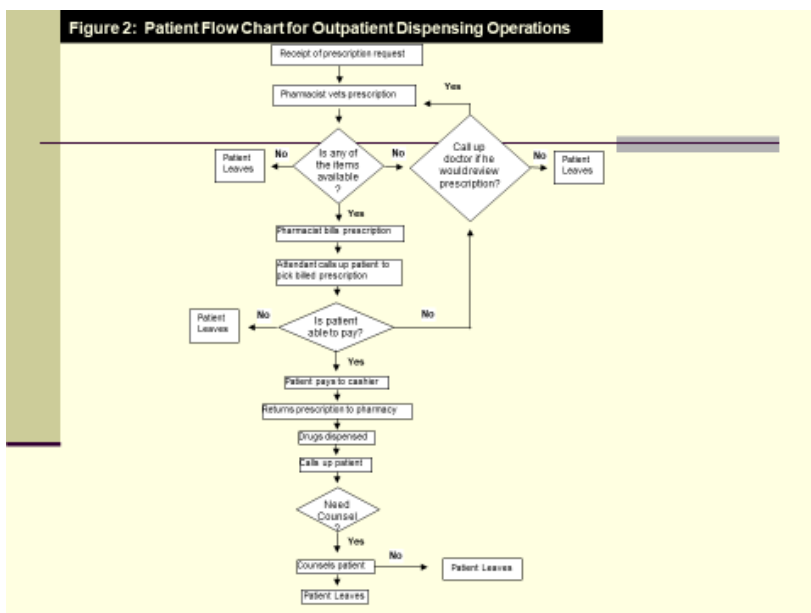**Figure 2: Patient Flow Chart for Outpatient Dispensing Operations**

Table 2 shows that most of the patient waiting time was due to delay = 12.8 minutes, i.e 74.90% of the overall patient waiting time, while the process component took 4.29 minutes.

The longest delay occurred before payment for the billed prescription, i.e. collection of money, issuing of receipts and recording by the cashier (8.68 minutes or 50.79% of total patient waiting time). The source of delay resulted from the processes involved before the payment; on observation, the payment/recording time, which shows that the process was not efficient. The actual prescription filling time was 1.38min (8.07%), whereas the total processing time was 4.29min, which was 25.10% of patient wait. Delay components took 11.62min (68.0%) before the core activity. In summary, the total dispensing process time is 4.29 min. (25.10%) while the delay components took 12.81 min (74.90%).

Apparently, from Figures 1a & 1b, much of the delay components involved movements from one area of the pharmacy to another.

The following movements took about 75% of the processing time: -
  a. Attendant takes prescription to pharmacist for billing.
  b. Attendant returns the billed prescription to the patient.
  c. Patient takes billed prescription to cashier for payment.
  d. Patient collects the receipt and the billed prescription and submits them to the attendant.
  e. Attendant takes prescription and receipt to pharmacist for dispensing.
  f. Attendant takes packaged medicines to the patient with instructions.

Restructuring the pharmacy layout appropriately to reduce movements will lead to a reduction in the total patient waiting time.

A delay is more likely to occur at the end of a process component due to a break in the workflow. Decrease in the number of process components should reduce the delay and total waiting time, for instance, merging the billing process and payment/recording (eliminates 9 out of 16 dispensing components). If merged, the billing and payment/recording processes could be computerised. Similarly, increasing the number of "payment units" or servers at the pharmacy to two, especially during peak hours has the potentials to decrease the time lag (a delay) before the process of payment and recording. This potential for improvement is buttressed by the short delay (0.58 min) observed prior to "filling of prescription".

The processing time for filling of prescription (1.38min) and payment/recording time (1.42min) are similar, but because there was more than one member of staff filling prescriptions, the time lag (delay) before initiation of the process is significantly shorter, 0.58 min versus 8.68 min.

Table 3 presents patient waiting times and dispensing processes at two teaching hospitals, Ladoke Akintola University Teaching Hospital (LTH) and University College Hospital (UCH). At these

hospitals, patients were attended to directly by the pharmacists without the mediation of attendants. The average patient waiting times were 10.09 min and 30.81 min for LTH and UCH, respectively, out of which 8.72 min (86.72%; LTH) and 11.18 min (36.29%; UCH) were related to process components while 1.37 min (13.58%; LTH) and 19.63 min (63.71%; UCH) were the delay components.

Major delays occurred at the cashier's desk as the patient waited to pay for billed prescriptions (1.37 min - LTH; 19.25 min - UCH). The considerable delay in payment at UCH was due to the volume of transactions at the cashier's desk. There were two payment points, but billed patients from other sections of the hospital also queued to pay at these points. At LTH, the cashier's stand was far removed from the pharmacy, hence the longer time observed in commuting (1.53min). However, the actual prescription filling time was similar at each of the hospitals (1.63 min - LTH; 1.13 min - UCH).

iii. Modelling dispensing procedures using the queuing theory
Attempts at proffering solutions to patient delay in the pharmacies informed the application of management science techniques to model the service procedure. **Afolabi *et al.* (2010)** presented a redesign of the work system and provided quantitative data relevant to improving dispensing operations in the pharmacies. Queuing models were used to characterise patient waiting lines to simulate optimal capacity utilisation for the service channels. The results showed that the capacity utilisation of the existing four service channels was considerably low (4% - 8%), but this was improved (48% - 66%) when the facility was simulated with two service channels (Table 4a)

Table 4a: Operating characteristics of waiting lines in the pharmacies

Institu-tions	No of Channels	λ/min	μ/min	P_o	n_s	n_q	t_s/min	t_q/min	P_w
	Waiting line parameters								
	4	0.55	0.38	0.24	1.49	0.04	2.71	0.07	0.07
	3	0.55	0.38	0.23	1.66	0.21	3.02	0.38	0.22
	2	0.55	0.38	0.16	3.07	1.62	5.58	2.95	0.62
OAUTHC	4	0.62	0.40	0.20	1.60	0.05	2.58	0.08	0.08
	3	0.62	0.40	0.20	1.82	0.27	2.94	0.44	0.25
	2	0.62	0.40	0.12	3.83	2.28	6.18	3.68	0.66
	4	0.33	0.27	0.30	1.24	0.02	3.78	0.05	0.04
	3	0.33	0.27	0.30	1.32	0.10	4.00	0.30	0.15
	2	0.33	0.27	0.25	1.97	0.75	5.97	2.27	0.48

Where:

P_o = The probability of no client in the system

n_s = The average number of clients in the system

n_q = The average number of clients in the queue waiting for service

t_s = The average time a client spends in the system (waiting time + service time)

t_q = The average time a client spends in the queue waiting for service

P_w = The probability that an arriving client has to wait for service (utilisation factor)

The queuing characteristics were simulated using three or two servers (Table 4a). With two service channels, patients spent about 5 – 6 minutes in the pharmacies (t_s), and time on the queues (t_q) ranged between 2 – 4 minutes. The mean utilisation factors (Pw) of

the operations were quite low (0.04 – 0.078) for four channels but highest (0.48 – 0.66) for two service channels. With these utilisation factors, the number of patients on the queues was reasonable (1 – 3 patients). The number of dispensing pharmacists could be kept at two in each of the outpatient units while remaining pharmacists may be engaged in other duties at the pharmacies.

Table 4b presents operating characteristics of waiting lines at the cashiers' counters. Values recorded for the parameters shown in row A of the table were calculated from observed mean arrival rates (λ) and mean service rates (μ). Rows B and C present the simulated queuing characteristics assuming utilisation factors (Pw) of 0.70 and 0.65 for the operating systems, respectively. Results in row A for the three hospitals indicate that patients queued for about 8 – 19 minutes to be attended to while they spent between 10 – 20 minutes in the paying system. This appears a bit long considering the state of ill-health of some of these patients and the fact that they would have to join queues in other service units of the hospitals.

The mean utilisation factors of the operations are very high (0.87 – 0.93) but the resultant long queues (7 – 12 patients) and the waiting time (8 – 19 minutes) may demand an increase in service channels. Similarly, the length of queue and the waiting time may be reduced either by increasing the service rates or making a creative design change, such as changing the service channels.
Similarly, considerable delay was observed at the payment counter; patients queued for up to 19 minutes and waited for about 20 minutes in the system while the capacity utilisation ranged between 65% - 93%. The operating characteristics of one cashier service channel with varied service rates were also simulated (Table 4b) with the queuing theory.

Table 4b: Operating characteristics of one cashier service channel with varied service rates

INSTITUTIONS	λ/min.	Models	μ/min.	n_s	n_q	t_s/min	t_q/min	P_w	P_0
						WAITING LINE PARAMETERS			
UCH	0.62	A	0.67	12.40	11.47	20	18.50	0.93	0.07
	0.62	B	0.89	2.3	1.60	3.70	2.58	0.70	0.30
	0.62	C	0.95	1.88	1.23	3.03	2.0	0.65	0.35
OAUTHC	0.60	A	0.67	8.6	7.68	14.30	12.80	0.90	0.10
	0.60	B	0.86	2.31	1.64	3.85	2.73	0.70	0.30
	0.60	C	0.92	1.88	1.24	3.13	2.07	0.65	0.35
LTH	0.45	A	0.52	6.43	5.56	10.30	8.40	0.87	0.13
	0.45	B	0.64	2.37	1.69	5.26	3.75	0.70	0.30
	0.45	C	0.69	1.88	1.19	4.17	2.65	0.65	0.35

Where:
ns = The average number of clients in the system
nq = The average number of clients in the queue waiting for service
ts = The average time a client spends in the system (waiting time + service time)
tq = The average time a client spends in the queue waiting for service
Pw = The probability that an arriving client has to wait for service (utilization factor)
Po = The probability of no client in the system

Where:
λ = Arrival rate
μ = Service rate
P_w = The probability that an arriving client has to wait for service
(utilisation factor or capacity utilisation of the facility)

Assuming a constant arrival rate but varying the service rates to obtain utilisation factors (Pw) of 0.70 and 0.60 gave the operating characteristics in rows B and C of Table 4b. As the service rates

increased, performance measures of the waiting lines also improved remarkably, and the number of people waiting in line was an average of two at each of the three hospitals.

The probability values of no patient in the systems (P_0) also increased with improved service rates, and these may be increased at the paying counters. However, the application of modern technology in cash transactions and accounting records may also improve the service rate. On the other hand, service rate may be improved by a process redesign or addition of parallel service channels, but this would lead to additional costs. Essentially, it is imperative to maintain an economic balance between reasonable utilisation factors and moderately sized queues in the operating system.

Time elements of the dispensing operations revealed extensive delay components, which contributed to excessive patient waiting time. The average waiting time in the hospitals varied between 10 – 31 minutes, with 37 – 75% for patient delays. Tortuous procedure for prescription filling and the volume of transactions at the cashier stand were major operational problems.

Application of queuing models to the waiting lines showed that the utilisation factor (Pw) was considerably low (0.04 – 0.07) for each of the facilities with four service channels. Considerable delays were observed in dispensing to outpatients in the three hospital pharmacies. Essentially, these delays were due to the conventional work procedure and the volume of manual transactions at the payment counters. The ratio of out-patient dispensing time to patient waiting time was relatively high, especially at UCH, suggesting the need to reduce delay points between the submission of prescriptions and actual dispensing of the medicines. The operational problems observed in structural facilities, processes of service delivery and work systems were largely within the purview of management capacity and responsibility.

Introduction of electronic and automated devices was suggested as a possible strategy, and the pharmacists were largely inclined to embrace this intervention. A positive turnaround in the service delivery could involve redesigning and expanding existing infrastructural facilities. Continuing reorientation of pharmacists to contemporary and emerging technologies, innovative practices and skills in medicine management and dispensing are essential.

From the analysis of dispensing activities at the hospitals, it became obvious that most of the patient waiting time in the hospitals could be accounted for by the delay components of the procedures. Quite expectedly, the long waiting time was a major cause of patient dissatisfaction with the pharmaceutical services, but the level of satisfaction was found to vary among different groups of patients; with patients of post-secondary level of education, who were mainly students and civil servants being the least satisfied (**Afolabi** and Erhun, 2003). Interestingly, except for the challenge of waiting in queues, majority of the patients were fairly satisfied with pharmaceutical services at the hospitals. Attempts should therefore be made to reduce the time spent on components of dispensing so that more time may be devoted to counselling and direct patient care, while minimising the total turnaround time spent by the patients.

iv. Pharmacist views on their work system in the hospitals

The hospital pharmacy as a service operating system is expected to provide relevant and adequate infrastructure in form of equipment, facilities and tools required to satisfy client needs of appropriate medicine supply, pharmaceutical care and information services. Similarly, the service design should facilitate social and interprofessional interactions between pharmacists and other employees in the workplace. Design thinking recognises the service provider, and in this regard, **Afolabi** *et al. (*2009) investigated the views of hospital pharmacists on the adequacy of the content and design of their work environment (Table 5) and further assessed their level of job satisfaction.

Table 5: Responses of hospital pharmacists to the adequacy of specific aspects of their work system

		Not adequate %	Adequate %	Weighted Average
A.	**Structural Facilities**			
1.	Dispensing layout	64.2	35.8	1.36
2.	Dispensing furniture	60.7	39.3	1.46
3.	Counselling privacy	96.4	3.6	0.54
4.	Internet facilities	82.1	7.9	0.71
B.	**Staff Welfare**			
1.	Recruitment procedure	78.6	21.4	1.14
2.	Poor staff remuneration	85.7	14.3	1.07
3.	Continuing professional development	92.8	7.2	1.18
4.	Information communication	71.4	28.6	1.21
5.	Social amenities	86.9	13.1	0.68
C.	**Process of service delivery**			
1.	Dispensing procedure	25.0	75.0	1.82
2.	Billing and payment procedure	21.4	78.6	1.75
3.	Interprofessional communication	71.4	28.6	1.21
4.	Basis of interaction with patients	52.0	48.0	1.46
5.	Patient delays	88.9	11.1	0.86
6.	Number of pharmacists	82.1	17.9	1.18
7.	Number of pharmacy support staff	66.1	33.3	1.28

Two sets of questionnaires were administered on a sample population of pharmacists across different job cadres in three university teaching hospitals in southwestern Nigeria. The challenges identified in the work system were in the areas of

inappropriate structural amenities, particularly the pharmacy layout (64.2%), dispensing furniture (60.7%) and lack of counselling privacy (96.4%). The process of service delivery was considered inadequate by most respondents, and the problem areas were shortage of staff pharmacists (82.1%), and **patient delays (88.9%)**. Issues relevant to staff welfare were poor remuneration (85.7%) and unsatisfactory procedure for staff recruitment (78.6%). Facilities required for updating pharmacists' professional knowledge were grossly inadequate (92.8%), and necessary structure for information communication was not in place (71.4%). The results showed that generally, practising pharmacists were not satisfied with their work system; though there were significant variations across gender groups (t = 2.50, p<.05) and years of experience (F = 3, p<.05). The issues raised were considered to be largely within the purview of management capacity and responsibility. From the study, suggestions to improve job satisfaction of pharmacists include creative deployment of their skills, in terms of job enrichment and job enlargement, improved remuneration and a conducive work environment. In addition, the adoption of electronic devices would facilitate considerable improvement in service delivery at the pharmacies.

In a previous study, **Afolabi (1999)** examined the level of job satisfaction of hospital pharmacists in Nigeria. The survey included respondents from ten states selected by stratified random sampling to accommodate the geopolitical zones of the country. Results showed general dissatisfaction among pharmacists in this practice setting. The reason might not be far-fetched in view of the operational problems identified and insufficient motivation at the workplace (**Afolabi *et al.,* 2009**). Applying various motivational theories, Ologunde and **Afolabi (2008)** identified job-related factors which are of significance to healthcare givers, including practising pharmacists. The study examined the concept of motivation, effective strategies and the essence of motivating healthcare practitioners for optimum performance, with emphasis on the relevance of intrinsic and extrinsic motivational factors as suggested by Herzberg's two-factor theory.

v. Perspectives of physicians and nurses on pharmacists' activities in the hospital

Patrons of a service delivery should be valued, and this requires that the service provider spend time to understand various interactions with the service. This may be achieved in two ways: first, by viewing the service through the patrons' eyes, with appropriate feedback on performance and second, by designing the service in such a way that the patrons receive consistently valuable experiences over time.

In a bid to view the service through the patrons' eyes, **Afolabi *et al.* (2009)** examined inter-professional perspectives of physicians and nurses on pharmacists' activities in the hospitals (Table 6). Pharmacists' activities were grouped into four domains based on the Pharmacists' Practice Activity Classification (PPAC) document, namely: pharmacists' influence on prescribing and medicine use; dispensing of prescriptions; participation in health promotion and medicine supply management (Maine, 1998).

The PPAC was the first hierarchical list of practice activities common to pharmacists across the spectrum of healthcare settings, released in 1998. The project was led by the American Pharmaceutical Association, in collaboration with about ten other pharmacy organisations. The classification system provides pharmacists with a shared language for describing their activities in pharmaceutical care research. The PPAC organises pharmacists' activities into four domains, with each domain broken down into activities, then into tasks, and the tasks into steps. The PPAC is a response to the growing need to measure the contributions of pharmaceutical care activities to improved patient care and cost-effective resource use. In addition to facilitating pharmaceutical care research and reimbursement, the classification system also seeks to improve documentation of pharmacists' activities, strengthen connectivity and cooperation between pharmacy and other healthcare disciplines, enhance pharmacy management, and assist in the development of quality-of-care guidelines.

Several studies have examined inter-professional perspectives of pharmacists' roles as healthcare professionals to improve collaborations on patient care. In this study on inter-professional perspectives, **Afolabi *et al.* (2009)** designed a service importance–performance checklist, using 19 response items selected from the four domains of PPAC. Items on the instrument reflected general and specific aspects of pharmacists' activities. The checklist was administered on a stratified sample of physicians and nurses from three university teaching hospitals in southwestern Nigeria.

The results showed concordance by the two professional groups on perceived order of importance of pharmacists' activities, but there was a significant difference in their ratings of pharmacists' influence on prescribing and medicine use ($t = 2.002$, $p<.05$). Dispensing function ranked highest in importance, while medicine supply activities were rated lowest. Both groups rated pharmacists' performance lowest in dispensing functions; however, the physicians scored them high in health promotion activities, while the nurses preferred pharmacists' influence on prescribing and medicine use. Perceptions of pharmacists' activities varied across the respondents' years of work experience.

Table 6: Perspectives on Pharmacists' activities by Physicians and Nurses

S/N	Pharmacists' activities	Respondents	Ratings	
			Importance	Performance
1.	Pharmacists' influence on prescribing and medicine use	Physicians Nurses	2 2	3 4
2.	Dispensing of medications and devices	Physicians Nurses	1 1	1 1
3.	Pharmacists' participation in health promotion and disease prevention	Physicians Nurses	3 3	4 2
4.	Hospital medicine supply management	Physicians Nurses	4 4	2 3

Key:

Importance	**Rating**

Performance Rating

1. Very important
2. Important
3. Fairly Important
4. Less Important

1. Very Good Performance
2. Good Performance
3. Fairly Good Performance
4. Poor Performance

vi. Perspectives of patients as consumers of pharmaceutical services

Patient satisfaction may be viewed as an indicator of service quality and described as an individual's reaction to a particular service experience or a culmination of experiences. At the measurement level, patient satisfaction may be conceptualised as a performance evaluation or as an affect-based assessment. These views encouraged the use of a questionnaire to facilitate patients' evaluation of healthcare providers and their services; patients are the patrons or consumers of these services. **Afolabi (1999)** examined patient satisfaction with pharmacists' activities in a tertiary hospital using a validated patient satisfaction survey instrument administered on a sample of clinic outpatients who came to fill their prescriptions at the pharmacy; data were collected over a period of time to accommodate different clinic days at the hospital. The results showed that patients were generally satisfied with services at the pharmacy. Specific aspects of satisfaction include ready availability of most prescribed medicines, 24-hour service and the assurance of quality medicines. On the other hand, an area of major dissatisfaction was the long waiting time, and most patients wished for a more conducive waiting lounge with some conveniences. The study recommended appropriate expansion of pharmacy services with more personnel and a comfortable waiting area for the patients.

In another study on patrons' perspectives, **Afolabi and Osemene (2021)** examined consumer satisfaction with healthcare services provided by community pharmacies in Sierra Leone. Community pharmacies are readily available in the neighbourhoods and

usually, they serve as the first port of call when seeking proper healthcare; essentially as a primary healthcare facility. A cross-sectional survey of 583 participants was conducted using a pretested self-administered questionnaire presented on a 5-point Likert scale. Descriptive and parametric techniques were used to summarise the data at $p< .05$. The level of satisfaction varied with different activities and across consumer demographic characteristics, which include age, gender, level of education and occupation. Services mostly sought after were patient counselling and provision of information relevant to therapy (87.8%), availability of quality prescription and non-prescription medicines (82%), ancillary health products (74.1%) and treatment of minor ailments (71%). On the other hand, services least sought-after after were requests for health screening (5.3%), health education (4.6%), health monitoring devices (4.5%), and education on reproductive health (3.6%). About 84.8% of participants reported a good level of satisfaction, and their degree of satisfaction was significantly associated with age ($p = .031$), gender ($p = .012$), education ($p = .016$) and occupation ($p = .004$).

Services that were rated highly satisfactory by patrons included provision of health information and the quality of available medicines. Moderate scores were obtained for promptness of service delivery and stock level. Statements with poor scores included occasional absence of pharmacists from their premises, poor attitude of pharmacy staff, and high cost of the medicines.

Strategies to enhance the quality of pharmaceutical services are integral to the sustainability of community pharmacies as primary healthcare outlets. In an attempt to examine issues relevant to quality improvement of these services, Ihekoronye *et al.* (2021) explored customer perspectives using selected indicators drawn from service quality domains of reliability, assurance, tangibles, equity and responsiveness. Significant gaps were observed in customer expectations of responsiveness, reliability of service teams and service fulfilment. These findings underscored the need

to prioritise customer satisfaction, serving them promptly, correctly and as promised.

Construct validation of an instrument to measure patient satisfaction with pharmaceutical services in Nigeria hospitals

Patient satisfaction is a multidimensional construct that reflects the type and quality of service provided by healthcare providers, how well it is delivered, and the extent to which the expectations and needs of patients are met. As a performance measure, patient satisfaction has been defined as the personal evaluation of healthcare services and providers (*Ware et al.*, 1983). It serves as a link between services that are provided and patients' needs and desires; it also allows an assessment that directly reflects the patients' perspective on a service (Kucukaslan *et al.*, 1996). A review of healthcare literature showed that data on patient satisfaction could serve as an indicator of service quality and as a predictor of related behaviour. It may also be used to assess the performance of healthcare programmes and the personnel (Ware *et al.*, 1975). Thus, it is expected that patients who are satisfied with healthcare services are more likely to continue using such services and maintain relationships with specific providers than those who are not (Yi, 1990; Crosby *et al.,* 1990). In our quest to present patient satisfaction as a measure of pharmacists' performance, **Afolabi,** *et al.* (2012) developed a patient satisfaction scale, that could be used to assess the quality of pharmaceutical services provided in Nigeria hospitals and to determine the construct validity of the scale to identify factors that may be considered relevant to the target users.

The questionnaire was a 35-item inventory titled "Patient Satisfaction Survey (PSS)" and this instrument was based on the conceptualisation of patient satisfaction as a multidimensional construct, incorporating relevant items on both the performance evaluation and consumer expectations. The study was conducted in three university teaching hospitals located in Southwestern Nigeria, and the PSS was administered on a sample of clinic outpatients who patronised the hospital pharmacies. Participation in the study was voluntary with appropriate informed consent and

ethical approval from the institutional Medical and Ethics Committee.

The initial version of the PSS was administered on a pilot sample of 30 patients, selected on the basis of convenience and willingness to participate in the study. Their responses to the inventory were used to investigate the internal consistency and reliability of the initial instrument before the main phase of data collection.

The data obtained were subjected to reliability analysis and Principal Components Analysis (PCA), which yielded a Kaiser-Meyer-Olkin (KMO) value of 0.80. This value showed the sampling adequacy, an indication that the data collected were suitable for factor analysis. The KMO is one of the statistics used in determining whether a collected set of data is suitable for factor analysis investigation or not.

Internal consistency methods of Cronbach's coefficient Alpha, Spearman Brown's and Guttmann's coefficients were used to determine the reliability of the scale. The instrument was subjected to reliability analysis and exploratory factor analysis, leading to a final 25-item scale. The mean inter-item correlation was 0.52, while the Cronbach alpha, Spearman Brown and Guttman reliability coefficients were 0.72, 0.78 and 0.79, respectively. Principal component analysis with varimax rotation revealed six factors accounting for 51.3% of the total scale variance. The factors on the final scale were reducible to six factor components, reflecting key dimensions of pharmacy services perceived as important by patients. The six factors (with eigenvalue greater than one) are: attitude of pharmacy personnel; accessibility and convenience of pharmacy location; quality and cost of the medicines; conducive patient waiting area; availability of prescribed medicines; and promptness of service delivery. The item loadings across the six factors are contained in Table 7. The coefficients of item loadings on the first factor (attitude of pharmacy personnel) are the highest of all the loadings for the six factors on the scale. A scree plot for the scale however, showed

four factor dimensions with eigenvalues greater than one. The four dimensions were: attitude of pharmacy personnel; accessibility and convenience of pharmacy location; quality and cost of medicines; and a conducive patient waiting area. The scree plot is a two-dimensional graph that carries factors on its X-axis and eigenvalues on the Y-axis. The factor(s) with the greatest 'effect' (depending on the rule of determination, usually, values greater than one) are considered as the number of factors on the scale.

Correlation of the scale was carried out both on the initial 35 items and the final scales (Table 7). Item retention decisions were based on the use of corrected item-total statistics and Cronbach's Alpha if-item-deleted approaches. The coefficients of reliability of the initial and final scales are shown in Table 8. Furthermore, a scree plot was drawn for the final 25-item PSS scale to visualise the principal components, and this confirmed the factor composition (Fig. 3).

In order to further investigate the quality of the result obtained, the influence of sample-related factors such as educational background and gender was examined. The results showed that patient satisfaction reduced with an increase in level of education. Furthermore, the influence of gender on patients' responses to the scale items was examined using a t-test. The results of the t-test analysis showed that gender had a significant influence on the responses to patient satisfaction, with female respondents expressing greater satisfaction (mean = 66.25) than their male counterparts (mean = 63.78).

The final 25-item PSS scale presented significant and stable coefficients of correlation and yielded six derived dimensions of patient satisfaction. These factors appear to capture the important concerns of patients who came to obtain prescribed medicines from the hospital pharmacies. Essentially, the scale was found to be psychometrically valid to measure patient satisfaction with pharmaceutical services in selected Nigerian teaching hospitals. The identified underlying factors could be used to improve the

services and also in the training of pharmacy students in pharmaceutical care.

Table 7: Summary item statistics of the initial 35 and final 25 scale items

Initial Scale					Final Scale			
	Mean	Min	Max	Range	Mean	Min	Max	Range
Item Mean	2.658	1.015	5.015	4.000	2.794	1.882	3.617	1.735
Inter–item Correlation	0.470	0.418	0.667	0.249	0.520	0.427	0.745	0.318

Table 8: Coefficients of the probability of the patient satisfaction survey

Reliability	N = 35	N=25
Cronbach Alpha	0.670	0.714
Spearman – Brown (unequal lengths)	0.752	0.780
Guttman Split – half	0.752	0.792

Table 8 shows that consistently greater reliability coefficients were obtained on the 25-item scale than on the initial 35 items, each being significant at $p<.05$. Initial factor analysis using eigen value greater than one suggested the presence of seven factors in the scale, but Principal Component Analysis (PCA) with varimax rotation, revealed six factors on which the 25-item scale loaded, accounting for 52.28% of the total scale variance. This suggests that the factors on the scale were reducible to six factor components reflecting key dimensions of the services perceived as important by patients. In conclusion, the study developed a scale to measure patient satisfaction with pharmaceutical services in the hospitals.
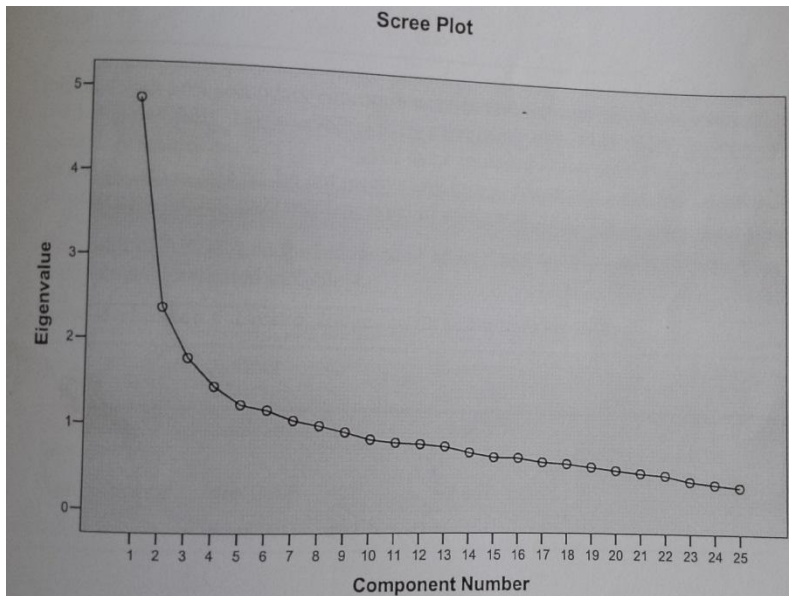
Figure 3: **Scree plot for the final PSS scale**

vii. Medicine Information Leaflets – Usability, Readability and Comprehension

The desire for a service offering depends upon the functional benefits that the customer appreciates and finds relevant. A high utility score for a service offering demands an understanding of customer needs and the functional benefits of the service design. In order to obtain a high score on the utility value of a service and to have a good grip, the organisation should consider the service offering from the viewpoints of what customers value, rather than adding unnecessary feature creep, bearing in mind that utility is about what the customer needs.

A service offering is essentially defined as the range of services a company provides to its clients, encompassing solutions, expertise, and assistance tailored to meet diverse needs. Usability or utility value describes how easy it is to use the product or service. The ease of use often relates to how quickly and smoothly a customer can move through the service journey; the risk they run of misunderstanding something and making errors, and possible error

recovery. Usability relates to how the interaction is strung together, often in terms of the design of the dialogue between the service and the customer. This is often referred to as interaction architecture, and this may be used to describe the functional divisions and design layout of different parts of a medicine information leaflet (MIL).

The process of service design thinking starts by articulating the problem of a service offering from the perspective of the customer. Different methods and tools from various disciplines are used to explore and understand the mindset and behaviour of all persons involved to adjust certain aspects of the service proposition that might not be functioning appropriately. The major focus of this process is on identifying the problem first.

Afolabi *et al.* (2010) employed the framework of service design thinking to examine Medicine Information Leaflets (MILs) enclosed in the packages of some over the counter medications. MILs may also be considered as consumer medicine information (CMI) or patient information leaflets (PILs); they are documents that provide important information about a medication: appropriate dosage regimen, possible side effects, interactions with other substances and who should or should not take the medication. MILs are available as package inserts for all patent medications, including those prescribed by a doctor and those available as OTC at a pharmacy. The leaflets are typically included as package inserts in the medication boxes.

A medicine information leaflet as a service offering to medications must be presented according to customers' expectations of structure or readability and level of comprehension; these views should be considered in the design of MIL by the manufacturers.

Three keys to unlock the door to product or service usability are: frequency, sequence and importance. Frequency refers to things the customers do or refer to most often, like dosage and side effects of the medicine described in the leaflet. This should have a

prominent position in the sequence. Sequence refers to the order of the interactions with the themes, while importance means that significant information should be given clearly and conspicuously. These key issues were considered in evaluating the MIL, hence the studies on content validity, readability and patient comprehension of the leaflets. Investigations on the usability of MIL considered the themes frequently checked, the sequence, and the importance of these themes to rational medicine use by patients or caregivers who interact with this service design – the MIL (**Afolabi** *et al.,* 2010; Titus *et al.,* 2020; Titus *et al.,* 2022).

In Nigeria, self-medication with over the counter (OTC) anti-malarial medicines is a common practice, and it is expected that the MIL should enhance proper medication use. **Afolabi** *et al*. (2010) developed an instrument to estimate the readability and content validity of MILs in five selected anti-malarial medicine packages. This instrument was administered to sampled consumers of these medicines. The leaflets were further examined using the Gunning Fog Formula to estimate the probable reading age of potential consumers. The MILs were considered readable for an average consumer, especially in terms of vocabulary levels, text design and ability to stimulate readers' interests. However, they were rated low on legibility, syntax and illustrations.

The Gunning Fog Formula approach involved selecting a sample of 100 consecutive words (W), counting the number of sentences (S) in the sample, and checking the number of words having three or more syllables (T) that are not combination or capitalised words, or verbs ending in "ed" or "es". The final step involved calculating the reading age needed to interpret the material using the formula $[(W/S + T) \times 0.4]$. The approach has been widely used to estimate the readability of late primary and early secondary school reading texts (Ojedokun, 2005). The values obtained using the formula were used to evaluate the selected MIL for degree of difficulty, while data obtained from respondents were used to assess the content validity and to further corroborate the measure of readability obtained via the formula.

Table 9: The readability of selected MIL using Gunning Fog analysis

Sample MIL	S	T	Reading age (yrs)	Remark
A	6	25	*16.67	Readable
B	4	25	**20.00	Unreadable
C	8	21	*13.40	Readable
D	7	21	*14.11	Readable
E	7	29	**17.31	Unreadable

*Within the reading age range (8 - 16) of potential medicine users
**Above the reading age range of all potential. Medicine consumers

Pleasurability of service design is another significant factor in presenting a functional MIL. This concept relates to the way the interaction is designed; the look in terms of style, layout and emotional pleasure it gives. The presentation of MIL should stimulate readers' interests for maximum benefits. This consideration prompted an analysis of the text design, syntax and illustrations of some other medicine package inserts - MILs of Artemisinin-based-combination therapies (ACTs). These medicines are readily obtained over the counter for the treatment of malaria, which is endemic in Nigeria.

Studies have shown that information contained in some MILs is often incomplete, but these leaflets should serve as a guide for effective therapeutic outcomes. Titus, **Afolabi** and Ola-Olorun (2020) assessed the adequacy of information contained in MILs of ACTs, in terms of the content validity and sequence, based on guidelines in the Summary Product Characteristics (SPC) of Nigeria's medicine regulatory agency, National Agency for Food and Drugs Administration and Control (NAFDAC). The research was a descriptive cross-sectional study of 32 MILs of ACTs conveniently sampled over four months in community pharmacies across four geopolitical zones of Nigeria. The NAFDAC-

recommended SPC guidelines were adapted to yield a 31-item evaluation guide, which was employed for the analysis.

Twenty-three (71.88%) of the thirty-one recommended information items were identified in the sample leaflets, with a mean content score of 24.17±2.57, which was significantly less (t = -15.99, df = 30, p=.000) than the expected test value of 31. The difference between the mean content scores of the MILs of locally produced ACTs (23.22±2.32) and imported ones (25.11±2.80) was not statistically significant. The findings showed that the information contents were not all sequenced as listed in the SPC of NAFDAC.

The study concluded that the content validity of information in the MILs of ACTs in Nigeria was suboptimal, and similarly, the sequence of information was irregular. Thus, recommending stricter enforcement to ensure full compliance with NAFDAC specifications for information contained in MILs, to serve as a proper guide for consumers of these medications.

In another study on the design of MILs to facilitate effective medicine use, Titus, **Afolabi** and Ola-Olorun (2022) explored the use of two other tools to determine the readability level and to assess the interaction architecture of other antimalarial medicine package inserts.

Texts in selected passages of the leaflets were subjected to the Flesch-Kincaid (F-K) formula to determine the F-K score and the corresponding reading-grade level, while the Baker Able Leaflet Design (BALD) assessment tool was employed to appraise the design layout.

Mean F-K score for the MILs was 14.22 ±5.06. A proportion of 15.63% of the MILs were readable at the postgraduate level, 28.13% at the undergraduate level, 37.5% at the senior secondary school level and 18.76% at the junior secondary school level. These low levels represented the total proportion of leaflets

readable among the respondents. On the BALD tool only 46.28% of the MILs were rated 'above standard' while the others were 'poor' in design, and the longest MIL measured 80cm by 36cm in dimension. A large proportion of the MILs were poorly designed and written above the reading level of average consumers of these OTC products. Some of the patrons would not likely be able to read these leaflets for reference purposes, to serve as a reminder for instructions received during medication counselling.

2. APPLICATION OF DIGITAL TECHNOLOGY IN PHARMACY OPERATIONS

Pharmacies provide an interesting framework for the study of automation, where multiple factors, including professional interests, governmental regulations, and patient interests, all determine how the technology is applied.

i. Perceptions on pharmacy automation

Applying a qualitative approach, including a comprehensive survey of pharmacists in selected teaching hospitals, **Afolabi** and Oyebisi (2007) investigated the perceptions of pharmacists on possible effects of automation in pharmacy operations. The study showed that pharmacy automation was considered useful by the pharmacists; however, they opined that this innovation may reduce workers' autonomy. Significant factors in evaluating the usefulness of automation were found to be autonomy and time pressure. Pharmacy robots would also facilitate new spatial design and more latitude, where the effectiveness of automation can also be harnessed to increase patient–focused clinical roles as the pharmacists are relieved of routine pharmacy logistics.

Some of the benefits of pharmacy automation highlighted included a reduction in human error during dispensing and releasing pharmacists' time from routine jobs to allow for personal customer services. It has been established that digitisation and automation increase medication safety as well as efficiency in the dispensing of medicines. An early example of this was the

implementation of bar code technology in hospital pharmacies (Poon *et al.,* 2010).

In order to decrease pharmacists' workload while maintaining or increasing efficiency and productivity, the inputs of information technology and automation for dispensing, logistics and management processes have been found promising. **Afolabi** and Oyebisi (2007) examined the attitude of pharmacists to the introduction of automated techniques in the delivery of pharmaceutical services in Nigeria hospitals, and the results showed that hospital pharmacists were well aware of various forms of automation applicable to pharmacy operations. They recognised the potential contributions to operational efficiency, and they viewed this technological innovation as an enabler for re-engineering pharmacy practice. However, sociologically, it is rational to think that the results of pharmacy automation would depend on many factors other than just the logistical effectiveness or professional interests of delivering the right medication doses at the right time to the right patients and clients.

Automated dispensing systems in pharmacies can be viewed as mechanising and robotising human tasks such as the shelving of drug packages. In principle, these do not differ from the automated industrial solutions of warehousing logistics. From an engineering perspective, automatic dispensers are logistical devices rendering store management more effective, optimising use of the space needed for handling, picking and delivering the products. Notwithstanding, the widespread general interest in pharmacy automation devices can be taken as a sign of pressures to make the healthcare sector more cost-efficient and productive. The use of logistic robots, including pharmacy automation, is more pervasive, and this seems to show the most promise in automating healthcare, although the usage of care robots is gradually emerging globally. Studies on the application of these technologies in pharmacy operations show that automation and the electronic prescription system could free pharmacists from routine tasks of medicines management (Beard, 2017).

ii. Web–based software for prescription monitoring and medicines management

In a bid to demonstrate a homegrown quality improvement solution for hospital pharmacy operations, **Afolabi** *et al.* (2018) developed a web–based software for prescription monitoring and medicines management. This was deployed for use at the University healthcare facility.

The software, named *PharmaPortal*, was designed to track dispensing of medicines and prescription details, patient prescription history, inventory management of medicines in the pharmacy, online chatting to facilitate effective communication among the users, automatic billing, patient registration and identification, and management of cash receipts.

In a typical healthcare facility in Nigeria, pharmacy operations are laden with paper-based methods of documentation. As a result, there are largely inadequate structures in place to monitor patients' prescription history and to prevent impersonation and fraud. The web-based system (*PharmaPortal*) was designed to manage medicine inventory and prescriptions at the healthcare facility.

The *PharmaPortal* was implemented with PHP, MySQL, JavaScript and CSS on an Apache web server. This software was browser-based and intended to be made accessible at various workstations within the Local Area Network (LAN) of the healthcare facility. Routine activities in five sections [Physician's Clinic, Pharmacy unit, Medical Records unit, Cashier point, and the National Health Insurance Scheme desk office] of the facility were digitised into six modules [Prescription Transmission, Patient Medical Records, Cash Payment, Administrative, Inventory Management and Dispense modules] containing closely related tasks and activities within the sections. The software facilitated enhanced speed of patients' registration and information retrieval, as well as simplified management of pharmacy inventory and prescription processing. Most significantly, an evaluation of the

system revealed an improved tracking of prescriptions through the use of patient identifiers, which served to eliminate impersonation and to reduce fraud.

The software was scalable and flexible, such that it could meet any surge in service. This flexibility allowed redefinition of users' roles and permissions at any point of usage, re-classification of medicines into subclasses, setting of reorder levels, addition of medicines and the capability to facilitate offline prescription and dispensing of medications in order to accommodate emergency cases and power outage. It was also modularly designed such that it could be expanded easily to interoperate with other emerging systems.

Apart from security features on the LAN of the health facility, the system required unique username and password for each user, only registered systems on the LAN and those within a specific IP address could use the software, the system automatically logged all actions performed by a login user and the system administrator could disable any user with suspicious activity at any point in time. It is gratifying that the inventory management module of the software was deployed successfully at the pharmacy unit of the healthcare facility, with the hope of full application of other modules.
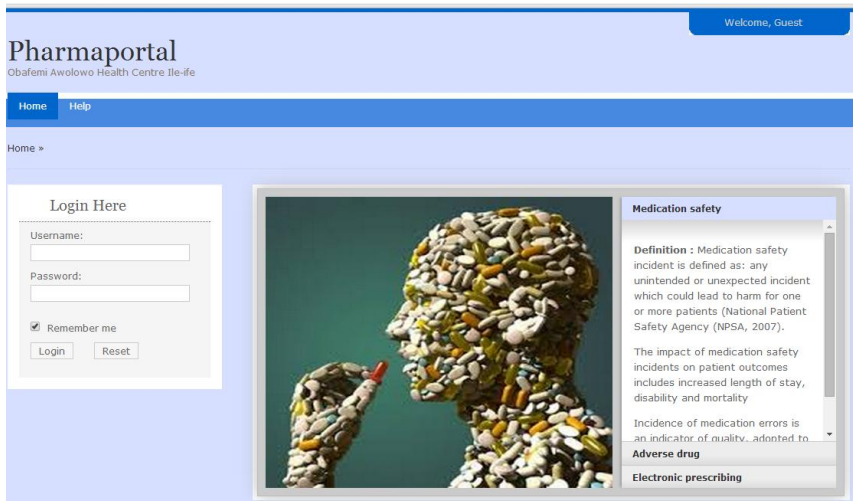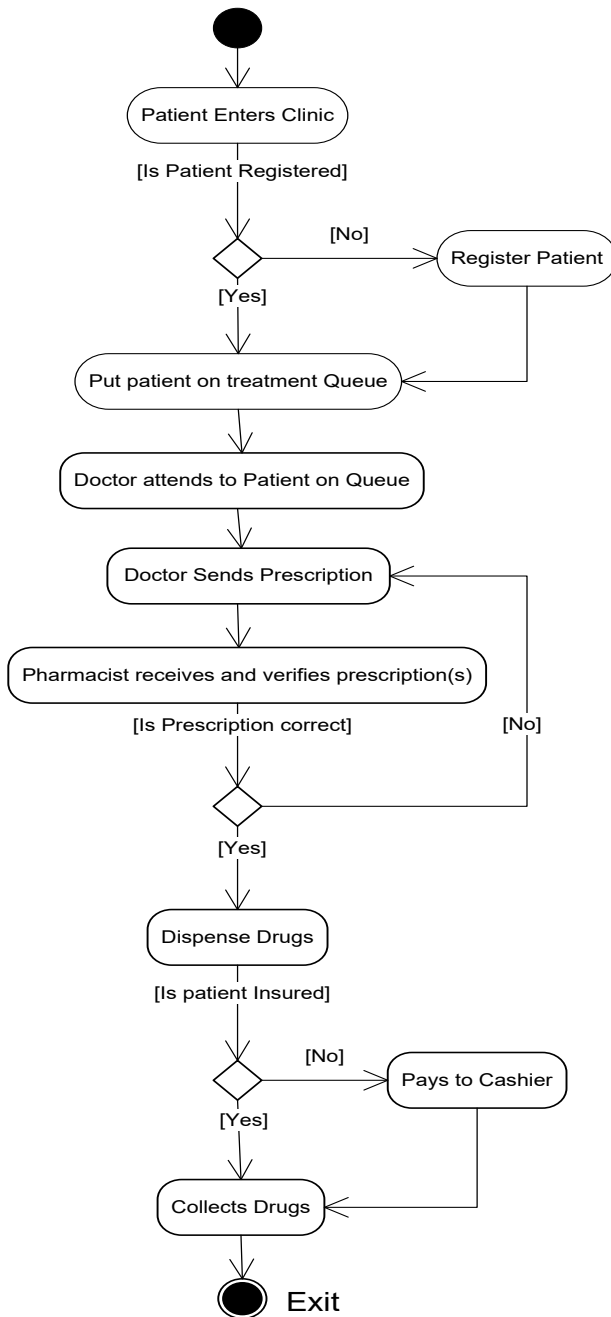
Figure 4: The PharmaPortal

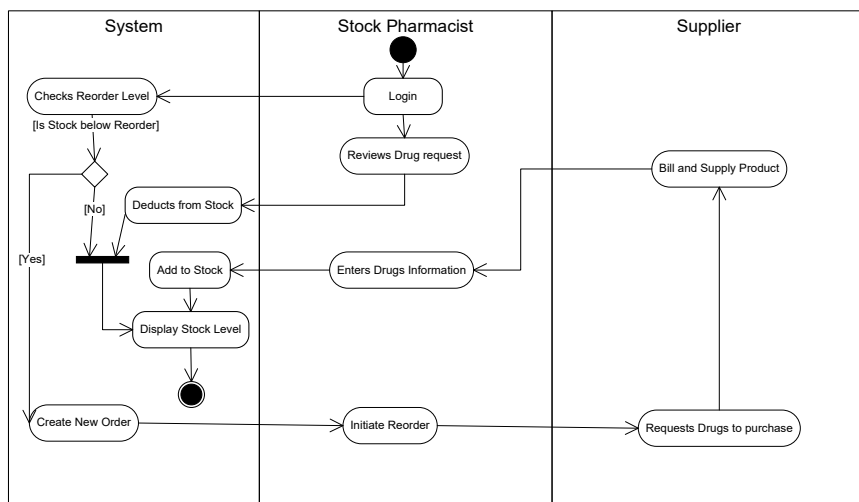Figure 5: Electronic Prescription Activities at the University Health Centre

Figure 6:   Medicines Inventory Management Activities on the PharmaPortal

iii.   Perceived barriers to pharmacy automation

Automation has the potential to achieve many qualitative changes in how organisations and groups of people work and interact. Vocal discussions about technological unemployment argue that automation does not only cause job loss but also impairs the quality of existing jobs by subjecting work to the control and rhythm of the machine and decreasing workers' autonomy. **Afolabi** and Oyebisi (2007), explored this view in a study on "Pharmacists' perceptions of barriers to automation in hospital pharmacies" and this was buttressed in a review essay by Wajcman (2017). Pharmacy automation can have a deskilling effect on both professionals and 'occupationals' (pharmacy technicians and other assistants in the pharmacy). The study identified inherent fears by pharmacists regarding the feasibility of automation in the current healthcare system. This attitudinal disposition presented a significant potential barrier to the implementation of digital technology in pharmacy operations in Nigeria. Other areas of concern included large capital outlay required, inadequate infrastructural facilities, such as uninterrupted power supply, technical expertise and internet connectivity; other factors

mentioned were dearth of skilled manpower for routine operation and maintenance in addition to poor management commitment.

Pharmacy operations should be designed to satisfy clients' needs and, at the same time, provide an enabling environment for people interacting at the workplace. In recognition of the strategic role of service providers, **Afolabi** and Ola-Olorun (2013) examined the subject of "Managing Pharmacy Operations with People and Technology". We presented the scope of operations management in healthcare with emphasis on the integration of technology and quantitative techniques to support pharmaceutical services in patient care. The paper highlighted the essence of technology in pharmacy operations, coupled with a discussion on possible applications of these novel strategies to pharmacy practice. Furthermore, we examined human resource issues relevant to operations and technology in the pharmacies using process improvement approaches to optimise patient flow. Specifically, the process workflow of prescription dispensing was highlighted. The findings were published as a chapter contribution in an online book titled "Engineering Management". To date, this book chapter has the highest download of 6,773 by viewers, followed only by another chapter on modelling and linear programming with a download of 5,447.

iv. Use of information technology to promote medication adherence

Afolabi *et al.* (2008; 2012) explored innovative approaches for medicine optimisation using information and communications technology. Medicines play a crucial role in both preventive and curative care; this is of essence in the management of long-term illnesses. Medicine optimisation is a person-centred approach to safe and effective use of medicines to ensure that people obtain the best possible outcomes from their medicines. This can only be realised when patients adhere to their medication regimen; however, patients need the assistance of caring professionals to optimise medicine use, particularly in the management of chronic illnesses. Pharmacists occupy a central role in helping patients gain

the best possible therapeutic outcome; through counselling and education every time their medicines are prescribed, dispensed or administered.

Adherence to medication in chronic illnesses may be facilitated by technology, and this plays an integral role in connecting all stakeholders. Different communication media enable the sharing and dissemination of information between the patient and the caregiver. Acquired Immune Deficiency Syndrome (AIDS) is a chronic illness which requires a high level of adherence to multiple medications in its management. **Afolabi** *et al.* (*2008*) examined pharmacists' use of mobile telephony to monitor patient adherence to antiretroviral therapy among HIV/AIDS patients at a university teaching hospital (OAUTHC). Positive responses and increased adherence were obtained from outpatients enrolled in the study. This intervention emphasised the significance of pharmacists' extended role in patient therapeutic outcome, but facilitated by technological innovations – '**beyond counting, pouring and sticking…**'. The study concluded that the adoption of a novel strategy for patient follow-up with e-messaging could address some patient adherence issues. Participants expressed satisfaction with the telephone messaging system and reported that the follow-up strategy helped with their medication adherence and clinic attendance without intruding on their privacy.

In a similar study, Ola-Olorun, **Afolabi** *et al.,*2014, explored the medicine information needs of medical outpatients at the cardiac care unit of a university teaching hospital, using short message services on the mobile phone. The findings showed an improvement in patient adherence to medications and clinic attendance.

Furthermore, Adesokun *et al*. (2024) examined the effect of mobile telephony on medication adherence among patients with Type 2 Diabetes (T2D). Therapeutic failure, poor quality of life and high economic costs have been linked to poor medication adherence among patients with Type 2 Diabetes. In an intervention study with

twice-weekly short message service (SMS), a patient group was followed up, in addition to the usual healthcare services. The patients were assessed on their knowledge of T2D, glycaemic control and medication adherence. The study showed that patients followed up with mobile telephony recorded significantly improved glycemic control as measured by a reduction of the glycated haemoglobin (HbA1c); improved knowledge of T2D, and better medication adherence. We recommended policy reforms in healthcare financing for the sustainable provision of mobile health technology (mhealth) follow-up in diabetes care.

iv. Online patient medication counselling in pharmacy practice

Patient medication counselling (PMC) is a pharmaceutical care service targeted at optimising medicine use, medication safety and improved treatment outcomes. The counselling component serves as a crucial supportive therapy for patients on long-term medications. In the study on the use of online patient medication counselling in pharmacy practice, there was an emphasis on the qualities of this innovative counselling technique in the care of chronically ill and stigmatised patients living with HIV/AIDS (**Afolabi** *et al.,* 2012). The attractive qualities of this model included unfettered access and anonymity, which hold more promise for care outreach to individuals living with HIV/AIDS, their families and groups. The paper also identified communication skills required by pharmacists for online counselling relationships, while enumerating other digital technologies applicable for possible online interactions.

The findings of a number of studies show the positive effects of integrating digital technologies as an enabling factor in healthcare delivery, and these were amplified by our work in Irinoye *et al*. (2007. In a bid to identify some of the challenges to effective deployment of ICT in healthcare delivery, we examined the types and extent of use of available ICT devices, among healthcare givers and their clients (Irinoye *et al*., 2012). Mobile telephony, the internet and computing were the usual facilities available, but with

varying degrees of usability among respondents. Major challenges to effective adoption of ICT included inadequate infrastructural facilities, human factors and poor management commitment. Epileptic power supply, inadequate budgetary allocation and poor attitudinal disposition to digital switch among staff were other factors identified as limitations to full integration of ICT in healthcare delivery. The paper viewed the adoption of ICT as an enabling factor in achieving the goals of universal health coverage. We recommended that the government may need to establish a special agency to facilitate the integration of ICT in all tiers of the healthcare delivery system in the country.

v.   Attitude of pharmacists to digitisation of core pharmacy operations

Much as the relevant technologies facilitate effective healthcare service delivery, the level of adoption varies among the practitioners and this response may limit the expected benefits considerably. In a study on the level of adoption of the Minilab®, one of the novel technologies, Ola-Olorun, **Afolabi** and Oyebisi (2015), showed that the adoption level was very low among hospital pharmacists; the equipment was only available in three of the eight hospitals examined; and it was used regularly in only one of the three hospitals. The Minilab® is a mobile quality assessment technology for use in developing countries to detect spurious medicines in the pharmaceutical distribution chain. The low level of awareness and poor adoption of these innovative technologies in pharmaceutical service delivery may warrant relevant government regulatory policies for their integration.

Digitisation of the health system provides a platform for involvement of the private sector to which community pharmacy belongs; this is imperative for universal health coverage and improved services at the primary healthcare facilities. Ola-Olorun, Oyebisi and **Afolabi**. (2022) evaluated the readiness of community pharmacists to embrace e-pharmacy in their operations. A representative sample of community pharmacists in Osun State participated in the survey, which sought information on their

attitude to this innovation and possible factors affecting their adoption of e-pharmacy. The findings showed a prevalence of a negative attitude toward this proposed change. The reasons alluded to this dissentious view centred mainly on organisational factors, which included the business size (Mdn $\pm$ IQR = 3$\pm$2) and business performance (Mdn $\pm$ IQR = 3$\pm$1). These were the most significant of all the set of factors examined [B (5) = -.204, p = .043]. The study concluded that community pharmacists in Osun State were not favourably disposed to e-pharmacy, and they may be ill-prepared for the implementation of such change.

3. PHARMACEUTICAL SERVICES IN PUBLIC HEALTH

Pharmaceutical public health has been described as "the application of pharmaceutical knowledge, skills and resources to the science and art of preventing disease, prolonging life, promoting, protecting and improving health for all through organised efforts of society" (Walker, 2000). It highlights pharmacists' contribution to the delivery of public health at the policy, strategic and service levels; their role in all issues where there is a pharmaceutical dimension, such as vaccinations, public health emergencies, medicine procurement processes, medication use and health promotions.

Many aspects of pharmacy practice are relevant to public health, and they could contribute directly to actual health gain, or indirectly through better information gathering and use of information systems to inform decision-making. Typical examples of pharmaceutical public health roles include patient counselling on self-care, health promotion campaigns, provision of reproductive health commodities, awareness of drug misuse, promoting patient medication adherence, provision of out-of-hours services, facilitating effective disposal of waste medicines, monitoring adverse drug reactions (ADRs), alerts on pharmaceutical hazards and pharmacovigilance. My studies in the following areas demonstrate the extended role of pharmacists in public health, beyond product dispensing.

i.   Role of pharmacists in the medication use process

Pharmacists play a central role in the medication use process wherein they review and evaluate all prescriptions or medication orders before dispensing, administration and monitoring. They are expected to control the distribution of medicines, thus contributing to positive medication outcomes by assuring that each patient receives safe, appropriate and effective medication therapy through the provision of pharmaceutical care. In a publication on "Patient Therapy and Drug Control in Healthcare Organisations", **Afolabi** (2004) examined drug utilisation studies (DUS) or drug monitoring programmes as possible strategies in a quality assurance framework designed to enhance the standards of medicine use at all levels of the healthcare delivery system. The paper highlighted the types and essence of drug utilisation studies, emphasising the integral part of these activities in the evaluation of patient care. Medicine use is central to patient care, and hospital pharmacists occupy a pivotal role, initiating and operating effective systems for assuring the quality of the medicines. Drug utilisation studies may use a retrospective, prospective or concurrent review method, either of which in turn may be quantitative, qualitative or a combination of both, to provide information about the pattern of use, quantity and quality of the medicines. These control strategies are necessary as measures of performance in the health system.

ii.   Health-seeking behaviour

In the quest for ways to ensure improved access to health and quality of care, **Afolabi** *et al.* (2013) examined consumer healthcare behaviour using the template of student environment in a university. Health-seeking behaviour is viewed as the varied response of individuals to states of ill-health, depending on their knowledge and perceptions of health, socioeconomic constraints, adequacy of available health services and attitude of healthcare providers. The study examined health-seeking behaviour of university students, their use of healthcare services in the community and barriers to seeking help at the university health centre. The findings showed that students sought care from community pharmacies for ease of access and from peers in health-

related academic programmes rather than from physicians at the healthcare facility. Their health-seeking behaviour was influenced, essentially, by the nature of the ailment, waiting time and attitude of healthcare workers at the health centre. The extent of use of available health services within the university was identified. Initiatives to improve student patronage of the university health centre should address significant barriers of patient delays, the need for attitudinal change and continuing professional development of relevant workers at the health facility. Promotional activities may be necessary to inform and educate students on the rational use of medicines and access to treatment at the health centre.

iii.   Management of pharmaceutical wastes

Pharmaceutical wastes continue to be a new frontier in environmental management for healthcare facilities and a strong issue of public health concern. Pharmaceutical wastes include expired, unused, spilt and contaminated pharmaceutical products, vaccines and sera that are no longer required. Due to their chemical or biological nature, these hazardous wastes should be disposed of carefully. This category of wastes also includes discarded items heavily contaminated during the handling of pharmaceuticals, such as bottles, vials and boxes containing pharmaceutical residues, gloves, masks and connecting tubing (WHO, 2014; Thomas, 2017). Pharmaceuticals may be conveyed to the environment through wastewater treatment infrastructure and discharge, land application of biosolids, landfill leachate, agriculture and pest control (Daughton, 2010). However, the primary pathway of pharmaceuticals to the environment is through human use. Many human (and veterinary) pharmaceuticals are only partially metabolised and excreted unchanged in urine and faeces (Daughton and Ruhoy, 2014). Liquid effluent may be discharged to a receiving water body or injected to groundwater, putting both surface water and the underground bed (aquifer) at risk. Underground leakage of septic systems or the sewage infrastructure may also allow pharmaceuticals to escape to the environment. Several studies carried out in Nigeria also revealed

the presence of pharmaceuticals in the terrestrial and aquatic environments with potential adverse effects on human life and the environment (Bala *et al.*, 2012).

Odewale and **Afolabi** (2019) examined the management of pharmaceutical wastes in four healthcare facilities in Lagos metropolis. The study showed that none of the facilities had clear policies or plans in place for managing pharmaceutical wastes, as evidenced by the absence of manuals and guidelines, in addition to poor compliance with recommended waste management practices prescribed by the WHO. The wastes were not segregated but commingled with other healthcare wastes, which were collected daily in polythene bags and plastic bins; transported to temporary storage sites within each hospital using wheelbarrows, open trucks and trolleys, which were not dedicated to waste disposal. Majority of the healthcare personnel had good knowledge of and a positive attitude towards proper management of these wastes, but they lacked adequate training and facilities in handling the wastes. The study identified these lapses and recommended waste management training for staff and appropriate policies within the hospitals.

I am currently involved in a team project on take-back strategies to manage pharmaceutical wastes and prevent indiscriminate disposal into the ecosystem. This project, tagged "PHARMABIN", is designed to involve relevant stakeholders, including community pharmacies, to foster green pharmacy and pharmEcovigilance.

iv.   Monitoring and reporting Adverse Drug Reactions

With the extended role of pharmacists in patient care, it becomes imperative to assess their level of competence in medication management. Reporting ADR is an integral part of pharmacists' activities in monitoring the use of medicines.

In a bid to identify the role of community pharmacists in this aspect of pharmaceutical care, Osemene, Ayeni and **Afolabi** (2012) examined common types of ADRs detected and reported by community pharmacists in Nigeria. The study considered the

extent of their involvement and relevant factors affecting this role of monitoring and reporting ADRs. Results of the study showed that the involvement of pharmacists was considerably low and the ability to report was influenced by their practice experience, knowledge of ADR, access to patients' medical information and the logistics of filing a report. These research findings should guide the design of relevant update lectures to fill the knowledge gap and to enhance the professional competence of practising pharmacists in monitoring ADRs.

In a similar study conducted on practising pharmacy professionals in Sierra Leone, **Afolabi** Osemene and Komeh (2015) sought to determine the respondents' knowledge, attitude and practices in reporting adverse drug reactions as well as an evaluation of the factors influencing the reporting. Our findings revealed some knowledge gaps among the professionals in monitoring and reporting ADRs. Factors influencing the activities were professional experience, inadequate knowledge about ADRs and restricted access to ADR reporting forms. We recommended educational programmes on ADR activities for practising pharmacy professionals in order to improve ADR reporting in Sierra Leone.

Some forms of traditional medicine are used by a significant proportion of the Nigerian population for reasons of culture, tradition, affordability and accessibility. Surveys suggest a growing support for the integration of traditional and Western medicines. Main purveyors of these remedies are the traditional medicine practitioners (TMPs) whose services are controlled by state and local government boards; however, it becomes imperative to appraise their knowledge of these commodities periodically to safeguard population health. In a questionnaire survey and personal interview to assess the knowledge of TMPs on the use of antimalarial plants and possible herbal interactions, Adepiti, Agbaje and **Afolabi** (2021) engaged a considerable number of TMPs from Ilesha and Ile-Ife in Osun State, Nigeria. The leaves of selected herbs (*Ficus exasperata, Alstonia boonei, Azadirachta*

indica and *Morinda lucida*) were examined to assess their knowledge of the indications and possible interactions. Results of the study showed that the respondents had some knowledge of herb-herb interactions, and they remarked that *Ficus* had no effect on antimalarial activities of *Alstonia, Azadirachta* and *Morinda* combinations. This view agreed with empirical studies on anti-malarial properties of the herbs; using the chemosuppressive test model, *Ficus* was macerated in methanol while decoctions of *Alstonia, Azadirachta* and *Morinda* were freeze-dried. Analysis of data obtained showed no interactions in the combination.

v. Pharmacovigilance – post-marketing surveillance of medicines

Post-marketing surveillance of medicines is important in order to monitor other emerging adverse effects of medicines already in use. In this regard, it becomes imperative for healthcare professionals to demonstrate some knowledge of pharmacovigilance (PV) activities and reporting ADR. This body of knowledge should be taught at the pharmacy schools, while further competencies may be acquired in practice. However, the level of knowledge of undergraduate students in health-related disciplines, such as pharmacy, about ADR reporting and PV activities has not been fully studied in Nigeria. Training and quality of knowledge are important for good professional practice, hence the need for an assessment in order to address the gaps in knowledge, as the case may be. Osemene and **Afolabi** (2017) conducted a cross-sectional survey among final year pharmacy students in three Nigeria universities to assess their knowledge of PV activities. The study revealed a low score on their knowledge, and this was affected by the students' university and prior exposure to relevant subjects on pharmacovigilance. About 64% of respondents had positive perceptions of PV activities, while less than 50% were able to identify the organisation which collates and documents ADR reports in Nigeria. Only a few (6.1%) respondents gave the correct answer to whether or not all possible ADRs of a drug can be determined during clinical trials or the pre-marketing phase of drug assessment. Quite a number of them (59.7%)

erroneously believed that adverse reactions caused by cosmetics should not be reported. The study revealed inadequate knowledge of these students on PV activities, and this underscores the need for more emphasis on PV activities in the training curriculum.

vi.   Monitoring the availability of contraceptive commodities

Family planning (FP) is an important aspect of socio–economic development for which access to contraceptive commodities (CCs) by users is critical. Unfortunately, the availability of these commodities is usually compromised in most developing countries. Olonade, **Afolabi** and Ola-Olorun (2016) designed a study to assess the availability of CCs in Osun State, Nigeria. The study population were Service Providers (SPs) at the family planning unit of the State Ministry of Health (State Central Warehouse) and at the Service Delivery Points (SDPs) for CCs in Osun State. Data were obtained through questionnaire survey, personal interview, physical observation of storage and transportation facilities, a review of inventory records and other documents relevant to the commodities. Findings of the study showed there was a full supply of CCs at the State Central Warehouse (SCW) but a non-full supply at SDPs. During the period under review (April to November, 2015), all inventory of CCs was available at the SCW all the time, whereas only 25% of SDPs had all inventory of CCs available all the time. Identified factors responsible for non-full supply of CCs at SDPs include a pull system of inventory control accompanied by transportation inadequacies. In addition, the logistics officers appeared to possess low capacity and low motivation for the work. The study concluded that the availability of CCs was optimal at the SCW but sub-optimal at the SDPs. The sub-optimal level at the SDPs portends grave implications for the attainment of contraceptive security and expected population control among the studied population. This calls for urgent government action in addressing issues identified in the study.

vii.   Use of psychoactive drugs among adolescents

Studies on psychoactive drug use among adolescents in Nigeria have indicated an emerging problem of public health concern, particularly with the socially acceptable drugs like cigarettes and alcohol (Odejide *et al.*, 1987; Abiodun *et al.*, 1994; Obot *et al.*, 2001). Having realised that the majority of drug abuse starts in adolescence, particularly with the 'gateway' drugs - cigarettes and alcohol, it becomes imperative to check the practice of psychoactive drug use among youths in the society. Alcohol and cigarettes are described as 'gateway' drugs because they are usually the first substances used before other drugs are tried out (Indiana Prevention Resource Centre, 2003). Drug abuse by students can lead to a sharp decline in their academic performance, increase reports of truancy, deviant behaviours and ultimately, expulsion from school. It can also lead to addiction (increased desire for drugs without which normal life processes are disturbed), increased appetite and uncontrolled libido. Similarly, other vices such as stealing, fighting and gambling may be caused by drug abuse as a result of alterations in the brain chemistry of the abusers. **Afolabi** *et al. (*2012) identified various drugs used by adolescents in some secondary schools in Ile-Ife, the prevalence of abuse and the factors influencing such practices. Relevant data were collected with the aid of a modified version of an instrument designed by the United Nations for conducting school surveys on drug abuse. This toolkit had been previously validated in Nigeria. The response items solicited information on drug use practices, including types of drugs, sources, frequency of administration and motivation for use. The findings showed that these students most widely used caffeine, alcohol, cigarettes, marijuana and various combinations of psychoactive substances. The substances were obtained from open drug markets (23.5%), peers (5.2%) and itinerant drug hawkers (0.6%). Reasons proffered for their drug use included the need for alertness (22.2%), the experience of high feelings (21.8%), body building (14.1%), and to moderate appetite (11.9%). The drugs were used at any time of the day and mainly by the oral route of administration or inhalation. The study showed a high frequency of psychoactive drug use among the students and

this was attributed to psychosocial perceptions of self-esteem and peer influence.

viii. Antimicrobial Stewardship

Misuse of antimicrobial medicines is a major contributory factor to the development of resistant strains of microorganisms, therapeutic failure and increased healthcare costs in many countries. **Afolabi** *et al.* **(2014)** examined the pattern of antimicrobial use among undergraduate students at the University of Sierra Leone and determined possible gaps in their understanding of appropriate use of these therapeutic agents. These prescription medicines were obtained on demand from open markets and pharmacies, without prescriptions, and there were knowledge gaps in the proper use by most of the respondents who reported having self-medicated with antimicrobials at different times for such ailments as common colds and diarrhoea. Previous experiences of treating similar symptoms ranked highest as the factor affecting the demands. Respondents did not usually complete the full regimen of the medications for reasons of cost, long duration of treatment and side effects, indicating the role of pharmacists in antimicrobial stewardship and counselling on rational medicine use.

Unrestricted access to prescription medicines was a major factor in misuse, and we recommended a strengthening of drug laws in Sierra Leone in a bid to control indiscriminate sale and distribution of prescription medicines. Furthermore, the study advocated for the introduction of basic courses on rational medicine use in the general studies programme of the University, with emphasis on the consequences of indiscriminate use of antimicrobial medicines.

ix. Pharmaceutical Services and Health Promotion

Pharmacists are highly accessible health professionals who contribute to the management of public health in diverse ways. They also direct individuals to other agencies and relevant healthcare professionals through referrals.

Oseni and **Afolabi** (2018) appraised the knowledge and involvement of community pharmacists in the delivery of health promotion services in Oyo State, Nigeria. Only a few of the respondents (22.5%) demonstrated knowledge of health promotion activities, whereas some of them were involved in health screening for chronic illnesses, promotive health with proper nutrition and physical activities, weight management and smoking cessation. The least involvement was in screening patients for dyslipidemia and counselling on the use of contraceptive devices. Major barriers to health promotion services in community pharmacies included the following: lack of collaboration with other healthcare professionals (52.8%), improper time scheduling (37.1%), incompetence in the use of appropriate diagnostic tools (32.6%), lack of access to patient health records and inadequate training (32.6%). The respondents acknowledged these barriers to their full involvement in health promotion services, and the majority (98.9%) were willing to participate in relevant training to enhance their skills for these services.

In an attempt to bridge this knowledge gap, Oseni and **Afolabi** (2020) developed and evaluated the appropriateness and applicability of a relevant training programme for community pharmacists. A two-day training in health promotion activities was developed, conducted and evaluated using a semi-structured questionnaire administered to a random sample of 80 community pharmacists. The survey instrument, designed on a 5-point Likert-type scale, rated participants' opinions on the training content, competence of resource persons on the subject matter and perceived adequacy of the training. The respondents (93.1%) strongly agreed that the training was sufficient to equip them for health promotion services and further suggested the need to organise such training periodically. Other relevant training needs identified included the use of diagnostic test kits and vaccination skills. The participants requested for more interactions at future trainings and sharing of personal experiences. The training was adjudged adequate for use by community pharmacists and fit for its designed purpose.

In a longitudinal study on health promotion activities of community pharmacists, Oseni and **Afolabi** (2020) evaluated their level of involvement after exposure to relevant training programmes; this was with a view to assessing the relevance of the educational interventions. A post-intervention study was conducted on 48 participants after exposure to training in relevant health promotion activities. A large number of respondents (8l%) embarked on health promotion initiatives after the training while 90.5% improved on the documentation of patient care services provided at their pharmacy premises. Personal observations showed that the community pharmacists extended periods of stay on their premises in order to attend to clients, with considerable improvement on the aesthetics and layout of the pharmacies to facilitate traffic flow and patient counselling. Furthermore, they held awareness campaigns on international health days and other days as may be scheduled by the pharmacists. The study concluded that the community pharmacists demonstrated favourable attitude towards health promotion with notable improvements in the services they offered after the training.

x.   Management of medicine inventory in the hospitals

Financing of medicines in public hospitals has been challenged by financial constraints due to limited government budgetary allocations. Health is a fundamental human right and access to healthcare, including essential medicines, is pivotal to realising this right. Improving access to quality medicines is of greater concern in sub-Saharan Africa (Bennette *et al*., 1997) and it is currently the most important strategy to reduce disability and death from many diseases.

In view of the limited financial resources, managing medicine inventory in the hospitals pose considerable challenges with late deliveries, fluctuating prices and eventual stock-outs. In a bid to address some of these challenges the Nigerian government set up a Drug Revolving Fund (DRF) scheme in 1988 on the creation of the National Health Policy (NHP) to guarantee a reliable supply of low-cost essential generic medicines at all levels of healthcare. The

DRF was part of a series of healthcare reforms initiated by the Nigerian government after the meeting of African Health Ministers at Bamako in 1987. DRFs are a way to guarantee good quality medicines direct from manufacturers at affordable costs in accordance with the goals of the National Drug Policy (NDP, Federal Ministry of Health, 2005a). The DRF operates on the concept of Bamako Initiative which requires an initial capital investment for medicine supplies and these supplies are expected to be replenished with the money collected from subsequent sales. The DRF as a cost recovery scheme should eliminate leakages and intermediaries who often markup medicine prices excessively. For a couple of years, this programme recorded many notable successes in expanding access to low-cost essential medicines in some of the tertiary hospitals that embraced the initiative, notable among which were the University College Hospital (UCH), Ibadan where it was first modelled, University of Benin Teaching Hospital (UBTH) and then at Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC), Ile-Ife. The OAUTHC adopted this scheme in September 1984 to finance medicine supply and other pharmaceuticals in their facilities. The DRF programme was under the supervision of a special monitoring committee with pharmacists actively involved in its operations.

Afolabi (2013) examined the DRF at OAUTHC in an attempt to evaluate its performance, pattern of inventory management, pricing system and effectiveness in the provision of essential medicines at the facilities. In a previous study, **Afolabi** (1999) evaluated the operations and patient perception of DRF scheme at the hospital pharmacy. Four aspects of the scheme were examined: pattern of medicine use, pharmacists' workload, level of patient satisfaction with the services provided and extent of achieving its operational objectives. The study utilised basic ingredients of formative evaluation, and the findings showed that medicines were available on demand with adequate cost recovery. Patients were satisfied with the operations of the scheme, particularly the quality of medicines supplied. However, basic dispensing and compounding form the core and pre-occupation of pharmacists' activities in the

hospitals, leaving them with little or no time for patient counselling and clinical pharmacy rounds.

4. ENHANCING SERVICE QUALITY IN COMMUNITY PHARMACIES

"Pharmapreneurship" is an innovative idea that is being used to advance pharmacy education, scientific discovery, patient care and community engagement; it is part of the curriculum of some schools of pharmacy abroad. It refers to pharmacy entrepreneurs who employ various management strategies and skills for effective delivery of pharmaceutical services across practice settings. The associated skills of a pharmapreneur are key to the development of a range of health services in the community and hospital sectors.

i.   Entrepreneurship education

Entrepreneurship education has gone beyond the specific concept of business startup to include a broader concept of education that can develop entrepreneurial attitudes and skills of students; hence, such awareness holds great opportunities for the future. The prevailing global problems of poverty, inequalities and sustainability require students and leaders who can think and act entrepreneurially to exploit opportunities that would generate economic and social value (Brush, 2014). In view of the great potential obtainable from entrepreneurial education and the possibility of its economic advantage, **Afolabi,** *et al*. (2016) designed a cross-sectional study to explore the level of entrepreneurial traits among pharmacy undergraduates at Obafemi Awolowo University and to identify factors that may influence their propensity towards self-employment. The level of entrepreneurial traits of the students was high, while majority (79.67%) of their responses for future entrepreneurial intention were in the affirmative. The most prominent factor perceived by respondents as motivating future entrepreneurial intention was 'preference for personal creativity' (63.3%), whereas 'lack of security in the country' (28.8%) was reported as the strongest barrier. Chi-square test showed that gender was significantly associated with some entrepreneurial traits, namely, willingness to

take calculated risks and ability to formulate an effective venture team. The study concluded that the level of entrepreneurial traits of the students was high, and they possessed future entrepreneurial intention. It was therefore recommended to incorporate entrepreneurial studies in the pharmacy undergraduate curriculum to facilitate appropriate deployment of the students' entrepreneurial traits and an actualisation of their intention.

Furthermore, Jolaosho and **Afolabi** (2018) examined the pervasiveness of entrepreneurship orientation among community pharmacists in Nigeria. These practising pharmacists, involved in the sale and distribution of medicines and other health commodities in Nigeria, require some level of entrepreneurial orientation to enable them cope adequately with competitions in the marketplace. Various challenges are encountered in the course of practice, and some pharmacists perceive these challenges as opportunities that may be converted to meaningful economic gains. The study evaluated variations in entrepreneurial orientation of these pharmacists, and the constructs were found to vary significantly with demographic characteristics of the pharmacists and nature of their businesses; in terms of estimated net-worth, staff strength and age of the business.

ii.   Location analysis of community pharmacies

The physical location of a retail business in relation to potential and existing markets is an important success factor. The object of locating a community pharmacy in a specific neighbourhood is to provide pharmaceutical services and products at a profit; therefore, the physical location should be able to support the type of pharmacy practice desired by the entrepreneur. Profitability is a critical factor in site selection, as certain physical locations can support a diversified pharmacy but may not be suitable for a purely prescription dispensing type. In principle, some factors have been identified to be relevant to the physical location of business concerns, and with particular reference to pharmacies, Jensen (1983) emphasised the relevance of competing and complementary institutions such as other pharmacies, dispensing physicians'

clinics and government healthcare facilities. In view of these studies, **Afolabi** (1990) investigated the factors influencing the physical location of retail pharmacies in Nigeria and assessed these factors in line with theoretical expectations. The survey was carried out in selected towns and cities from ten states of the federation. The study showed the relevance of competing institutions and closeness to government hospitals or clinics. Sales volume was enhanced by the pharmacist's supervision and proximity to complementary businesses; purchasing power and size of population at the site of location were also relevant.

iii.   Partnership patterns of community pharmacies

In many circumstances, community pharmacies serve as the first port of call for the sick; therefore, their proximity and ease of access are desirable. These pharmaceutical small holdings or sole proprietorships are domiciled in the prevailing ailing business environment in Nigeria. Collapse of small-scale businesses, failure of the acid-test ratio by surviving businesses, and unintended diversification, as well as unutilised capacities, are hallmarks of stress in the pharmaceutical subsector of small-holding businesses. The acid-test ratio acts as a guide to indicate whether a business has sufficient liquid resources to meet its current liabilities. The peculiar nature of healthcare services puts some limits on what may be done to revive an ailing community pharmacy; however, the threat of collapse can adversely affect the quality of such professional services, thereby compromising public health. Alternatives to sole business ownership are joint ventures in the form of partnerships or limited liability companies. Either of these options allows for risk sharing and could improve the survival rates of small-holding businesses. Other advantages include shared expertise and experiences, enhanced financial base, better management and prospects for expansion. **Afolabi** *et al.* (1999) examined partnership patterns of community pharmacies in Nigeria. This was with a view to identifying factors that might help develop collaborative practice among the pharmacists. The few surviving partnerships attributed their successes to unique operational modes that recognised individualism, appropriate flow

and exchange of information in addition to strategies that engendered commitment from all the group members. Essentially, the study concluded that in Nigeria, community pharmacy practice was largely individualised while the existing partnership was on the verge of total collapse, due to personal biases, fear and suspicions.

iv. Inventory management of medicines in community pharmacies

Inventory control is a principal area of management concern in any business set-up. In retailing, inventories represent a sizeable portion of the firm's assets. However, whether in retailing, hospital pharmacy or the industry, there is a need for adequate monitoring and control of medicine stock. Inventory holding is necessary to run a business, but to tie up excessive capital in goods is not profitable due to various costs that may be incurred (Fig. 7). Prudent inventory management encourages effective customer service and tends to improve the amount of profit generated. **Afolabi** (1993), examined the procedure for medicine stock control at a hospital in Osun State. Management of inventory at the pharmacy was done manually, checking stock levels with the use of bin cards. There was neither a rigorous attempt at the application of inventory management models nor of strict adherence to prompts on minimum stock or re-order level. Three inventory management models were discussed and demonstrated in the study. The Economic Order Quantity model, which seeks to present the optimum inventory order size, that is, when the total cost is at a minimum; then the Order Point System, where the order size is fixed while the order interval varies, and the third model is the Periodic Review System. This third model is mostly applicable in retailing, where the inventory items are many with a large number being of low value. In this case, the time interval for ordering is fixed, but the order size would vary for each item. Inventory management may not be cumbersome or rigorous; however, it requires proper planning, which would enable the pharmacist-manager to select groups of related items for periodic checks in order to minimise errors. Proper medicine inventory

management would improve the store image, business turnover and profitability with effective customer service.
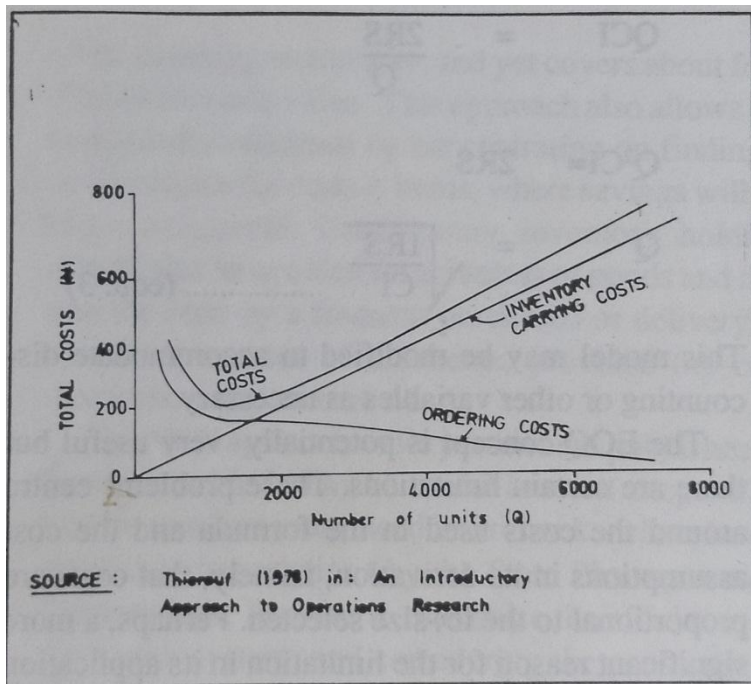

Figure 7: Inventory management costs

v. Strategic management of community pharmacies (SWOT analysis)

Community pharmacies are easily accessible to the public, but quality of the professional services holds important promises for sustenance of this basic healthcare unit, which remains under-exploited. In view of lapses in control of medicine sales and distribution in Nigeria, professional services hold a competitive edge for the survival of community pharmacies. In a bid to propose strategic options for quality management of these pharmacies, Ihekoronye *et al*. (2020) conducted the SWOT (Strength, Weakness, Opportunity, Threat) analysis of 321 randomly selected community pharmacies with responses from 642 pharmacy clients. Using a 5-point Likert scale survey instrument, results showed that strengths were most obvious in the ease of access (MWA 3.69) and

good managerial skills (3.69). Prominent weak points of the practice were time constraints (3.36); inadequate remuneration and inability to quantify the services for appropriate remuneration (3.39). Emerging opportunities identified in the study include enhanced clinical skills as the pharmacy training curriculum is upgraded to Pharm.D programme, and the use of digital technologies in service delivery. On the other hand, unhealthy competition (3.50) and increased recognition for patent and proprietary medicine vendors (3.50) posed the greatest threats.

The community pharmacists exhibited marginal capacity to exploit opportunities and to mitigate threats and weaknesses; these factors limit service outcomes considerably. The extent to which the opportunities were exploited had a strong bearing on service quality (r = 0.129, p = 0.02), while the weaknesses influenced opportunities the most; weaknesses and threats were the major factors limiting service outcomes.

Higher educational qualifications and location of practice did not improve service management scores, but length of practice experience was a significant factor for improvement. The study concluded that strategic planning for professional services was not adequately addressed in the pharmacies and recommended that the strategic options should be strengthened for optimum patient care.

Closing reflections
i. My leadership experiences, services and human capacity building
In a bid to enhance my academic and professional capability, I registered for a number of intensive training courses and obtained the following certifications: Economic Evaluation in Global Health, Epidemiology for Global Health, Leadership and Management in Global Health and Health Research in Global Health (University of Washington). Others include Human Resource Management (UNICAF), and Certificate of Proficiency in Cybersecurity (VICBHE, Nigeria).

Similarly, I attended Executive Leadership Training at various institutions abroad: the International Women's Forum (IWF) in Montreal, Canada; Harvard Business School, Boston, Massachusetts, USA; and the Women Leading Global Change programme held at INSEAD (the Business School for the World^R), Fontainebleau, France. This exposure was made possible by my selection into the IWF programme and funded through sponsorship by the Carnegie Foundation. My candidature emerged from a very competitive pool of applicants from around the world. The 2010-2011 IWF Fellows Class, to which I belong, comprised 32 participants from 12 nations: Brazil, Canada, Georgia, Hong Kong, Israel, Mexico, Nigeria, Singapore, South Africa, Sweden, the United Kingdom and the United States. I was fortunate to be one of the two women of colour selected from Africa (Plates 1 – 2). The Fellows' Programme was designed to inspire talented women to break the glass ceiling, push forward and scale barriers to leadership positions and empowerment. The training hosted vice-presidents of international organisations such as the General Electric Company (an American multinational conglomerate, NY Inc.) and NASA (National Aeronautics and Space Administration), the United States government agency responsible for the nation's aeronautics and space research.

IWF Leadership Foundation Fellows Program
Harvard Business School

**Women Leading Global Change Programme
INSEAD, Fontainebleau, France**

These various exposures in professional development and executive leadership training groomed my teaching and administrative skills, some of which I have deployed successfully in the service of this university and other government establishments. I am glad I was able to break through the glass ceiling to attain to the peak of my career in academics as the first woman Professor of Pharmacy Administration in this university, thus fulfilling the vision of the IWF, Washington, DC.

I was opportuned to serve in leadership positions at various times at the Faculty of Pharmacy of this university; as student officer for eleven years (1996 - 2007), Acting Head of the Department of Clinical Pharmacy and Pharmacy Administration on two occasions; Vice- Dean (July 2010 – June 2012), Dean (Aug. 2021 – July, 2023); Chairman, PCN Committee of Deans of Pharmacy Schools in Nigeria and member, PCN Investigating Panel. As a member of the OAUTHC Governing Board, I was Chairman of the Establishment Committee charged with strategic management functions of staff recruitment, promotions and welfare.

At the community level, I serve as a member in the following organs: Board of Trustees, Christway Ministries (Int.), Board of Trustees, Ife Development Board, Council of All Souls Chapel. OAU, Ile-Ife and as a weekly radio presenter of the "Hour of Praise", Furthermore, I was a Visiting Lecturer at the University of Ibadan, University College, Belize, Central America, and a WHO Consultant as Visiting Professor at the University of Sierra Leone, Freetown. I am a Fellow of the West Africa Postgraduate College of Pharmacists (FPCPharm) and a Fellow of the Leadership Foundation, IWF, Washington, DC.

Over the course of my academic journey in this university, I have been involved in teaching and mentoring a large number of undergraduate and postgraduate pharmacy trainees; many of whom are currently captains in pharmaceutical industries, directors of establishments and accomplished scholars. I have successfully supervised 21 postgraduate dissertations; five of whom earned the Fellowship of the West Africa Postgraduate College of Pharmacists. The others obtained MSc. or MPhil., while three of them had since concluded their Ph. D and making their marks in academics. Currently, in the Department, I am supervising six students on various postgraduate programmes, with four on the M.Sc. /M.Phil. programme and two on Ph.D.

I have served as an external examiner to different faculties of pharmacy in Nigeria at both undergraduate and postgraduate levels, with the privilege of reviewing promotion cases of colleagues to the professorial cadre at this university and others across various geopolitical zones of the country. I have been involved as a lecturer, supervisor and examiner at the West Africa Postgraduate College of Pharmacists (WAPCP), and I review for some reputable academic journals in my field; these include African Health Sciences, International Journal of Healthcare Technology and Management (IJHTM), Inderscience, and Hospital Pharmacy, USA, among others.

My teaching career has produced successful healthcare professionals in different pharmacy practice settings, both in Nigeria and abroad. As a visiting scholar to the University College of Belize in the Caribbean, I was deeply involved in pharmacy training to support human capacity building for the country while on a national assignment on the Technical Aids Corps (TAC) programme (Plates 3 & 4).

Plate 3: University College of Belize, Central America, as a Visiting Lecturer

Plate 4: With my Pharmacy Students in Belize, Central America

I was appointed as a WHO Consultant and Visiting Professor to the Faculty of Pharmaceutical Sciences, University of Sierra Leone, as part of a crew with a mandate to train the required health workforce for the country and we successfully produced two sets of Pharmacy graduates. I was fortunate to work with the duo of Prof. T. A. Olugbade and Prof. Lara Orafidiya, each of us being responsible for different aspects of the pharmacy programme. In the university, I successfully supervised seven postgraduate students, some of whom are currently serving as heads of departments and lecturers at the University of Sierra Leone. Others are in top pharmacy positions in the country; in fact, one of the products is the current Registrar of the Pharmacy Board of Sierra Leone. Furthermore, on 14 – 20 August 2017, I led a two-man team on ACE Project 031, OAK - Park (OAUICT – Driven Knowledge Park), to train regional participants in Sierra Leone on the application of software in prescription processing and medicine inventory management as an activity of the STEM project. This further enhanced the capacity of Sierra Leone's workforce in healthcare delivery (Plates 5 & 6).

Plate 5: ACE 039 Project – Human capacity building in Sierra Leone

Plate 6: ACE 039 Project – Human capacity building in Sierra Leone

My odyssey in academics took me to international conferences with opportunities to visit the Caribbean, UK, USA, South Africa and Sierra Leone, during which I mentored students and presented papers to share my research experience with others. On one of such visits, my IWF mentor, Professor Cain, invited me to present a seminar at the American College of Obstetricians and Gynaecologists (ACOG) in Wahington DC (Plate 7).

Plate 7: Seminar presentation at ACOG, Washington DC

I owe much gratitude to God, my Enabler, and to this university for providing me with the platform to have all these exposures and international recognition. I am appreciative of the financial assistance received from the University to support some of my conference expenses; the permission to be excused from duty, and the privilege to study, work and serve in this noble institution.

ii.   Empirical documentations of pharmacy administration as applied research

Mr. Vice Chancellor, sir, distinguished audience, Pharmacy Administration is a relatively new area of research and a subdiscipline of Pharmacy. I therefore had the challenge of wading

through an uncharted path, but the rare opportunity of being one of two pioneer professors in this important area of pharmacy. Professor Wilson Erhun blazed the trail, not only as the first professor in the department but also the first professor of Pharmacy Administration in West Africa, while I followed suit as the first female professor in the discipline, both in the department and in the subregion. My major research focus has been on enhancing pharmacy practice both in the hospital and the community.

My studies have provided empirical documentation of pharmacists' extended role in medicine management, optimising pharmaceutical service delivery through the adoption of quality improvement processes. With postgraduate training in relevant faculties of the university, my odyssey, through scholarship, has demonstrated and established that pharmacy administration is a multidisciplinary programme.

In my research endeavours, I have been able to establish that the essence of pharmacy training goes beyond the packaging procedure of medication **counting, pouring and sticking** of labels. Some of my studies evaluated the current state of pharmacy practice in the hospital and community settings and proposed innovative strategies to enhance service quality. With the deployment of medicine management software – the PharmaPortal, application of management sciences and service design thinking, the pharmacy operations witnessed some improvements. The attractiveness of technology options and the use of management sciences for quality improvement were elucidated.

Pharmacy administration provides a platform to proffer solutions to practical problems experienced in concrete social reality. Delay points and operational problems in the dispensing procedure result in excessive patient waiting lines at the pharmacies; these issues were identified for due attention in the hospitals. Consumers have a right to good service, and client feedback is a reasonable measure of service quality; hence, the design and validation of instruments to measure client satisfaction, patient response to long queues and

adherence to dispensed medications. Medicine information leaflets are essential as a guide in the medication use process; as such, the design must be suitable for use in terms of readability, comprehension and aesthetics, hence the need for a periodic appraisal of these package inserts.

Use of medications and psychoactive drugs is pervasive in our society, and pharmacists' involvement in pharmaceutical public health helps to safeguard the people's health through health promotion activities, patient adherence to medication in chronic illnesses, adverse drug event monitoring, pharmacovigilance, support in health-seeking and referral to appropriate care specialists. In terms of training, skill and practice, pharmacists are the universally acknowledged medicine experts, and they are well-suited to take up the extended role in all ramifications. Furthermore, pharmapreneurship enables pharmacists to go beyond traditional pharmacy roles, encouraging them to introduce innovative interventions to healthcare challenges.

iii. Harnessing the untapped resources in a pharmacist: As I bring this lecture to a close, I wish to reiterate the untapped resources inherent in a pharmacist, irrespective of the practice setting. The healthcare system would benefit immensely with proper deployment of these resources, through:

- Recognition of pharmacists' central role in medicine supply management, rational medicine use, patient adherence to therapy and medication reconciliation; such recognition through interprofessional collaboration is integral to appropriate patient care
- Creative deployment of pharmacists' skills, in terms of job enrichment and job enlargement in a conducive work environment with a commensurate welfare package. In addition, integration of appropriate technology and innovative approaches would facilitate considerable improvement in service delivery at the pharmacies. For instance, the digitisation of repetitive tasks should release the needed time for more patient-focused care.

- Proactive engagement in pharmaceutical care and public health activities, with relevant policies, appropriate remuneration and legal backing to support the extended roles.
- Developing pharmacists' entrepreneurial mindsets on creativity, innovation and idea generation to improve the healthcare system.

iv. Recognition and appreciation of my support system:

Mr. Vice Chancellor, sir, I wish to submit that I dare not claim sole credit for the achievements that have culminated in the substance of this Lecture – a succinct recap of my academic sojourn. It represents not only my dedication and hard work but also the unwavering support of my family, friends, mentors, and all well-wishers who stood by me. Every message of encouragement, every prayer, and every bit of motivation I received played a crucial role in making this dream a reality. Please permit the following recognitions:

My sincere appreciation to the Almighty God for this uncommon favour to be reckoned among the intellectuals of my day. Indeed, ***"…no one can do anything unless God in heaven allows it" Jn. 3:27.*** I confess that this Inaugural Lecture is the Lord's doing and it is marvellous in my eyes.

I pay unalloyed tributes to my late parents, Pa Joseph Eluwole Adefisan from Balea Compound, Ilode, Ile-Ife and "*Maami*" Princess Bernice Oyedotun Adefisan (nee Ayoola of Elewa ruling house, Ipetumodu). Education was of immense importance to my parents, and they toiled assiduously to see me through to the tertiary level, bequeathing this worthy legacy, for which I am immensely grateful. I was raised in royalty, with royal blood flowing through my veins, but never was I allowed to gloat about this noble birth; my dear parents taught me the way of faith in addition to the dignity of labour, service, and humility. I am glad that today, my modest achievement in life could be traced to these devoted parents, of blessed memory.

Sincere gratitude to this citadel of learning, Great Ife! the crucible wherein I was moulded and fashioned to become who I am today in my academic career. My intellectual growth, learning, teaching and research were enabled by this university. I appreciate the opportunity to acquire postgraduate qualifications while on the university pay roll; the partial funding to attend international conferences, the research grant I obtained from the institution and the nomination, through Carnegie scholarship, to compete for a Fellowship of the prestigious Leadership Foundation of the IWF, Washington; which I won, thus making me a Fellow of the Foundation in Washington. With the university serving as my base, I had the opportunity to visit a number of countries in four continents, in my quest for learning, sharing my research outputs and serving as a consultant to the WHO in health resource capacity building. For these unique privileges that OAU afforded me, I am highly indebted to her and the various administrations over the years of my sojourn here.

Same appreciation goes to professors and other lecturers who trained me in the various Faculties, Units and Departments I ventured into; people who shared their wealth of academic knowledge with me in my career pursuit. Others left indelible imprints on my path either as mentors, academic supervisors or professional colleagues. Prof. T.O. Oyebisi supervised my Ph. D. programme, ably co-supervised by Prof. W. O. Erhun. Thank you very much for the thorough work, which I am very proud of to date. Administrative positions paired me with the following professional colleagues who impacted my life positively: Professors Tiwalade Olugbade, 'Lara Orafidiya, Biodun Ogundaini, Grace Onawunmi and Seye Bolaji. Professor Funmi Togonu-Bickersteth brought the IWF advert to my notice and she encouraged me to apply for the prestigious programme. She was the Deputy Vice Chancellor at that period and she believed in my abilities to perform creditably. Thanks for your help in advancing. my career. I appreciate other colleagues in the faculty and especially staff in the Department of Clinical Pharmacy and Pharmacy Administration for their support in various

ramifications. You have all contributed academically or socially to who I am today. Thank you.

My family of lineage is very dear to me. My sisters, Pharmacist Mofoluwake Akinwonmi and Oluwatomisin Babalola, along with their late husbands, made their homes a ready abode for me, and they were my economic backbone in the course of my studies. They were quick to fill the gaps and youth cravings that parents would normally frown at. Thanks to my brothers and their spouses: Oluseyi & Tola, Oluyinka & Lola, whose homes are havens for me anytime I travel out of the country on academic trips or on vacation - the Adefisans at home and in diaspora, I love you all. My late siblings, Olusegun Adefisan and Olufunke Arikawe, left indelible marks of living in a large, caring family – I am glad your children are doing well in life.

To my dear husband, Ven. (Prof.) Eyitayo Rufus Ifedayo (ERI), my cheerleader and encourager, a diehard academic and teacher of teachers who encouraged me to veer into academia, very resolute in the face of difficult challenges along our path. He recognised the academic potentials in me and he gave all the support, excusing the late hours I spent at my reading desk and periods of absence from home, as I travelled for academic conferences, seminars and trainings. He never felt threatened by my achievements and exposures; we have been on this sail together for more than four decades, through thick and thin. He has been extremely amazing in his dogged passion to nurture my academic pursuit, even in the face of hardships occasioned by various detours. I started my pharmacy career with little ambition but he believed in my ability to scale the utmost heights in academia, and here I am today presenting my Inaugural Lecture as a Professor of Pharmacy Administration, before this distinguished audience. Thank you immensely for this sacrifice of love – my academic mentor per excellence!

I appreciate our children and their lovely young ones; Tosin + Oyewumi Afolabi, Efe-Dolapo + Tolulope Whowha and Olayiwola + Oluseyi Abe. Thanks for your understanding all through my career journey. May you continue to enjoy the blessings of parenting.

I am highly favoured with peace at the home front, and this is further engendered by my God fearing and amiable in-laws: the Afolabi Boyinbode family from Akure Oloyemekun and our dear auntie, Mrs Beatrice Ogunsuyi. Thanks for your love and support over the years.

I am honoured to have in attendance my Christian leaders and distinguished elders of our community – Bishops, General overseers of Christian ministries, Chaplains and Pastors of various cadres; distinguished elders of Ife land – Ife Board of Trustees; Ife Development Board, Ife Trust Fund and Ife Academia - the palace is ably represented by these notable groups.

To my Christian community, the Anglican Communion Dioceses of Ile-Ife and Akure; Christway Ministries International, All Souls Chapel, Obafemi Awolowo University, Ile-Ife and Nigeria Christian Graduate Fellowship (NCGF); thank you for the veritable platforms provided to develop my Christian calling in teaching, preaching and intercession; for your prayers and brotherly love which I will not trade for anything.

To all my friends and acquaintances at home and abroad, my former students and mentees, thank you for your help in shaping my destiny. My distinguished audience seated in this hall and many others on the live streaming platform, thank you for your patience.
"Now unto the King eternal, immortal, invisible, the only wise God, be honour and glory for ever and ever. Amen" (1Timothy 1:17)

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