Inventory Management in Community Pharmacies in Nigeria

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There is no data on the types of technology used in community pharmacies to manage inventory in Nigeria. Also the extent of use of such technology and factors influencing their use has not been studied. This study is carried out to identify the types of technology used in managing inventory in community pharmacies, determine the extent of use of such technologies, evaluate the factors influencing their use, and identify the benefits of inventory management technologies in community pharmacies. A cross sectional survey of 410 community pharmacists was undertaken with the aid of pre-tested questionnaires which were purposively administered to achieve the objectives of the study. Data was analyzed using frequencies, percentages, means, standard deviations and ordinary least square regression analysis. The study identified eleven different technologies that community pharmacies utilize in managing inventory. These were the bin cards, stock cards, store ledger inventory control cards, computers among others. Prominent factors influencing their use include but not limited to knowledge, training and skill of the community pharmacists. Respondents perceived that inventory control technologies used were beneficial to them. The underutilization of newer technologies to manage inventory could limit community pharmacists' ability to deliver quality pharmaceutical services that are patient-focused.

Keywords: *Computer, Generics, Medication, Patients, Stock.*

INTRODUCTION

The rising profile and sophistication in the operations of community pharmacies in developed countries has been attributed to the use of technology in various aspects of community pharmacy practice especially in inventory management. In the pharmaceutical setting, inventory could be regarded as all the medications and non-medical supplies used in the day-to-day running of a pharmacy. Inventory could be classified as raw materials work-in-progress and finished goods (Kotler, 2002; Lucey, 2006). The management of inventory therefore involves a process of ensuring that these medical and non-medical inventory are properly managed in such a manner that stock outs are avoided at all times thereby ensuring commodity security at low costs(USAID | DELIVER PROJECT, 2013).Inventory represents major assets in community pharmacies (West, 2009).Inappropriate management of inventory could lead to undesirable consequences such as overstocking, under-stocking, increased carrying costs arising from product storage, damage, theft and stock out cost (West,2009). The latter could mar the image of the pharmacy through the loss of customers, decreased cash flow, and compromised patients' wellbeing through the use of unwholesome products that may have either expired or deteriorated. Developed countries have been able to leverage the use of technology to manufacture and inventoried many medical and non-medical products over the years. In

Nigeria, community pharmacies use of technologies to manage inventory has so far not been reported. Also, the gains of using modern technologies to control inventory in Nigerian community pharmacies have not been discussed.

RESEARCH QUESTIONS

From the statement of the problem, the following research questions were formulated as follows,

1. What are the technologies used to manage inventory in community pharmacies in Nigeria?
2. What is the extent of use of such technologies in community pharmacies in Nigeria?
3. What factors affect the use of the identified technologies in the management of inventory in community pharmacies in Nigeria?
4. What are the benefits arising from the use of such technologies to manage inventory in community pharmacies?

OBJECTIVES OF THE STUDY

The specific objectives of the study are to:

i. Identify the types of technology used in community pharmacies to manage inventory;
ii. Determine the extent of use of such technologies;
iii. Evaluate the factors affecting the use of such technologies in the management of inventory in community pharmacies; and
iv. Determine the benefits of using the identified technologies to manage inventory in community pharmacies.

LITERATURE REVIEW

Inventory management could be called stock control. It involves balancing of influx and outflow of products in order to such avoid wastages and ensure that goods are purchased at minimal costs (Rosenblatt, 1977). It is an intricate process which requires that the operators strive hard to balance the conflicting economics of not holding too much stock (Adeyemi & Salami, 2010).Inventory could be regarded as stock of goods maintained by a business in anticipation of future demand (Drury, 1996).There are three broad reasons for holding stocks; which according to (Lucey, 2006) are transactional which helps to meet production and sales targets. It would also absorb variations in demand; as necessary part of the production process; act as buffer between production processes and enable a smooth flow of the production process; Precautionary which is to avoid stock outs and meet unexpected shortages in the future and speculative motive which is a strategic move that could be as a deliberate investment policy to checkmate unforeseen shortages or future inflations.

Costs Associated with Inventory

All costs incurred in the process of managing an inventory are called stock costs. Specifically, they are made up of costs of holding stock (carrying costs such as pilferage of medicines, which is a major challenge in community pharmacy practice, audit, handling, store staffing), cost of obtaining products (overhead costs), and stock out costs which leads to losses to future sales, customers' goodwill, contributions and decreased cash flow (Huffman, 1996; Carrol, 1998; Lucey, 2006; Bouldin et al., 2011). Efficient and effective inventory managers would endeavour to keep these costs at the barest minimum while at same time maintain appropriate stock level to keep the community pharmacy going.

Objectives of Inventory management in community pharmacy

In community pharmacy practice as well as in other businesses, the general focus is to continue to balance the conflicting mechanism of not holding too much stock(Adeyemi & Salami, 2010); but at the same time ensure the availability of adequate stock of medication. Furthermore, the following objectives

are subtly pursued: to reduce the time and costs for placing orders of drugs, and tender purchasing; improve patient welfare by reducing incidences of out of stock, keeping medication cost low, and ensuring that costs associated with damage and expiration of drugs are reduced too(Mahatma et al.,2012). Invariably, these actions would improve patients' care, optimize the use of resources and add value to services rendered to patients (Mahatma et al, 2012).

Types of inventory management systems

The two major types of inventory management systems are the Re-order Level (two-bin system) and the Periodic Review systems which could be called the constant cycle system (Lucey, 2006). However, a firm may decide to use the two systems simultaneously i.e. the hybrid system. In the re-order level system a predetermined re-order level is set and when inventory level falls to the re-order level, a replenished order called Economic Order Quantity (EOQ) is issued. Here inventory remains at reorder determined points (Lucey, 2006). This is one of the major merits. Others are that the system is more responsive to fluctuations in demand, automatic generation of a replacement order at the right time occurs, and the system helps to lower inventory on the average. In the periodic review system inventory are reviewed periodically at a fixed interval and at the necessary time, uncalculated replacement order is raised. It is apt for large quantities of inventory. This in itself is an added advantage as well as a disadvantage because larger inventory could attract discounts while more costs could be incurred as purchasing costs.

Methods of managing inventory in community pharmacy

Three prominent methods exists namely the visual, periodic and perpetual methods (Carroll, 1999; West, 2009; Bouldin et al., 2011). The visual method involves mere visualizing and counting the amount of inventory and then comparing the result with the documented amount in the store books. The idea is to determine whether inventory has gone beyond the desired level so that a purchase order could be made. This method according to Ayad 2011, is inexpensive, convenient, and requires less pharmacy personnel but associated with errors such as staff oversight, focus is on inventory rather than costs and there is high probability of overlooking low inventory. The periodic method is almost the same as the visual method except that the periodic method is regularly conducted on a predetermined periods of time. The process gives room to monitor fluctuations in demand and supply, involves less record keeping but measures inventory at a single point in time, and requires a lot of staff and therefore expensive (Ayad, 2011).The perpetual method is commonly used in advanced countries. It works with the aid of computer software which automatically deducts the amount of inventory sold once a prescription is filled (Ayad, 2011). With the perpetual method, inventory and cost of products are monitored continuously. It gives a quick and accurate assessment of inventory position, and makes up-to-date records available. However, the pharmacists and ancillary staff must be computer literate. Users of such facility require constant training because there are variants in the software employed in carrying perpetual inventory monitoring.

Factors affecting inventory management in community pharmacy

Community pharmacies keep varieties of inventory but this depends on the type of the community pharmacy, its' location, prescription and demand pattern of surrounding hospitals, customer base of each pharmacy location and the financial strength of the community pharmacy. However, notable factors that affect inventory management in that sector include but not limited to management principle of stocking. There could a deliberate policy to stock

more of generic drugs than branded drugs. Generics attract lower acquisition costs because they are cheaper than branded drugs. Inventory size has a direct relationship with inventory costs. Inventory shrinkage arising from theft, robbery, and shoplifting remains a potent factor that affect inventory management because 4.5% of community pharmacy sales are lost through inventory shrinkage (Garner, 1994). Unclaimed prescriptions are common and the pharmacists may have to return such prescribed medications to the shelve (Dwivedi et al., 2012). The use of formulary in hospitals could affect the stocking pattern of community pharmacies located around such hospitals.

Community pharmacy inventory keeping records

Inventory keeping records are generally of two kinds namely, bin and inventory control cards. Usually, one bin card is kept per lot, batch, and indicates expiry date, quantity received, date of purchase, quantity issued, and quantity purchased. It is usually kept with the products on the store room shelves or pallets. The inventory control card has is opened for each product and are sometimes kept in ledger or book form and may be kept in the community pharmacists' office. These two inventory keeping records are mainly used in developing countries. However, they assist the pharmacists in knowing when to order or issue, how much to other or issue, how to maintain an appropriate inventory level of all products in order to avoid shortages and oversupply.

Technology used in inventory management in community pharmacy

In developed countries, technology is deployed to manage inventory because they have been found to be more efficient, precise, and accurate (Ayad, 2011). Prominent among these technologies are the computer systems. Apart from their use in the maintenance of inventory, they can be used to process prescription orders and maintain patient files. Pharmacy staff can order medications directly through wholesalers' website (Ayad, 2011). Computer can track turnover rates, predict future drug needs. Perpetual inventory system is based on the use of computer. Another tool used is the barcode technology which is a handheld device that can scan the barcode or enter the ID number of the medication that needs to be ordered. It can be used to monitor or track inventory in community pharmacy. It improves patients' safety by reducing erroneous medication stocking, preventing the distribution of expired medications, and facilitates recall (Daina, 2010; ASHP, 2011, Ingersoll, 2015). Computers can be networked for monitoring inventory in community pharmacies especially those that have multiple branches. This will allow data to be shared. If such computer is connected to the internet, then community pharmacy can place order for medicine supply from the manufacturers in order to make new purchases for inventory replacement. Extranet which allows limited access to specific sites can be used in community pharmacy to track and monitor inventory. Radio Frequency Identification microchips can be used to track medications from the date they are manufactured to the date they are removed from storage shelves (Yuan, 2004; Ayad, 2011). Point of Sale(POS) can be used to manage inventory by minimizing inventory shrinkage arising from cashiers' error and pilfering. It can be used to monitor sales, profits and priceless in making informed decisions on inventory management. Mobile phones can serve as inventory tracking and monitoring tool. Mobile phones are widely used because they are portable and personal(Philips et al., 2006).Radio Frequency Identification(RFID) can be used to identify missing inventory, increase sales and profits, decreases patients' waiting time, offer useful insights into consumer buying behaviour (Yuan, 2004). However, they are expensive (Attaran, 2011).Closed Circuit Television (CCTV) is widely used to monitor

inventory through surveillance. It would guide against inventory shrinkage in the pharmacy as a result of pilfering, robbery and burglary.

Deploying modern technology to control inventory requires training, money, manpower and skill because technology is the application of knowledge which is tacit in nature. Developed countries such as the USA, Canada, and UK among others community pharmacies have leveraged technology to make impressive strides in inventory management. Furthermore, some of the inventory management control software that are commonly used are Sage, Peach Tree, Tally, Quickbook, Abacus Law, Microsoft Money, Electroclerk, Personal Stock Management, Dac Easy, among others (Ingersoll, 2015).

Inventory management strategies in community pharmacy

The two distinct strategies that are widely employed are the 80/20 rule and ABC(always, better, and control) analysis. In the former, it is assumed that 80 percent of the drug costs of a pharmacy are spent on 20 percent of the pharmacy's stock. Hence, it is wiser to focus on the management of the inventory of the top 20 percent of medications carried. By doing so, the pharmacists can review the purchasing history of the top 20 percent of medication and use the result to manage future inventory levels. ABC analysis is primarily on usage and cost. The medication items must first be identified in order to ease the process of classifying them in order of relevant importance. This involves the process of "separating the vital few from the trivial many" (Dwivedi et al., 2012). In practice, A class consists of 20 percent of products that account for 80 percent of pharmacy annual drug costs. The B class consists of 15 percent of the pharmacy's medications that account for 15 percent of pharmacy annual drug costs. The C class consists of 65 percent of the pharmacy's medications that account for 5 percent of pharmacy annual drug costs.

In order to balance profitability with inventory control the ABC strategy focuses more on medications that have high costs to the pharmacy and minimal focus is placed on low-cost products(Ingersoll, 2015). The ABC method is limited in the sense that only monetary values and rate of usage of products are considered. (Dwivedi et al., 2012). However, an item may be of low value and of low consumption rate but vital. Then it cannot be rejected because it is not in category A. Therefore we have to apply the VED(vital, essential, and desirable) analysis to handle this situation. Using acombination of the ABC and VED techniques appears to be better option" (Dwivedi et al., 2012; Anand et al., 2013; Devnani et al., 2010).

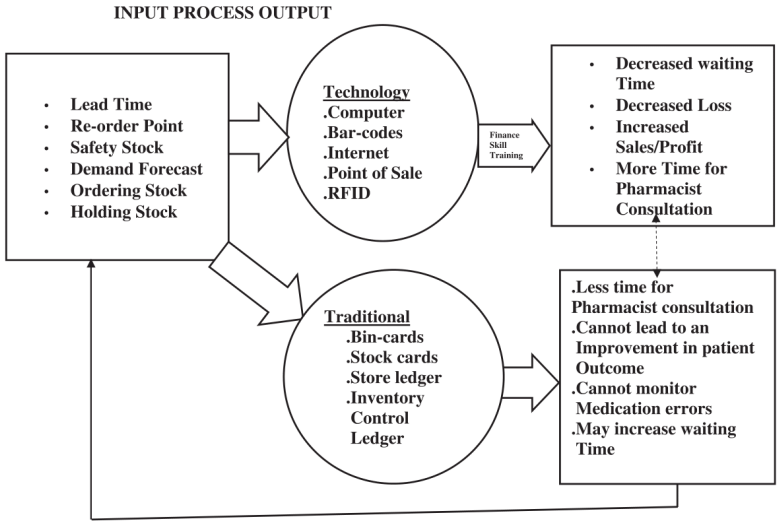
CONCEPTUAL FRAMEWORK

The conceptualized framework for this study was gleaned from the review of current and extant literature on inventory management systems. The capabilities of the traditional inventory control tools such as the bincards, stock cards, and inventory control ledger among others in terms of outcomes are stated and shown in Fig1.Little training and minimal skills are required to effectively put them to use. These tools are less expensive, not complex but could be tedious and time wasting hence requires more personnel to put them to effective use. As a result of the nature of these inventory control tools, they are not efficiently operationalized, because they are time wasting and more often than not do not create ample time for the community pharmacists to embarkon patient-centred care. They also have the tendency to prolong patient waiting time and indirectly, increase the costs of care. Naturally, the traditional tools used for inventory management are not suitable for detecting and monitoring errors arising from medication use. However, they could be invaluable in decreasing inventory shrinkage.

Advent of new technology is gradually replacing the traditional methods of controlling and managing

inventory especially in advanced countries. In this regard, the computer systems are frequently replacing existing systems even if the process is a step-care one. The new technology for inventory management is computer driven and expensive. In any inventory control system, the latent but desired goals are usually to shorten the lead time, ensure the availability of safety stocks, decrease the cost of ordering and holding stocks and ensure almost an error free re-ordering points. In fact, computerized programme has been discovered to decrease workload, time and money budgeted for inventory. (Awaya et al., 2005). Achieving all this requires a critical mass of highly skilled individuals, who must undergo incessant trainings in order to effectively put to use the computers. The resultant effect of using modern technology to manage inventory are decreased inventory shrinkage, reduction in patient waiting time, improves medication management, creates more time for the community pharmacist to conduct patient counselling, and has a higher probability of increasing sales and profit. The underlining principle of the study framework, is that outputs not only depend on the nature of inputs but also on the process that transforms the inputs to outputs.

Fig 1: Conceptual Framework for inventory control system in community pharmacy



Source: Authors' Initiative (2016)

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RESEARCH METHODOLOGY

Study design Structured and semi-structured questionnaires were administered to community pharmacists at the annual conference of the Association of Community Pharmacists' of Nigeria (ACPN) organized in 2015. The timing of the study was chosen to coincide with the period of the ACPN conference because a lot of community pharmacists would be in attendance. It was also easy to reach a majority of the community pharmacists attending the ACPN conference. The study was a cross sectional survey. Model specification In order to evaluate the factors affecting inventory management in community pharmacies, an empirical model was formulated. This model captured the relationship between inventory management activities in community pharmacies and some identified explanatory variables from literature that affect such activities. Other factors not explicitly included in the model were captured by the error term as presented below. CIMA = f (T, K, TR, PN,S, ISH, C, IS, PT, UCP, UFM ….Ut) (1)

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

$CIMA=ß_0 + ß_1T+ß_2K+ ß_3TR+ ß_4PN+ ß_5S+ ß_6ISH+ ß_7C+ ß_8IS+ ß_9PT+ ß_{10}UCP,+ ß_{11}UFM-Ut$ (2)

Where:

CIMA = Community Pharmacists' Inventory Management Activities (Dependent variable) while the independent variables are:T =Technology

K =knowledge

TR =Training

PN =Personnel

S =Skill

ISH=Inventory Shrinkage(pilferage, shoplifting, robbery, damages, deterioration, expiration)

C = Cost

IS= Inventory Size

PT= Product Type

UCP=Unclaimed Prescriptions

UFM= Use of Formularies

$ß_1$- $ß_{11}$= Regression coefficients of the variables to be measured

$ß_0$ = Constant term/Slope or intercept

Ut= Stochastic error term

Research hypothesis

Ho: No significant relationship exists between all the identified explanatory variables and inventory management activities in community pharmacies.

Sample size

Pre-tested questionnaires were administered to 410 community pharmacists using purposive or judgmental sampling technique because the researcher used his own judgement to choose and select respondents who best meet the purpose of the study.

Questionnaire design and questionnaire administration

The questionnaire and oral interview 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 first part of the questionnaire contained demographic variables, such as age, sex, year of graduation, degree(s) obtained, experience, and location of practice area. The second part of the questionnaire contained questions on core issues which helped to identify the types of instruments used by the community pharmacists to manage inventory; the extent of use of such instruments, the factors affecting their use, strategies to optimize their use, and the prospects of using modern technologies to operationalize inventory management in community pharmacy practices in Nigeria. In this regard, respondents were asked to thick in the spaces provided in the questionnaire, type(s) of instruments used in managing inventory, the extent of use of such instruments 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 affect inventory management in their pharmacies 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 with oral interview which focused on the benefits and prospects of modern technologies in operationalizing inventory management in community pharmacies. 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, the questionnaire items were designed from research questions, study objectives, and the conceptual framework. The contents of the questionnaires were validated through a focus group interview with seven community pharmacists in Oyo 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 scales used. Authors such as Hair et al., 2003, Pallant; 2007, posited that reliability scores greater than 0.70 are acceptable. All items had an alpha score above 0.70, hence they are suitable for analysis with acceptable reliability. Cronbach alpha score of 0.85 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 in twenty 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

Analysis of data was carried out with 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 instruments used in inventory control in community pharmacies; determine the extent of use of such instruments, by community pharmacists. Simple multiple regression analysis was used to evaluate factors influencing inventory control by community pharmacists. The robustness of this model was determined based on the values of the R^2, Adj. R^2, 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 analyse ordinal data obtained from Likert Scale as if they were interval data for the following reasons: the sample size (410) 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 analyse data obtained from Likert scales(Sullivan & Artino 2013); and parametric tests are sufficiently robust to yield largely unbiased answers that are acceptably close to "the truth" when analysing Likert scale responses (Norman,2010).

DISCUSSION OF RESULTS

The percentage response for the administered questionnaire was 99.3% because out of a total of 413 questionnaires that were administered, 410 were properly filled, and used for analysis. Ages groups within 31-52years bracket were more than other age groups. The distribution of respondents according to academic qualifications presented in Table 2 showed that holders of first degree (Bachelor of Pharmacy or its' equivalent) were higher in number. No respondent had neither a Master of Philosophy nor a Doctor of Philosophy degrees. Some of the respondents had more than one qualifications. Most of the community pharmacists practice in the urban and sub-urban centres 362 (88.3%) while a few of

them 48 (11.71%) practice in the rural areas. The study identified eleven types of technologies used in managing inventory in community pharmacies. All the respondents utilized the traditional tools of controlling inventory, such as the bin-cards, stock cards and inventory control ledgers in their community pharmacies. The community pharmacies also made use of mobile handsets. The large scale use of these tools may be because they are inexpensive, less complex and requires little training and minimal skills, to operationalize when compared to modern technology-based tools. Mobile phones, are personal, portable, and easy to use. (Phillips et al., 2006).However, more hands or personnel are usually required, to effectively put to use traditional tools; especially, if the inventory is large. In addition, traditional inventory management tools may not be robust enough to efficiently control inventory activities in modern day community pharmacy practice as a result of the expanding roles of the pharmacy profession. Currently, there is a paradigm shift in pharmacy practice from being product-focused to patient–centred care (Hepler & Strand, 1990) which requires the use of modern techniques and technologies. Appropriate use of technology to manage inventory could decrease patient waiting time, create more time for community pharmacist to provide pharmaceutical care and other pharmaceutical services to patients and customers (Awaya, et al., 2005).The use of technology to monitor inventory could reduce incidents of medication errors and improve patient outcomes (ASHP, 2011).Meanwhile, the traditional inventory control tools are less effective, more error prone, time wasting and more often than not do not create amble time for the community pharmacists to embark on patient-centred care (Awaya, et al., 2005; Ayad, 2011). In most cases, the traditional tools used for inventory management are not suitable for detecting and monitoring errors arising from medication use because they cannot be used to track the degree of patient compliance to prescribed medications.

The use of modern technologies to control inventory by the community pharmacists was revealed by this study to be grossly inadequate. Apart from the Electronic Payment System (63.3%), and perhaps the Point-of–Sales (42.1%), the Barcode, CCTV, and the Internet were underutilized. Even, the RFID was never used at all in spite of the fact that research has shown that the radiofrequency identification (RFID) microchips, is capable of storing information about pharmaceutical products from their day of manufacture to the time they are removed from the shelves (Awaya et al., 2005). This attribute of the RFID makes it a priceless instrument for monitoring and tracking inventory, and drug usage because it will reduce inventory shrinkage arising from shoplifting, robbery, and theft. RFID captures information about existing inventory (Yuan, 2004).The RFID has improved product distribution from manufacturers to wholesalers and to retailers in pharmacies. This rigorous tracking process can help detect faked and adulterated medicines since RFID provides the opportunity to trace the sources of such medicines. RFIDs, therefore become indispensable tools not only for managing inventory, but also for minimising the chances of administering wrong medicines which usually have the potential of causing great and unimaginable harm to patients.The lack of use of the RFID by community pharmacies maybe due the fact RFIDs are expensive (Attaran, 2011). The influence of cost (ß7=0.74, p=.032), as a variable on inventory management, was not only significant but very high (74%).The gross underutilization of the barcode technology is another major finding of this study. In most advanced countries, the barcode technology remains a “must-use” for dispensing in hospitals and in the retail community pharmacies. The barcode technology screens prescriptions and at the same time ensures that the correct medication is used to fill prescriptions (Ingersoll, 2015). It also improves medical record keeping, enhances patients' safety and quality of care. Therefore, the barcode technology is an error-prevention strategy that should be used in controlling inventories in community pharmacies. The barcode identifies sources of routine error, and permits better management of drug distribution process (Daina, 2010). Use of the POS was uncommon and below average among the community pharmacies. Some of

the outstanding attributes of the POS which community pharmacies could leverage on are that the POS monitors and records all sales, reduces cashiers error, ensures easy and customers checkout, reduces inventory shrinkage, identifies seasonal trends in sales among others. The end result is that the POS will provide quality information that would enable the community pharmacists make better and informed decision on inventory management.

Regression results showed that all but one of the explanatory variables captured in the model had significant effects on inventory control system in community pharmacies. The determined coefficients of the eleven explanatory variables in the regression model revealed the extent to which they affected inventory control activities in community pharmacies,(which was proxied by the dependent variable(CPUT) as follows Technology(ß1=0.94,p=.031),Knowledge(ß2=0.81,p=.001),Training(ß3=0.77,p=.003),Personnel(ß4=0.75' p=.010),Skill(ß5=0.83,p=.014),InventoryShrinkage(ß6=0.87,p=.001),Cost(ß7=0.74,p=.032),InventorySize(ß8=0..67,p=.011),ProductType(ß9=0.53,p=.024),Unclaimedprescriptions(ß10=0.21,p=.066) and Use of Formularies (ß11=0.72,p=.007).Only the variable, unclaimed prescription which was not significant, had minimal effect on inventory management activities in community pharmacies. All other variables had direct relationships with the dependent variable. Therefore, a unit change in each of the variables will cause a corresponding change of 94%, 81%, 77%, 75%, 83%, 87%, 74%, 67%, 53% 21% and 72% respectively in the dependent variable. These results revealed the magnitude of influence the explanatory variables especially technology (94%), inventory shrinkage (87%), skill (83%) and knowledge (81%) have on management of inventory in community pharmacies.

The Durbin-Watson statistics obtained for the model was 1.80 which is close to 2. This result signifies the absence of first order autocorrelation in the regression model. The coefficient of determination R-squared was 0.72 which shows that 72% of inventory activities in community pharmacies is determined by the variations in the independent

Table 1: Sample of Study Distribution According to Age

Age (years)	Number	Percentage
<30	21	5.12
31-41	154	37.56
42-52	165	40.24
53-63	60	14.63
>64	10	2.44
Total	410	100

Table 2: Sample of Study Distribution According to Qualifications

Qualification	Number	Percentage
B. Pharm	347	84.63
Pharm D	13	3.17
M. Pharm	12	2.93
MSc in Pharmacy	8	1.95
M.Phil. in Pharmacy	NIL	NIL
MBA	25	6.10
MPH	5	1.22
Ph.D.	NIL	NIL
Total	410	100

Table 3: Sample of Study Distribution According to Experience

Experience (Years)	Number	Percentage
< 5	45	10.98
5-10	103	25.12
11-15	91	22.20
16-20	85	20.73
21-25	45	1 0.97
26-30	24	5.85
> 30	17	4.15
Total	410	100

Table 4: Practice Location of the Community Pharmacists

Practice Locations	Number	Percentage
Rural	48	11.71
Sub-Urban	52	12.68
Urban	310	75.61
Total	410	100

Table 5. Types of Technology used for Inventory Management in Community Pharmacies.

Types	Number	Percentage
Computer system	180	43.9
Electronic payment	310	75.6
Closed Circuit Television	87	21.2
Barcodes	60	14.6
Point-of –Sales	209	51.0
Mobile Phones	410	100.0
Internet	189	46.1
Radiofrequency Identification(RFID)	NIL	NIL
Bin-cards	410	100.0
Stock cards	410	100.0
Store Ledger	410	100.0
Inventory Control Ledger	410	100.0

Table 6: Extent of Use of Technology to Manage Inventory in Community Pharmacies.

No.	Types of Instruments	Never 1	Rare 2	Sometimes 3	Often 4	Very Often 5	Mean	Std Dev.
1.	Computer system	1	1	4	174	230	4.54	0.56
2	Electronic payment	73	30	40	68	199	3.70	1.57
3	Closed Circuit Television	93	53	24	99	141	3.35	1.58
4	Barcode	276	104	8	12	10	1.48	0.87
5	Point-of –Sales	232	69	20	10	79	2.11	1.56
6	Mobile Phones	0	0	30	125	255	4.55	0.62
7	Internet	38	14	17	144	197	4.09	1.23
8	RFID	NA	NA	NA	NA	NA	NA	NA
9	Bin-cards	0	0	3	173	234	4.41	0.66
10	Stock cards	0	0	52	142	216	4.40	0.70
11	Store Ledger	0	0	70	169	171	4.25	0.71
12	Inventory Control Ledger	0	0	50	59	301	4.61	0.71

Table 7.Factors that affect inventory management activities in community pharmacies in Nigeria.

No.	Variables	No Influence 1	Little Influence 2	Moderate Influence 3	High Influence 4	Very High Influence 5	Mean
1.	Technology	0	0	0	21	389	4.95
2	Knowledge	0	5	8	54	343	4.79
3	Training	0	2	3	77	328	4.77
4	Personnel	10	11	30	80	279	4.48
5	Skill	4	3	22	100	281	4.59
6	Inventory Shrinkage	0	0	10	170	230	4.54
7	Cost	2	6	30	97	275	4.55
8	Inventory Size	1	5	10	120	274	4.61
9	Product Type	10	12	10	168	210	4.36
10	Unclaimed Prescriptions	157	211	20	10	12	1.80
11	Use of Formularies	23	19	39	114	215	4.17

Table 8. Ordinary Least Square Estimation Results

CIMA	2.81	0.94ß$_1$	0.81ß$_2$	0.77 ß$_3$	0.75 ß$_4$	0.83 ß$_5$	0.87 ß$_6$	0.74 ß$_7$	0.67 ß$_8$	0.53 ß$_9$	0.21 ß$_{10}$	0.72ß$_{11}$
Se	(0.75)	(0.34)	(0.38)	(0.30)	(0.23)	(0.40)	(0.42)	(0.30)	(0.34)	(0.11)	(0.18)	0.29)
t-value	3.75	2.79	2.15	2.58	3.25	2.05	2.08	2.50	1.99	4.70	1.16	2.50
Prob.	.011*	031*	.001*	.003*	.010*	.014*	.001*	.032*	.011*	.024*	.066	.007*

*Significant at p<0.05 Adj. R-square =0.713
R2 = 0.72
F-Stat = 655.93. Prob F-Stat = 0.000.
Durbin Watson Statistics (D-W) = 1.80

Table 9: Respondents' perceived benefits of using technology to manage inventory.

Benefits	Number of Respondents	Percentage
Decreased waiting time	402	98.0
Decreased loss	389	94.9
Increased sales/profit	279	68.0
More time for patient counselling	398	97.1
Ensures availability of products	388	94.3
Ensures patients' satisfaction	245	59.8
Improves accountability	406	99.0
Decrease in medication errors	402	98.0

Some respondents mentioned more than one benefit.

variables as explained by the model. Therefore, only 28% changes in the dependent variable could be attributed to the influence of 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 0.71; while the F-statistics was 655and significant at 5%. Hence the model is of good fit.

Some benefits of using technology in managing inventory in community pharmacies are presented in Table 9. A majority of the respondents believed that the use of technology in the management of inventory would result in a decrease in patient waiting time,a reduction in loss arising from inventory shrinkage and medication errors. In addition, more time would not only be available for patient counselling by community pharmacists, but also improve accountability, product availability and sales.

CONCLUSION

The study identified eleven different technologies that community pharmacies utilize in managing inventory. These technologies are the computer system, electronic payment, closed circuit television, barcode, point-of–sales, mobile phones, internet, bin cards, stock cards, store ledger and inventory control cards. The predominant technologies used in descending order of magnitude werebin cards, stock cards, store ledger inventory control cards, mobile phones, electronic payments, point-of-sale, internet, computer systems, closed circuit television, and barcode. Factors influencing the use of these technologies in decreasing order of magnitude were the level of technological capability of community pharmacists, their knowledge and training, inventory size, pharmacists' skill, cost, inventory shrinkage, quality of personnel, product types, use of formularies and unclaimed prescriptions. Community pharmacists were of the opinion that the use of technology in inventory management would reduce patient waiting time, create more time for patients' counselling, reduce medication errors, minimize inventory shrinkage, ensure availability of products and increase the degree of accountability in community pharmacies. However, some new technologies were not made use of in controlling inventory. Therefore community pharmacies should make use of newer technologies that would enable them manage inventory better.

LIMITATIONS OF THE STUDY AND NEED FOR FURTHER RESEARCH

Not all community pharmacists attended the ACPN annual conference. Therefore, the findings of this study cannot be generalized because the opinions of those who did not attend the conference were not obtained. Also the opinions of customers or patients who patronize these community pharmacies were not sort. Doing so would have provided useful data that could have been used to validate the claims of the community pharmacists, hence the need for further research.

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