A Study of the Technology used in Community Pharmacy Practice in Nigeria.

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ABSTRACT

Community pharmacists must employ technology in order to handle the extended practice responsibilities which are beyond dispensing and compounding. Valid Nigerian data on the level of use of technology in community pharmacies by community pharmacists is not available. The objectives of the study were to determine the types, extent of use of technology and evaluate factors influencing their use by community pharmacists. The benefits and prospects of the use of technology were also discussed.

Pre-tested questionnaires were purposively administered to 500 community pharmacists in an annual conference organized by the Association of Community Pharmacists' of Nigeria in May, 2016. The questionnaires elicited information on the study objectives. Data was analyzed with SPSS version 16 for windows. The study identified that computer, closed circuit television, barcode, point-of-sales, mobile phones, and the internet as the predominantly used technologies. Extent of use of these technologies was high but influenced by time, knowledge, attitude, internet connectivity, training, personnel, skill, and electricity, resistance to change, finance and cost. Some benefits arising from the use of technology include increased pharmacy image, decreased patient waiting time, creation of more time for patient counseling among others in spite of the fact that the pharmacists believed that the prospects of using sophisticated health technologies remains daunting.

The study concluded that community pharmacists should focus more on the use of advanced technologies in order to improve the quality of care and at the same time, cope with the ever expanding roles of the pharmacy profession.

(Keyword: technology, innovations, information, community pharmacy, Nigeria)

INTRODUCTION

Community pharmacists in developed countries have unlimited access to patient-specific health care information including medication profile and laboratory values through centralized health data base which was made possible by technology (Millonig *et al*., 2002; van Lint, 2003). In Nigeria for instance, community pharmacists do not have access to patients' documents and no information about patients is shared between the clinicians and community pharmacists who by convention are erroneously believed to have nothing to do with patients' case files. Whereas, access to patients' record system will assist pharmacist professional decision-making in providing patient-centered services (van Lint, 2003; Groundrey-Smith, 2014).

Community pharmacists are yet to fully take advantage of the opportunities provided by the advent of technology to provide the much talked about patient care services which will ensure better rational and safe use of medication (Afolabi and Oyebisi, 2007). This perhaps has decreased the rate of patient oriented care services offered by community pharmacies (Leung et al., 2013). Previous studies in Nigeria focused on general community pharmacy practices (Adje and Oli, 2013), pharmaceutical care (Opara and Eferakeya, 2005, Okonta et al., 2012); hospital pharmacists' attitudes (Afolabi and Oyebisi, 2007a), and perceptions of barriers to automation techniques (Afolabi and Oyebisi, 2007b).

Valid Nigerian data on the level of use of technology in community pharmacies by community pharmacists is not available. Also, factors influencing the use technology by community pharmacists have not also been elucidated in Nigeria. This study is designed to fill these gaps. It is expected that the outcome of

this study will provide useful insights into the practice of community pharmacy by highlighting notable benefits arising from the use of technology. The objectives of the study are to identify the types of technology used by community pharmacists; determine the extent of use of such technologies; evaluate the factors influencing their use; identify the benefits arising from their use; and assess the prospects for future use of technology in community pharmacy practices in Nigeria.

LITERATURE REVIEW.

The theoretical framework for this study is based on the concept of pharmaceutical care. Pharmaceutical care has been explained as a patient-centered practice in which the pharmacists assume responsibility for the patients' drug-related needs, problems, and outcomes (Hepler and Strand 1990). The philosophy of pharmaceutical care was mooted by Hepler and Strand in 1990. Since then, community pharmacies worldwide have been urged to adopt pharmaceutical care practices (Hepler and Strand 1990, Christensen and Farris 2006, Hughes *et al*., 2010).

Pharmaceutical care practices entails either a complete shift from product–centered mentality of merchandizing in pharmacy practice or a re-engineering of the traditional pharmacy practices of compounding, retailing, and dispensing to a patient care-centered practice. In addition, the pharmacist is expected to build professional relationship among other health care professionals in order to enhance free flow of information on health related matters that would improve patients' outcome. Such information are collected, organized, documented, stored, reviewed or evaluated to improve pharmacists work flow. However, the successful implementation of pharmaceutical care requires the use of technological tools such as computer software support, drug utilization evaluation (DUE) programs, disease management protocols that would be used to assess medication therapy adherence and effectiveness.

Technologies in-use in Health Care Systems

Technology is the correct application of knowledge that is science-based. This knowledge could be in form of information, innovations in the design, production, and utilization of goods and services, and in the organization of human activities. Innovation involves using new ideas, practice, to create or enhance value of products or services (Rogers, 2003).

In community pharmacy practice in advanced countries, technology has been used to improve patients' safety and outcomes by reducing medication errors and cost of care, fill prescriptions while creating more time for pharmacists to engage in patient counseling (Aungst, 2015; Schueth, Hein and Hull, 2015). The use of technology in pharmacy practice is priceless in waging the war against substance of abuse such as opioids. In the United States a lot of avoidable deaths occurred from overdose of prescription medications (Centers for Disease Control, 2012).

Electronic prescribing of controlled substances (EPCS) and prescription drug monitoring programs (PDMPs) can help clinicians recognize substances of abuse through medication history checks. E-prescribing systems and pharmacy systems can detect deadly prescription errors and drug interactions relating to opioid use thus preventing accidental deaths and overdose (Schueth, Hein and Hull, 2015).

In Canada, for instance, the use of Digital Information System (DIS) and Laboratory Information System (LIS) reportedly increased productivity and better quality of care (Canadian Pharmacists Association and Canada Health Infoway, 2011; Leung *et al*., 2016). Refill requests can be closely tracked too. In addition, modern technology has been leveraged to optimize medication therapy management (MTM) through patient-centered personalized care services (Schueth, Hein and Hull, 2015). Other services include but not limited to, comprehensive medication reviews, medication reconciliation, drug use review, the ordering and review of lab tests, immunizations, drug dosage adjustments, and identification of gaps in care. MTM can improve medication adherence and patient outcomes among patients suffering from chronic diseases, thus cutting costs and improving the quality of care and patients' safety (Schueth, Hein and Hull, 2015).

Technology could be tangible, intangible, high, intermediate, and low. It is time based and therefore dynamic in nature. Hence, to keep abreast with technology, there must be

continuous innovation-creating new ideas or invention that must translate into goods and services that create value at minimal costs and at same time satisfy customers' needs appreciably. The act of innovating is skill based and requires critical mass of would-be innovators. This group of people may have to continuously track hi-tech innovations and possibly adapt, porch or steal such technologies as may be needed, in order to foster the process of modernization (Leipziger, 2006). This may be why acquiring and adapting technology is not a simple matter.

Since patient care orientation has changed the pharmacy professionals' educational and practices globally, most community pharmacists have no choice than to key into the use of modern technologies in their daily practice before they loss trend with current practices (WHO, 2006; FIP, 2010). Moreover, when community pharmacists are strengthening their professional roles through patient-oriented service provision because, pharmacy practice is tilting away from being product-centered to patient focused (Doucette *et al.,* 2006).

Health Information Technology (HIT) is defined as the application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of health care information data, and knowledge for communication and decision making (Health IT terms glossary, 2012). According to DeSalvo et al., 2015, HIT ensures that:

1. Needed information is available at the time and place of care;

2. Health care quality improves, medication errors are reduced, and delivery of appropriate evidence-based medical care is ensured;

3. There is promotion of more effective health market place;

4. The coordination across the continuum of care improves; and

5. Patients' individually identifiable health information is secure and protected.

Other technologies in use according to Groundrey-Smith (2014), include:

1. Barcode (at point of dispensing, inventory preparation, compounding and dispensing process.

2. The internet: This is usually web- based. Information of all sorts are stored on the web or cloud as the case may be and could be retrieved anytime if needed.

3. Electronic prescribing and discharge: Used in the administration or supply of medicine. It can be used to reduce medication errors if system is well designed. If not could in fact increase medication errors.

4. Mobile technology: This type of technology is widely in use in most developing countries because it is cheap, effective, and does not require any special skill for its operation. Groundrey-Smith 2014, enumerated the applicability of mobile technology, in reminding patients that repeat prescriptions are ready through text alerts; disease monitoring e.g. recording of the peak flow readings in Asthma, monitoring of blood glucose level, and medication adherence.

5. Adherence monitoring: This involves the use of "Smart" packaging, where a microchip-containing tablet blister pack is able to monitor when doses are popped out but not necessarily taken.

6. Telecare: Here digital communication technology inform of audio-visuals are used to provide health care consultations and seminars to patients remotely at home. Some of the benefits of Telecare are that patients are at the center of their care and at the same time, it supports personalized medicine. It also improves access to healthcare by reducing the need for hospital attendance especially for people with poor mobility, or those in remote areas. It also reduces the travelling times and costs of reaching out to patients by healthcare professionals.

Challenges Associated with the Use of Technology in Community Pharmacy Practice

Prominent among the challenges in the use of technology in developing countries are poor infrastructural facilities such as electricity, internet connectivity, inadequate trained personnel, financial constraints, attitude toward adoption of

innovations, limited patient-oriented attitude, ineffective collaboration with other health workers in terms of information sharing, lack of documentation of patients' profile, time constraints and lack of skill to use modern and sophisticated health technology, cost, resistance to change, interoperability issues, and privacy concerns (Latif and Boardman,2008; Westerliing *et al*; 2010; Siske and Tribble 2011; Holler 2013).

CONCEPTUAL FRAMEWORK

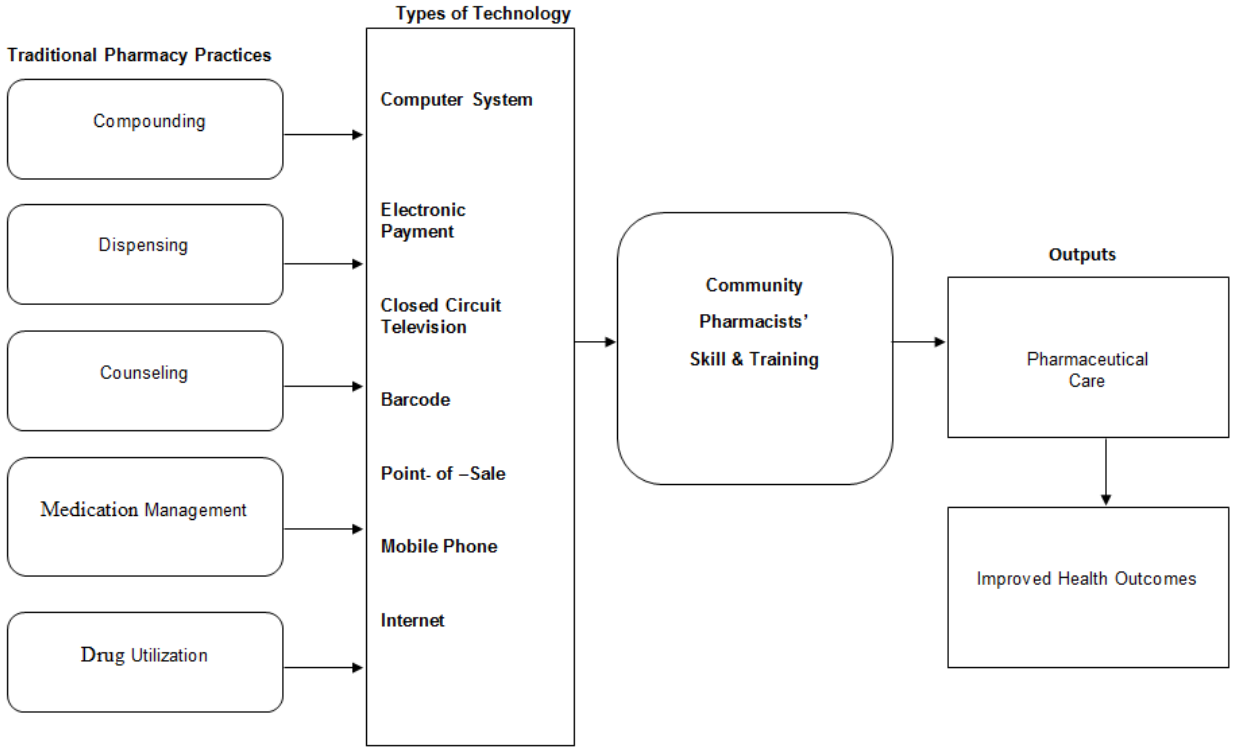
The study is largely based the concept of logistics management system which is geared to improving patients outcomes. Technology is applied to traditional pharmacy activities in order to improve their effectiveness and efficiency. However, the community pharmacists must have the requisite skill and training to accomplish this.

METHODS

Study Design

Structured questionnaires and semi-structured theme interviews were used to seek perspectives from a broad range of participants who attended the annual conference of the Association of Community Pharmacists' of Nigeria (ACPN) organized in May 2016 in Enugu, Nigeria. The timing of the study was designed to suit the period of the ACPN conference where most community pharmacists would participate in and it will be easier to reach them there. Therefore, it was a cross sectional survey study.

Figure 1: Conceptual Framework for the Study.



MODEL SPECIFICATION

In order to evaluate the factors influencing the extent of use of technology by community pharmacists in their practice, an empirical model was formulated. This model captured the relationship between the use of technology by community pharmacists' and some identified explanatory variables from literature which act as barriers to the use of such technologies. Other factors not explicitly included in the model were captured by the error term as presented below.

CPUT = f (T, K, AT, INT, TR, PN, PS, E, RC, F, CT…….Ut) **(1)**

The explicit form of Equation (1) above is represented as follows:

CPUT=ß0 + ß1T+ ß2K+ ß3AT+ ß4INT+ ß5 TR+ ß6PN+ ß7S+ ß8 E+ ß9 RC+ ß10F,+ ß11CT ---Ut **(2)**

Where:

CPUT = Community Pharmacist Use of Technology (Dependent variable) while the Independent variables are:

T =Time

K =knowledge

AT=Attitude

INT=Internet Connectivity

TR =Training

PN =Personnel

S =Skill

E =Electricity

RC= Resistance to Change

F= Finance

CT = Cost

ß1- ß11= Regression coefficients of the variables to be measured

ß0 = Constant term/Slope or intercept
Ut= Stochastic error term

Research Hypothesis

Ho: There is no significant relationship between all the eleven identified constrains and community pharmacists use of technology.

Sample Size

Pre-tested questionnaires were administered to 500 community pharmacists who participated in that conference using purposive or judgmental sampling technique because the researcher uses his own judgement about which respondents to choose and picks only those who best meet the purpose of the study.

Inclusion Criteria

The study included only community pharmacists practicing in pharmacies that are registered by the Pharmacists' Council of Nigeria.

Exclusion Criteria

The study excluded pharmacists practicing in other practice settings such as in the academic, clinics, hospitals, Government parastatals, and industries.

ETHICAL CONSIDERATION

The study did not involve any interaction with patients and it was not hospital-based. Only community pharmacists took part after they were briefed about the objectives of the study and a written consent to participate in the study was sort and obtained. Therefore the study was a questionnaire-based non-invasive survey.

Questionnaire Design and Questionnaire Administration

The questionnaire and oral interviews were the primary instruments for data collection and contained mostly closed ended questions. Questions in the questionnaire were drawn in such a way that they elicited appropriate responses on the study objectives. The questionnaire consists of two sections. The first section contained demographic variables, such as age, sex, year of qualification, educational

qualification(s), experience, and location of practice area.

The second section contained questions on core issues which helped to identify the types of technology used by the community pharmacists in their daily activities; the extent of use of such technology, the factors influencing their use, the benefits arising from their use, and the prospects of using modern technologies in community pharmacy practices in Nigeria. In this regard, respondents were asked to thick in the spaces provided in the questionnaire, type(s) of technology used in their daily practice, the extent of use of such technology in a 5-point Likert scale as Never (1), Rarely (2), Sometimes (3), Often (4) and Always (5). Furthermore, they were asked to rate the influence of some identified factors which act as barriers to the use of modern technology on a 5-point Likert scale as No influence(1), Little influence(2), Moderate influence (3), High influence (4), and Very High influence (5). This was complemented by oral interview which focused on the benefits and prospects of modern technologies in community pharmacy practices. The questionnaires were picked by the conference participants at the point of registration and filled later.

Validity and Reliability of the Research Instruments

A number of measures were taken to validate the questionnaire. First, concerted efforts were made to ensure that questionnaire items were designed from research questions, the study objectives as well as the conceptual framework. The contents of the questionnaires were validated through a focus group interview with nine community pharmacists who participated in a Mandatory Continuing Professional Education Programme held at Obafemi Awolowo University Ile-Ife, Osun State.

Reliability coefficient of the questionnaires was also determined. Reliability is an assessment of the degree of consistency between multiple measurements of a variable (Pallant, 2007). Cronbach's alpha was used to assess the consistency of the entire scale. According to Hair et al., 2003, Pallant; 2007, reliability scores greater than 0.70 are acceptable. Since all of the items had an alpha above the standard guideline of 0.70, the scale is suitable for analysis with acceptable reliability. Cronbach alpha score of 0.89 was obtained for the entire scale. This indicates that there is internal consistency of the entire variable scale and that variable construct exhibited strong internal reliability. The questionnaires were constructed in simple prose devoid of ambiguity. It was also pre-tested on ten community pharmacists in the study area at the pilot stage. Thereafter, comments, suggestions and corrections made by the respondents were incorporated in order to improve the quality of the questionnaire.

Data Analysis/Description of Methodology

Data was analyzed using SPSS version 18 for windows. Results were presented in descriptive statistics such as frequency, percentages, means and standard deviations. These were used to identify the various types of technologies in use by community pharmacist; determine the extent of use of such technologies by community pharmacists. Simple multiple regression analysis was employed to evaluate factors influencing the use of modern technologies by community pharmacists. The robustness of this model was determined based on the values of the R2, Adj. R2, standard of the regression, t-test of each independent variable in the function, F-test of the overall equation, appropriateness of the signs on the regression coefficients as they conform to economic implications and number of statistically significant variables. Durbin Watson d* statistics was used to establish the level of auto-correlation between the dependent and explanatory variables.

Means, standard deviations and regression technique was used to analyze Likert scale ordinal data obtained from this study as if they were interval data for the following reasons: the sample size (500) is adequate and has at least 5 observations in a group(Jamieson,2004); the study population of interest was normally distributed (Jamieson,2004), parametric tests can be used to analyze data obtained from Likert scales(Sullivan and Artino 2013); and parametric tests are sufficiently robust to yield largely unbiased answers that are acceptably close to ''the truth'' when analyzing Likert scale responses (Norman,2010).

Descriptive Statistics

The responds rate was 99% because out of a total of 506 questionnaires that were

administered, 500 were properly filled, harvested, and used for analysis.

Table 1: Sample of Study Distribution According to Age.

Age (years)	Number	Percentage
20-30	21	4.2
31-41	194	38.8
42-52	201	40.2
53-63	72	14.4
>64	12	2.4
Total	500	100

Middle aged community pharmacists (31-52 years) were more in number than other age groups or categories. They represent a total of 395(79%) of the entire respondents who attended the ACPN conference.

Table 2: Sample of Study Distribution According to Qualification.

Qualification	Number	Percentage
B. Pharm	376	75.2
Pharm D	41	8.2
M. Pharm	33	6.6
MSc in Pharmacy	18	3.6
M.Phil. in Pharmacy	0	0
MBA	27	5.4
MPH	5	1.0
Ph.D.	0	0
Total	500	100

The distribution of respondents according to academic qualifications presented in Table 2 showed that holders of first degree (Bachelor of Pharmacy) were higher in number. No respondent had either a Master of Philosophy degree in Pharmacy nor a Doctor of Philosophy in Pharmacy. Some of the respondents had more than one qualification.

Table 3: Sample of Study Distribution According to Experience.

Experience (years)	Number	Percentage
< 5	45	9.0
5-10	184	36.8
11-15	97	19.4
16-20	86	17.2
21-25	46	9.2
26-30	24	4.8
> 30	18	3.6
Total	500	100

A majority of the respondents 73.4% had 5-20 years of experience in community pharmacy practice.

Table 4: Practice Location of the Community Pharmacists.

Practice Locations	Number	Percentage
Rural	48	9.6
Sub-Urban	113	22.6
Urban	339	67.8
Total	500	100

Most of the community pharmacists practice in the urban and sub-urban centers and a handful of them (9.6%) have their shops located in the rural areas. Technology listed in Table 5 range from low to intermediate technologies.

Table 5: Types of Technology used by Community Pharmacists in Nigeria.

Technology Types	Number	Percentage
Computer system	500	100.0
Electronic payment	415	83.0
Closed Circuit Television	89	17.8
Barcode	165	33.0
Point-of -Sales	209	41.8
Mobile Phones	500	100.0
Internet	489	97.8

Table 6: Extent of Use of Technology by Community Pharmacists in Nigeria.

No.	Technology Types	Never 1	Rare 2	Sometimes 3	Often 4	Very Often 5	Mean	Std Dev.
1.	Computer system	5	4	18	240	233	4.38	0.72
2	Electronic payment	85	43	89	123	160	3.46	1.05
3	Closed Circuit Television	411	16	14	10	49	1.54	1.06
4	Barcode	335	24	23	58	60	1.97	1.50
5	Point-of -Sales	291	56	49	48	56	2.64	1.44
6	Mobile Phones	0	0	2	6	482	4.88	0.72
7	Internet	11	8	36	54	391	4.60	0.92

Table 7. Factors that Influence the use of Technology by Community Pharmacists in Nigeria.

No.	Variables	No Influence 1	Little Influence 2	Moderate Influence 3	High Influence 4	Very High Influence 5	Mean
1.	Time	8	6	9	74	403	4.72
2	Knowledge	5	14	63	97	321	4.43
3	Attitude	7	6	4	289	194	4.31
4	Internet Connectivity	75	82	20	144	179	3.54
5	Training	56	56	49	48	291	2.80
6	Personnel	4	11	32	108	345	4.56
7	Skill	8	54	37	93	308	4.23
8	Electricity	3	7	41	38	411	4.71
9	Resistance to Change	67	26	9	104	294	4.06
10	Finance	13	30	37	169	251	4.20
11	Cost	51	35	48	192	174	3.81

Specifically, the individual contribution of each variable to the use of these technological tools by community pharmacists' using inferential statistics will reveal the magnitude and direction of such contribution.

Table 8: Ordinary Least Square Estimation (Result or Output).

Variables	Coefficient	Std. Error	t-Stat.	Prob.	R^2	F-Stat.	Prob. F-Stat.	D-W
C_0	2.1600	0.6750	3.1617	.003*				
T	0.6621	0.0891	7.4309	.005*				
K	0.6232	0.1465	4.2539	.021*				
AT	0.5461	0.1078	5.0659	.013*				
INT	0.0464	0.1201	0.3863	.030*	0.89	941.93	0.000	
TR	0.6351	0.1336	4.7537	.016*				
PN	0.4215	0.1084	3.8884	.023*				
S	0.6121	0.1773	3.4523	.011*				
E	0.2363	0.0269	8.7844	.021*				
RC	-0.5273	0.1035	-5.0947	.034*				
F	0.5418	0.0911	5.9473	.036*				
CT	0.6012	0.1471	4.1604	.027*				1.85529

*Significant at p<0.05 Adj. R-square =0.78

Responses obtained from questionnaires identified some benefits of using technology in community pharmacy practices in Table 9.

Table 9: Benefits of using technology in community pharmacy practice. (N= 500).

Benefits	Number of Respondents	Percentage
Improves patients' outcomes	376	75.2
Reduces medication error	298	59.6
Reduces cost of care	301	60.2
More time for counseling	423	84.6
Improves image of pharmacy	364	72.8
Reduces patients waiting time	198	39.6
Improves productivity	105	21.0

Some respondents indicated multiple benefits.

DISSCUSSION

Apart from the computer, internet and mobile phones, other types of technology deployed in the day to day activities by community pharmacists in Nigeria seem to be directed at facilitating faster and easier means of routine business transactions, and improved provision of shop security. In any case, these technologies could be rated as low or intermediate technologies. However, this is not to say that patients would not benefit from the services arising from their use. For instance, faster and easier business transactions arising from the use of electronic payment system and barcode might reduce community pharmacists' work load, thereby creating more time for patient counseling activities (Aungst, 2015; Schueth, Hein and Hull, 2015).

Mobile telephone is used by all the community pharmacists surveyed in this study. This result seems to support the findings of a similar study carried out elsewhere (Groundrey-Smith, 2014). In that study it was revealed that mobile phone technology is widely by community pharmacists in most developing countries because it is cheap, effective, and does not require any special skill for its operation. Groundrey-Smith 2014, enumerated the applicability of this type of technology, in reminding patients that repeat prescriptions are ready through text alerts; disease monitoring e.g. recording of the peak flow readings in Asthma, monitoring of blood glucose level, and medication adherence.

Furthermore, low and intermediate technologies were routinely used by community pharmacists in Nigeria (with a mean of means of 3.35 on a 5-point Likert scale) in terms of their extent of use. However, no advanced health technologies such as Electronic Prescribing System, Prescription Drug Monitoring Programs, Laboratory Information System, Digital Information System, Medication Therapy Management System among others was made use of by community pharmacists in Nigeria. The implications of not using such technologies are that it will be difficult to monitor deadly prescription errors, drug interactions, medication adherence, patient outcomes among patients suffering from chronic diseases (Schueth, Hein and Hull, 2015).

Other benefits derivable from the use of Digital Information System (DIS) and Laboratory Information System (LIS) such as increased productivity, better quality of care, comprehensive medication reviews, medication reconciliation, drug use review, the ordering and review of lab tests, immunizations, drug dosage adjustments, and identification of gaps in care (Schueth, Hein and Hull, 2015; Leung *et al*., 2016) would have been lost. Even, a majority of the respondents alluded to the fact that modern technologies in pharmacy practice could reduce medication errors, improve productivity, improve patients' outcome and reduce patients' waiting time. The reasons for not using hi-tech health technologies could be as a result the influence of barriers hitherto analyzed in this study. Again prior exposure to advance health technologies and the background of the community pharmacists in terms of training in and out of college, could be factors that determined the types of technologies community pharmacists were able to put to use.

It has been empirically validated by various researchers that improving medication use through pharmacists' access to patient-specific health care information made possible by technology, improved the skill and knowledge of pharmacists (Millonig et al., 2002, van Lint et al., 2003).Till date, there is no central data base for patient-specific health care information in Nigeria. Moreover, the use of advanced technology is skill based, tacit in nature and requires critical mass of committed individuals with requisite training. This group of individuals according to Leipziger (2006), may have to continuously track hi-tech innovations and possibly adapt, porch or steal such technologies as may be needed, in order to foster the process of modernization.

Regression results revealed that all the identified factors from the literature, have significant effects on community pharmacists' use of modern technologies. This finding invalidates the null hypothesis. Hence, the alternative hypothesis is accepted. The estimated coefficients of ten independent variables namely, Time ($ß_1$=0.66, p=.005), Knowledge ($ß_2$=0.62, p=.021), Attitude ($ß_3$=0.54,p=.013), Internet ($ß_4$=0.05'p=.03), Training ($ß_5$=0.64,p=.016), Personnel ($ß_6$=0.42,p=.023), Skill ($ß_7$=0.61,p=.011), Electricity ($ß_8$=0.24,p=.021), Finance ($ß_{10}$=0.54, p=.036) and Cost ($ß_{11}$=0.60, p=.027) were positive and significant at $p<0.05$.

This shows that these variables have direct relationships with the dependent variable: Community pharmacists' use of technology. Therefore, a unit change in each variable will cause a corresponding change of 66%, 62%,

54%, 50%, 64%, 42%, 61%, 24%, 54%, and 60%, respectively in the dependent variable. Only the variable RC (Resistance to Change) with coefficient ($ß_9$ =-0.53, p=.034) had a negative or inverse relationship with the dependent variable. This means that for every unit increase in resistance to accept new technologies there will be a decrease of 53% in the use health technologies by community pharmacists. This corroborates the finding of Westerling et al., (2010) which revealed that pharmacists generally have weak attitude towards change.

The Durbin-Watson statistics was 1.89 which is close to 2. This implies the absence of first order autocorrelation in the regression model. The coefficient of determination R-squared was 0.89 which shows that 89% of community pharmacists' decision to use modern technology in their day to day activities is determined by the variations in the independent variables as explained by the model. This implies that only 11% changes in the dependent variable was caused by other variables not found in the equation but measured by the error term. The Adjusted R square value which is the most useful measure of the success of a model was 0.78 and this accounted for 78% of the variance in the criterion variable. The F-statistics of 941.93 was significant at 5% level of significance. Hence the model is of good fit.

Almost all the respondents 460 (92%) highlighted some of the benefits of using technology in community pharmacy practices as improved patients' outcome, increase in pharmacy image, and productivity, reductions in medication errors, patient waiting time and cost of care and the creation of time for patient counseling by community pharmacists. In the oral interview section, most of the respondents believed that there is no immediate prospect of using high-tech technologies in community pharmacy practice in Nigeria unless community pharmacists have access to patients' health information.

Limitations of the Study and the Need for Further Research

Since the study was a cross sectional survey, only the views of the community pharmacists were sort. The perspective of the patients on the acclaimed benefits of the use of technologies becomes relevant. This would provide the basis for an interventional study. Not all community pharmacists attended the ACPN conference. Hence the outcome of this study may not be generalized.

CONCLUSION AND RECOMMENDATIONS

The study identified types of technologies used by community pharmacists namely the computer, closed circuit television, barcode, point-of-sales, mobile phones and the internet which could be classified as low to intermediate technologies. The extent of use of these technologies was high but influenced by variables such as time, knowledge, attitude, internet, training, personnel, skill, and electricity, resistance to change, finance and cost. Notable benefits that were identified by the study include improved patients' outcome, increase in pharmacy image, and productivity, reductions in medication errors, patient waiting time and cost of care and the creation of time for patient counseling by community pharmacists. The study revealed that the prospect of using high-tech modern health technologies in community pharmacy practice in Nigeria is daunting.

Consequently, the study recommends that community pharmacists should strive hard to develop and sustain interactions with other health care professionals especially the physicians in their practice domain, so that they can obtain necessary information about patients. Scaling up the type of technologies presently in use by community pharmacists is very necessary for the benefit of the patient. This, therefore means that community pharmacists must continue to horn their skills, and embark on incessant training and remain innovative in order to remain relevant in the future and perhaps match global best practices through the use of high-tech health technologies.

REFERENCES

1. Adje, D.U. and A.N. Oli. 2013. "Community Pharmacy in Warri-A Survey of Practice Details". *Scholar Academic Journal of Pharmacy*. 2(5):391-397.

2. Afolabi, M.O. and T.O. Oyebisi. 2007a. "Pharmacists' Perceptions of Barriers to Automation in Selected Hospital Pharmacies in Nigeria". *Journal of Pharmacy Practice*. 20(1):64-71.

3. Afolabi, M.O. and T.O. Oyebisi. 2007b. "Pharmacists' Attitude to the Introduction of Automated Techniques in the Delivery of Pharmaceutical Services in Selected Nigerian Teaching Hospitals". *Journal of Pharmacy Practice*. 20(1):72-81.

4. Aungst, D.T. 2015. "Technology: Will it Help or Hurt the Future of Pharmacy Practice?". *Pharmacy Today*. pharmacytoday.org/article/pip/action.

5. Canadian Pharmacists Association and Canada Health Infoway. 2011. "The Value of Drug Information Systems to the Evolving Practice of Pharmacy". Available at: http://blueprintforpharmacy.ca/docs/default-documentlibrary/2011/03/11/124.pdf?Status=Master (Accessed 11th May 2016).

6. Centers for Disease Control and Prevention. 2012. "National Vital Statistics System.2010 Multiple Causes of Death File". CDC: Hyattsville, MD.

7. Christensen, D.B. and K.B. Farris. 2006. "Pharmaceutical Care in Community Pharmacies: Practice and Research in the US". *Ann Pharmacother*. 40(7-8):1400-1406.

8. DeSalvo, K.B., A.N. Dinkler, and L. Stevens. 2015. "The United States of the National Coordinator for Health Information Technology: Progress and Promise". *Ann Emerg Med*. 66(5): 507-10. Doi:10.1016/j.annemergmed.2015.03-032.Epub 2015 May 9.

9. Doucette, W.R., D.H. Kreling, J.C. Schommer, C.A. Gaither, D.A. Mott, and C.A. Pedersen. 2006. "Evaluation of Community Pharmacy Service Mix: Evidence of the 2004 National Pharmacist Workforce Study". *J. Am Pharm Assoc*. 46(3):348-355.

10. International Pharmaceutical Federation. 2010. "FIP Standards for Quality Pharmacy Services". http://www.fip.org/www/uploads/database_file.php?id=261&table_id=.Accessed24.09.2010.

11. Goundrey-Smith, S. 2014. "Examining the role of Technology in Pharmacy: Now and in the Future". *The Pharmaceutical Journal*. Available at http://pharmaceutical-journal.com/publications/supllements/foc

12. Hair, J.F., R.E. Anderson, R.L. Tatham, and W.C. Black. 2003. *Multivariate Data Analysis, 5th edition.* Pearson Education: Delhi, India.

13. Health IT Terms Glossary. 2012. Available at HealthIT.govwebsite. http://healthit.hhs.gov/portal/server.pt/community/health_it_hhs_glossary/1256. Accessed December 7, 2012.

14. Holler, J. 2013."The Role of Information Technology in Advancing Pharmacy Practice Models to Improve Patient Safety". *Pharmacy Times*. Available at: http://www.pharmacytimes.com/publications/health-system-edition/

15. Hepler, C.D. and T. Strand. 1990. "Opportunities and Responsibilities in Pharmaceutical Care". *Am J Hosp Pharm*. 47:533-543.

16. Hughes, C.M., A.F. Hawwa, and C. Scullin. 2010. "Provision of Pharmaceutical Care by Community Pharmacists: A Comparison across Europe". *Pharm World Sci*. 32(4):472-487.

17. Jamieson, S. 2004. "Likert Scales: How To (ab) Use Them". *Med Educ*. 38(12):1217–1218.

18. Latif, A. and H. Boardman. 2008. "Community Pharmacists' Attitude Towards Medicine Review and Factors Affecting the Numbers Performed". *Pharm World Sci*. 30(5):536-543.

19. Leipziger, D.M. 2006. "Technology, Adaptation, and Exports. How Some Developing Countries Got it Right". Vandana Chandra (ed). The World Bank.

20. Leung, V., S. Hagens, and J. Zelmer. 2013. "Drug Information Systems: Evolution of Benefits with System Maturity". *Health Quart*. 16(2). Available:www.longwoods.com/content/23409 (accessed May 10, 2016).

21. Leung, V., S. Tharmalingam, J. Cooper, and J. Charlebois. 2016. "Canadian Community Pharmacists' use of Digital Health Technologies in Practice". *Can Phar J (ott)*. 149(1):38-45.

22. Millonig, M.K., T.L. Jackson, and W.M. Ellis. 2002. "Improving Medication use through Pharmacists' Access to Patient-Specific Health Care Information". *J Am Pharm Assoc*. 42:638-45.

23. Norman, G. 2010. "Likert Scales, Levels of Measurement and the ''Laws'' of Statistics". *Adv. Health Sci Educ Theory Pract*. 15(5):625–632.

24. Okonta, J.M., E.O. Okonta, and T.C. Ofoegbu. 2012. "Barriers to the Implementation of Pharmaceutical Care by Pharmacists in Nnsuka and Enugu Metropolis of Enugu State". *Journal of Basic and Clinical Pharmacy*. 3:295-298.

25. Opara, C.A. and A.E. Eferakeya. 2005. "Attitude of Nigerian Pharmacists towards Pharmaceutical Care". *Pharmacy World Sci*. 27(3):208-14.

26. Pallant, J. 2007. *SPSS Survival Manual*. Ligare Book Printer: Sydney, Australia.

27. Rogers, E.M. 2003. *Diffusion of Innovation. 5th Edition*. Free Press: New York, NY.

28. Schueth, A., W. Hein, and J. Hull. 2015. "Five Technology Trends: Changing Pharmacy Practice Today and Tomorrow". *Pharmacy Times*. Available at: http;//www.pharmacytimes.com/publications/directions-in-pharmacy/.

29. Sisko, M.H. and D.A. Tribble. 2011. "Opportunities and Challenges Related to Technology in Supporting Optimal Pharmacy Practice Models in Hospitals and Health Systems". *Am J Health-Syst Pharm*. 68:1116-1126.

30. Sullivan, G.M. and A.R. Artino. 2013. "Analyzing and Interpreting Data from Likert –Type Scales". *Journal of Graduate Medical Education*. DOI: http://dx.dol.doi.org/10.4300/JGME-5-4-18.

31. Van Lint, J.A., L.A. Sorge, and J.P. Sorenen. 2003. "Access to Patients' Health Records for Drug Therapy Problem Determinations by Pharmacists". *J Am Pharm Assoc*. 55:278-81.

32. Westerling, A.M., V. Haikala, and M. Airaksinen. 2010. "The Role of Information Technology in the Development of Community Pharmacy Services: Visions and Strategic Views of International Experts". *Research in Social and Administrative Pharmacy*. Article in Press. Available on line at www.sciencedirect.com. Doi:10.1016/.sapharm.2010.09004. Accessed 10th May 2016.

33. World Health Organization in Collaboration with International Pharmaceutical Federation. 2006. *Developing Pharmacy Practice. A Focus on Patient Care. Handbook*. WHO/PSM/PAR/2006.5

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SUGGESTED CITATION

Osemene, K.P. and W.O. Erhun. 2016. "A Study of the Technology used in Community Pharmacy Practice in Nigeria". *Pacific Journal of Science and Technology*. 17(2):329-340.

Pacific Journal of Science and Technology