**RESEARCH ARTICLE**

# APPLICATION OF SCORING AND DECISION MODELS TO EVALUATE PROCUREMENT DETERMINANTS IN COMMUNITY PHARMACY PRACTICE IN NIGERIA

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## Abstract

**Objectives:** There is a need to evaluate the key factors influencing the choice of supply channels used by community pharmacists (CPs). The objectives of the study were to evaluate and score the determinant factors influencing CPs' procurement decisions from supply channels (pharmaceutical companies-PC, Wholesaler-LW, and Open-Market-OM). Secondly, to evaluate preference decisions based on relative odds ratios using regression models.

**Methods:** A descriptive, cross-sectional study that used structured questionnaires based on World Health Organization's recommendations for effective procurement decisions. A mixed-sampling method was used to administer the questionnaire to 393 community pharmacists in Southwest, Nigeria. Descriptive and inferential statistics such as Friedman's test, chi-square, Henry Garrett's scoring and, multinomial regression (MNL) models were used for data analysis, using SPSS-25. The significance level was set at $p < 0.05$.

**Results:** Results showed that 59.8% (235) of respondents operated as retail practice, 14.8% (62) Wholesale, and 24.4% (96) combined practice. Mean Garrett's score was highest with 'quality-assurance (63.36), while 'Value-added service' had the least score (38.88) among 10 decision-factors. The median score was 52.82. Individual effects of 'quality-assurance, competitive-pricing, access-to-credit facilities, flexible payment schedule, range of products, the potential-for-profit, trade-discounts, and value-added service' were significant determinants of preference decisions ($p < 0.01$; 95% CI) in the MNL model. Interaction effects of competitive pricing and access-to-credit facilities from suppliers had a significant effect on the MNL model (chi-square=493.411; $p < 0.01$; 95% CI).

**Conclusion:** The model predicted preference for supply channels (PC, LW, and OM) at various significance levels of the predictors. The study provided a scoring template for evaluating buying decision parameters. The study provided information that is useful to improve the understanding of buying behavior among CPs in pharmacy practice research

**Keywords**: Community Pharmacists, Henry Garrett, multinomial regression analysis, pharmacy practice, preference, procurement.

## INTRODUCTION

Procurement is an integral part of ensuring availability and access to essential medicines, with due consideration for quality, proper quantification, and appropriate pricing. The World Health Organization stipulated the core procurement principles to include; procure the most cost-effective medicines, in the right quantities, with requisite quality and quantity, from reliable suppliers, with assured timely delivery at minimal costs[1-4].The procurement process requires management and organizational skill sets to be fully

optimized and result-oriented. They include inventory management, transportation, logistic management, information, and communication technology, human resource management, time management, cost, and operations management. These should represent the best and standardized practice to be truly effective and efficient[5-10].

Access to quality medicines is a perennial issue of concern in low- and middle-income countries (LMIC), where the public health Infrastructure is yet to achieve optimal functionality in human capacity coupled with limited financial resources for the supply and provision

of essential medicines[2,11-12].This creates a window of opportunity for community pharmacies to provide services to bridge this resource gap prevalent in publicly managed health institutions. Unfortunately, in LMICs, community pharmacists (CPs) are also constrained in this respect, hence the imperative for resource prioritization and efficient decision-making when it comes to medicine procurement. World Health Organization enumerated key attributes of a functional procurement system, namely; procuring at the lowest purchase price, timely delivery, proper quantification and product range, appropriate payment planning, and ethical, professional, and mutually beneficial buyer-seller relationship[2,4]. In developing countries, most patients obtain their prescribed medications from retail pharmacies and this is done essentially as an out-of-pocket expenditure. Thus, this leaves the final cost to the patient to prices fixed by the retailer which oftentimes is a reflection of how the products are sourced. However, most studies have been focused on procurement challenges[7-8] from the perspective of public health institutions and procurement agencies, with little done on community pharmacy in developing countries[11-12]. To the best of our knowledge, there is little or no study on how procurement decisions are evaluated in community pharmacies in LMICs, thus leaving this gap in research. Therefore, this study explored using quantitative research techniques, the determinants informing buying decisions by community pharmacists in Southwest Nigeria. Community Pharmacists (CPs) are frontline healthcare personnel at the primary healthcare level[13,14]. They are expected to ensure safe, accessible, and affordable medicines. Most studies on procurement decision-making are often focused on hospital settings. Hence, there is the need to investigate the utilization and rating of these parameters among CPs. Despite the chaotic nature of drug supply in Nigeria, three major supply channels exist; Pharmaceutical companies (PC), Wholesalers (LW), and Open drug market (OM), for meeting the needs of CPs. There are over 200 registered local and international pharmaceutical companies and/or their representative in Nigeria. The drug distribution network which serves as the source of medicine supply to CPs includes Wholesalers who oftentimes bridges between CPs and pharmaceutical companies[15,16], and the chaotic open market which is often questioned for quality and standards[17,18]. The main objective of the study was to use Henry Garrett's scoring method and multinomial logistic regression to evaluate the dominant factors influencing Community Pharmacists' decision to procure from supply channels in South Western, Nigeria. Henry Garrett Ranking method is widely used in social and management sciences[19,20] to quantitatively measure the perception of respondents by applying a quantitative weighting and rating scale[21, 23].

## METHODS

### Questionnaire Design
A structured self-designed questionnaire was developed based on a comprehensive literature review and from the opinions of experts in the field. The questionnaire is composed of two parts namely Part 1 consists of socio-demographic variables. Part 2 consists of discrete choice questions focused on the rating of 10 buying criteria according to the level of importance ranging from 1 to 10 where 1 is the most important criteria and 10 is the least criteria rating. The face validity of the questionnaire was determined by a group of industry experts.

### Study design
A cross-sectional study which used literature guided questionnaires administered to 550 community pharmacists in selected cities in South West, Nigeria

### Ethics Statement
Ethical approval with approval number HPRS/381/371 dated 10th May 2021 from the Department of Health Planning, Research and Statistics, Ministry of Health, Ogun State, Nigeria. Informed consent was obtained from respondents before the administration of the questionnaire.

### Eligibility Criteria
CPs with direct operational and supervisory function in procurement decision making were included in the study. The basis for selective approachwas to ensure that only those with relevant experience in procurement are recruited for the study.

### Sample frame
The target study population consisted of registered community pharmacists in major cities in Lagos, Ogun, and Oyo states in the southwest, Nigeria. At the time of the study, the number of registered community pharmacists in the 3 Southwestern states was 1,732 as contained in the registry of Pharmacists' Council of Nigeria[24].

### Sample size determination
Raosoft sample size calculator was used. A 5% margin of error and 95% confidence level with a 50% response distribution set for sample size determination[25]. The minimum sample size obtained using the calculator was 315 from a sample population of 1,732 registered community pharmacists in Lagos, Ogun, and Oyo states as stated in Pharmacists 'Council of Nigeria Register[24,26]. The final number of respondents obtained for this study was 393. This covered for new registration of community pharmacists from 2018 to 2021 and accounted for likely attrition[27].

### Sampling technique and Data Collection
A mixed sampling method was adopted for the self-administered questionnaires in the study. Firstly, purposive (judgmental) sampling was used with stringent criteria for only community pharmacists with supervisory roles or responsibilities on procurement. Those who strictly play patient care roles were excluded from the study. Thereafter, a random sampling method was used to minimize researcher bias inherent in purposive sampling.

### Statistical Analysis
Data were analyzed using Statistical Package for Social Sciences version 25. Descriptive statistics such as mean, standard deviation, and median. Inferential statistical measures such as Friedman's ANOVA test, Kendall W, and Bonferroni test. Henry Garrett's ranking method was used to measure the mean rank

score of each determinant. Multinomial logistic regression analysis (MNL) was used to predict the channel preference decisions of community pharmacists based on the independent variables. Study outcomes for MNL were procurement decisions premised on channel preferences for; pharmaceutical companies (PC), wholesalers (LW), and Open market channels (OM).

**Multinomial Logistic Regression Model (MNL)**
MNL was the regression model used as it considers more than two dependent variables with no intrinsic ordering of outcome variables which in this study are the supply channels namely: pharmaceutical companies-PC, Wholesaler-LW, and Open-Market-OM). The explanatory or independent variables are the factors influencing the choice of supply channels such as; QOP=quality assurance of Products, TOP= timeliness of delivery, CPO=competitive pricing, ACF =access to credit facility from supplier, FPT=flexible payment timelines, GWR=good working relationship, ROP=range of products, POP=potential for more profit, TDP=offer of trade discounts and promos, and VS=value-added service. Multinomial logistic regression technique (MNL) was used to evaluate the implicit relationships and interaction effects between the preference decisions by community pharmacists and the factors. Hence, the choice of MNL as compared to simple, ordinal logistic regression or binary regression models[28].

**Friedman's two-way Analysis of Variance test of Ranks**
The rationale for the use of Friedman's test was to determine if the ranked responses of factors (independent, predictor variables) influencing preference for supply channels were statistically different and hence validate their use in the MNL analytical model.

**Null Hypothesis**
In this study, it was hypothesized that there is no difference in the mean of the ranks of the decision factors used by community pharmacists (H$_O$).
The results of Friedman's two-way analysis of variance test showed that there is a significant mean difference in the ranks (chi-square $X^2(9)$=673.406, $p$<0.0001). Kendall W coefficient of concordance test showed that showed significant effect chi-square $X^2(9)$=668.520, $p$<0.0001, W=0.19) implying that there is a significant effect of the mean difference in ranks based on the responses of community pharmacists. This was a result of significant pair wise comparisons between the various decision factors using pair wise comparison. Hence, the null hypothesis (Ho) was rejected

**Henry Garret's Ranking Method**
The study employed the use of the Henry Garrett Ranking Method as a prioritization technique to rank the various normative buying decision determinants among community pharmacists[29,30]. Henry Garret's Ranking Method provides a scoring template for evaluating buying decision factors. This analytical method was used to identify and rank according to the order of importance. It identified the most important, dominant, and relevant buying criteria by surveyed

community pharmacists using a ranking method[13,14]. It is computed by using this score conversion formula:

$$\text{Percent Position} = \frac{(R-0.5)}{N}$$

Where; R=rank and N=total number of variables of decision factors
In this method, each buying criteria is ranked based on the number of responses from respondents, thereby ranking from the first item to the last or vice-versa. Thereafter, a score conversion formula is used to generate the percent position of each criterion. Henry Garrett's conversion table is used to obtain individual Garrett's values[30]. The Garrett value for each item is multiplied with the frequencies to give total values. The total value for each item obtained is divided by the total number of respondents to give mean values. The mean rank score values are ranked according to magnitude. Decision Rule; Item with the highest mean score is the most important criterion.

## RESULTS

**Response rates and Demographic statistics**
A total of 393 responses were valid out of 550 questio-nnaires randomly administered to purposively selected community pharmacists (CPs). This represented a response rate of about 72%. This was more than the calculated sample size of 315 for the study, therefore adequate for further analysis. In Table 1, the distribution of individual and organization-based demographic characteristics of respondents showed that 54.5% (214) were males and 45.5% (179) females. A majority of respondents (194) fell within the 31 to 40 years age bracket. Ownership status showed that 53.4% (209) sole ownership, 15.8% (62) partnership, and 30.8% (122) pharmacist-managers. Years of experience as a pharmacist showed 39.7% (156) within 1 to 5 years, 48.6% (191) between 6 to 15 years, and 11.7% (46) greater than 15 years. Conversely, years of experience as a business manager showed 58.7% (231) were within 1 to 5 years, 34.1% (134) between 6 to 15 years, and a minority 7.1% (28) had greater than 15 years of business experience. The business model operated by CPs was 59.8% ( 235) core retail, 15.8% (62) wholesale, and 24.4% (96) having both models. Employee count revealed the majority 56.7% (223) had 1 to 5 persons, 30.5% (120) had 6 to 10 persons, and 5.9% (23) had 11 to 15 persons while 7.2% (27) has over 15 employees.

**Correlation analysis of Decision factors and Preference for Channels**
Table 2 showed that there is a significant positive correlation between the predictor variables 'quality assurance', and the dependent variable 'preference for procurement channels' at $p$<0.01. However, a negative correlation existed with 'competitive pricing', 'range of products, and 'potential for more profit'($p$<0.01)

**Garrett's Percent and Corresponding Value**
As shown in Table 3, Ranks 1 to 10 were calculated based on individual respondents' ranking of each Decision factor, and Garrett's corresponding value to each rank ranged from 10 to 85 representing the lowest and highest values respectively.

**Table 1: Demographic characteristics of community pharmacists (N=393).**

| Demographic | Number (N) | Percentage (%) |
|---|---|---|
| **Gender** | | |
| Male | 214 | 54.5 |
| Female | 179 | 45.5 |
| **Age** | | |
| 20 to 30 years | 107 | 27.2 |
| 31 to 40 years | 194 | 49.4 |
| 41 to 50 years | 72 | 18.3 |
| greater than 50 years | 20 | 5.1 |
| **Ownership status** | | |
| Sole Ownership | 209 | 53.4 |
| Partnership | 62 | 15.8 |
| Pharmacist Manager | 122 | 30.8 |
| **Post-graduation experience** | | |
| 1 to 5 years | 156 | 39.7 |
| 6 to 10 years | 191 | 48.6 |
| greater than 15 years | 46 | 11.7 |
| **Years of experience as Business Manager** | | |
| 1 to 5 years | 231 | 58.7 |
| 6 to 10 years | 134 | 34.1 |
| greater than 15 years | 28 | 7.1 |
| **Business Model** | | |
| Retail | 235 | 59.8 |
| Wholesale | 62 | 15.8 |
| Retail and Wholesale (mixed) | 96 | 24.4 |
| **Number of Employees** | | |
| 1 to 5 years | 223 | 56.7 |
| 6 to 10 years | 120 | 30.5 |
| 11 to 15 years | 23 | 5.9 |
| greater than 15 years | 27 | 7.2 |
| **Total** | **393** | 100 |

**Estimation and ranking of factors based on Garrett's scores**

Table 4 shows the Total Garrett values obtained by multiplying frequencies in each rank with corresponding Garrett scores. The average score was obtained by dividing by the number of respondents. 'Quality assurance' had the highest-ranked factor followed by 'Access to credit facility and 'Timeliness of supply'. The least ranked variable was 'Quality of Value-added service'.

**Table 2: Correlation Analysis of Preference Decisions (PP) versus decision factors used by community pharmacists.**

| Study Variables | Mean | SD | PP | QA | TOD | CP | ACF | FPT | GWR | ROP | POP | TDP | VAS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PP | 1.62 | 0.797 | 1.000 | | | | | | | | | | |
| QA | 2.80 | 2.533 | .157** | 1.000 | | | | | | | | | |
| TOD | 4.77 | 2.517 | -0.009 | .148** | 1.000 | | | | | | | | |
| CP | 4.84 | 2.794 | -.183** | -.071 | .179** | 1.000 | | | | | | | |
| ACF | 4.71 | 2.624 | 0.030 | -.080 | -.106* | 0.025 | 1.000 | | | | | | |
| FPT | 5.09 | 2.380 | -0.029 | -0.064 | .190** | -0.085 | 0.314** | 1.000 | | | | | |
| GWR | 5.95 | 2.729 | -0.017 | -0.080 | 0.014 | -.182** | -0.013 | .119* | 1.000 | | | | |
| ROP | 6.08 | 2.645 | -.104* | -.192** | -.109* | .028 | -0.013 | 0.098 | 0.112* | 1.000 | | | |
| POP | 4.95 | 2.708 | -.159** | -.200** | .204** | 0.013 | -0.002 | -.052 | -.129* | 0.048 | 1.000 | | |
| TDP | 7.07 | 2.556 | 0.085 | -.050 | 0.054 | -.071 | -.108* | -.048 | -.032 | -.034 | 0.122* | 1.000 | |
| VS | 7.20 | 2.762 | -0.008 | 0.010 | 0.025 | -.120* | -.218** | 0.207** | -.022 | 0.041 | -.054 | 0.184** | 1.0 |

Note: *$p<0.05$, **$p<0.01$, N=393; PP= Preference Decisions, QOP=quality assurance of Products, TOP=timeliness of delivery, CPO=competitive pricing, ACF=access to credit facility from supplier, FPT=flexible payment timelines, GWR= good working relationship, ROP=range of products, POP=potential for more profit, TDP=offer of trade discounts and promos, VS=value-added service (quality of).

**Multinomial logistic regression model of Decision factors and Procurement decisions**

The overall fit of the basic multinomial regression model was confirmed by the following parameters; Goodness of fit (Pearson $\chi^2$=699.060, $p<0.0001$: Deviance=430.209, p=1.000) proved that model is fit since the p-value is not significant; model fit characteristics $\chi^2$(df=180, N=393)=303.458, $p<0.0001$) was significant; classification table of observed versus predicted values representing 74.8% with even distribution in each variable item (PC=85.2%; LW= 58.1%; OM=62.8%) and Nagelkerke $R^2$ (0.629) and

McFadden $R^2$ (0.399) showed that the independent variables accounted for 39.9% to 62.9% of the variance in the model. On the other hand, the impact of the interaction effects of the deciding factors on the preference of community pharmacists for procurement was also evaluated using MNL. The objective was to identify the most dominant interplay of factors informing preference.

**Table 3: Computation of Percent Position and corresponding Garrett's Value.**

| Rank | 100(R-0.5)/N | Percent Position | Garrett's value |
|------|-------------|------------------|-----------------|
| 1 | 100(1-0.5)/10 | 5 | 82 |
| 2 | 100(2-0.5)/10 | 15 | 70 |
| 3 | 100(3-0.5)/10 | 25 | 63 |
| 4 | 100(4-0.5)/10 | 35 | 58 |
| 5 | 100(5-0.5)/10 | 45 | 52 |
| 6 | 100(6-0.5)/10 | 55 | 48 |
| 7 | 100(7-0.5)/10 | 65 | 42 |
| 8 | 100(8-0.5)/10 | 75 | 36 |
| 9 | 100(9-0.5)/10 | 85 | 29 |
| 10 | 100(10-0.5)/10 | 95 | 18 |

N= 393, R= ranks from 1st to 10th, Garrett's value obtained from Garrett's table.

The overall fit of the interaction-effect multinomial regression model was confirmed by the following parameters; Goodness of fit (Pearson $\chi^2$=465.991, $p$=0.999: Deviance $\chi^2$=485.967, $p$=0.991) proved that model is fit since p-value is not significant; model fit characteristics $\chi^2$(df=14, N=393)=176.144, $p<0.001$) was significant; classification table of observed versus predicted values representing 65.6% with even distribution in each variable item (PC=90.0%; LW=30.2% and 32.1% OM), and Nagelkerke $R^2$ (0.546) and McFadden $R^2$ (0.328) showed that the model accounted for 32.8% to 54.6% of the variance in the model.

**Table 4: Statistics of computed Garrett score and derived ranks to each factor.**

| Factors | Total | Mean score | Ranks |
|---------|-------|-----------|-------|
| Quality assurance of Products supplied | 26,864 | 68.36 | 1st |
| Timeliness of supply/Delivery | 21,254 | 54.08 | 3rd |
| Competitive pricing | 21,172 | 53.87 | 4th |
| Access to Credit facility | 21,434 | 54.54 | 2nd |
| Flexible payment timelines | 20,460 | 52.06 | 6th |
| Good working relationship | 18,473 | 47.01 | 7th |
| Range of Products offered | 18,115 | 46.09 | 8th |
| Potential to make more profit | 21,057 | 53.58 | 5th |
| Trade discount and promo offers | 15,643 | 39.8 | 9th |
| Quality of Value-added services provided | 15,280 | 38.88 | 10th |

**Association between Predictor, interaction variables and effects in MNL Model**

Table 5 summarizes the contribution of decision factors and their Interaction effects on the MNL model; it shows that only the 'Timely delivery factor' was not a significant contributor to the model and hence cannot be considered for further analysis and consideration. Other parameters showed very significant contributions at a $p$-value less than 0.01.

**Table 5: Predictor and interaction variables and unique effects to the multinomial logistic regression model.**

| Model Variables | Chi-square ($X^2$) | df | $p$-value |
|-----------------|--------------------|----|-----------|
| DECISION FACTORS | | | |
| Quality assurance of products | 54.450 | 18 | <0.01 |
| Timely delivery | 28.798 | 18 | 0.051 |
| Competitive pricing | 49.714 | 18 | <0.01 |
| Access to credit facility | 43.044 | 18 | <0.01 |
| Flexible payment timelines | 35.314 | 18 | <0.01 |
| Good working relationship | 35.711 | 18 | <0.01 |
| Range of Products offered | 42.073 | 18 | <0.01 |
| More Profit potential | 33.601 | 18 | <0.014 |
| Trade discounts and promos | 45.324 | 18 | <0.01 |
| Value-added service | 40.918 | 18 | *0.01 |
| INTERACTION FACTOR | | | |
| Competitive Pricing * Access to Credit facility© | 493.411 | 170 | <0.01 |

Note: $p<0.05$, $p<0.01$, ©= the only significant interaction term, $X^2$= chi square statistic, 95% CI.

**Table 6: Comparison of effects of supply preference decisions across three channels using multinomial logistic regression.**

| S/n | Decision Factors | OM versus. | β | SE | df | *p*-value |
|---|---|---|---|---|---|---|
| 1 | quality assurance of products=1 | PC | 7.521 | 3.058 | 1 | 0.014 |
|   | quality assurance of products=10 | PC | 0[b] |  | 0 |  |
| 2 | quality assurance of products=1 | LW | 6.9 | 2.991 | 1 | 0.021 |
|   | quality assurance of products=10 | LW | 0[b] |  | 0 |  |
| 3 | access to credit facility=1 | LW | 8.014 | 2.988 | 1 | 0.007 |
|   | access to credit facility=10 | LW | 0[b] |  | 0 |  |
| 4 | good working relationship=1 | PC | 4.519 | 2.731 | 1 | 0.098 |
|   | good working relationship=10 | PC | 0[b] |  | 0 |  |
| 5 | good working relationship=1 | LW | 8.126 | 2.848 | 1 | 0.004 |
|   | good working relationship=10 | LW | 0[b] |  | 0 |  |
| 6 | Range of products offered=1 | LW | 8.066 | 2.999 | 1 | 0.007 |
|   | Range of products offered=10 | LW | 0[b] |  | 0 |  |
| 7 | more Profit potential=1 | PC | 5.684 | 2.854 | 1 | 0.046 |
|   | more Profit potential=10 | PC | 0[b] |  | 0 |  |
| 8 | more Profit potential=1 | LW | 8.176 | 3.02 | 1 | 0.007 |
|   | more Profit potential=10 | LW | 0[b] |  | 0 |  |
| 9 | Trade discounts and promos=1 | PC | 5.883 | 2.973 | 1 | 0.048 |
|   | Trade discounts and promos=10 | PC | 0[b] |  | 0 |  |
| 10 | Trade discounts and promos=1 | LW | 7.433 | 3.106 | 1 | 0.017 |
|    | Trade discounts and promos=10 | LW | 0[b] |  | 0 |  |
| 11 | Value-added service=1 | PC | 24.614 | 1.701 | 1 | <0.01 |
|    | Value-added service=10 | PC | 0[b] |  | 0 |  |
| 12 | Value-added service=1 | LW | 26.812 | 0 | 1 |  |
|    | Value-added service=10 | LW | 0[b] |  | 0 |  |

Note: $p<0.05$, $p<0.01$, β=beta coefficient, 1=lowest rank, 10= highest rank, OM=open markets, LW=local wholesalers, PC=pharmaceutical companies, reference category= OM, 95% CI.

**Comparative effects of decision factors influencing preference for supply channels using MNL**

As shown in Table 6, beta coefficients (β), p-values, and Odds ratios (OR) showed the various output of decisions based on the ratings of each factor by respondents in the study. The Open market channel (OM) was used as the comparator or reference preference category while the odds ratios (OR) were obtained from respondents' choices of each pharmaceutical company (PC), Local Wholesale channels (LW) respectively. Significant preference decisions were obtained for; 'quality assurance 'for PC, and LW. In the same vein, 'access to credit facility was significant for LW, while 'good working relationship with suppliers' for LW and, 'range of products for LW. 'More profit potential' and 'trade discounts' gave significant p-values for PC. 'Trade discount' for LW, 'value-added service' for LW and PC gave significant results.

**Interpretation of MNL Output for each decision factor (determinant) using parameter coefficient estimates (β)**

As shown in Table 6, Item 1 is interpreted thus; For a Unit change in the predictor 'quality assurance', the likelihood or logit of choosing PC (outcome) relative to the OM (reference group) is expected to increase by 7.521, given that the other variables in the model are held constant. In other words, the odds or likelihood of a procurement manager who considers 'quality assurance' in his or her purchasing decision-making is 7.521 times more likely to use the PC channel compared to OM.

Conversely, Item 3 depicts; the odds or likelihood of a procurement manager who considers 'access to credit facilities in his or her purchasing decision-making is 8.014 times more likely to use the LW channel compared to OM.

## DISCUSSION

The results of the study showed that community pharmacists (CPs) placed a premium value on the factors which they consider most important to their practice concerning procurement decisions ('where to procure from?'). The application of Henry Garrett's method as well as multinomial logistic regression modeling to further explain the factors responsible for these decisions. In other words, the output of the Garret score sheet reflects in larger terms, the perception of relative value and importance placed on each determinant of procurement by the sample population. In Table 4, Garrett's scoring method clearly showed that the most important consideration was based on 'quality assurance' with Ranked 1 with the highest score of 63.36; in terms of perceived or known efficacy, safety, awareness of manufacturing standards, the integrity of packaging, storage, in line with the core value of pharmaceutical care. This is by far the most important consideration expected from community pharmacists because the emphasis is on the safety[13,14] and health of the patient consuming the pharmaceutical product[31]. Interestingly, 'Access to credit facility and 'Timeliness of delivery" which were ranked 2nd and 3rd respectively are indicative of the expectations of

community pharmacists from the supply chain. In a developing country where the out-of-pocket payment account for the bulk of medication cost to patients, there is a backlash to the CPs as patients do not fill their prescriptions as prescribed due to high cost[6,32]. This loss of revenue impacts the sustainability of local operations and cash flow. This is compensated for by the reliance on operational efficiency in timely delivery and credit facility to help improve turnaround time for practice owners[33,34]. Furthermore, the least ranked factor-'Value-added service by suppliers (ranked 10th) reflects another aspect of expectations by community pharmacists from their suppliers. Drug suppliers must adopt 'follow-through marketing strategies' in terms of stock monitoring, feedback, and information provision to their direct customers (community pharmacies) as a value-added service. This can be done in the form of updates on drugs, removal of short-dated or expired products, training for prescribers and pharmacists. For pharmaceutical marketing companies, it involves monitoring competition with a deliberate intention to enhance product and service quality. However, for LW, and OM channels, this is not the case.

In the study as shown in Table 5 and Table 6, the MNL model presents the odds likelihood or probability of the decision/s by CPs to procure from supply channels (OM, PC, and LW) based on their relative ranking of the respective decision factors. The relative importance of the individual factors was justified by the unique contribution to the Multinomial logit model. More, the model summary also showed that CPs who predominantly considers interaction effects of competitive pricing and access to credit' in their choice of supplier, tend to make better decisions. This is supported by some studies which considered pricing innovation and business adaptation as critical to the growth of Community pharmacy practice[33,35].

The interpretation of the output of the MNL model as shown in Table 6 implies that the likelihood or odds of choosing a particular channel to procure from is higher or lower based on the relative odds (odds ratio; OR) of the determinant/s involved (bearing in the mind their level of statistical significance). This provides another dimension to evaluating buying decisions in pharmacy practice research. Furthermore, the interpretation of the model as shown in Table 6 revealed better significance values for 'Quality assurance', 'Access to credit facility, 'good working relationship', 'range of products, 'potential to make a profit, 'trade discounts' and 'value-added service' associated with the preference of PC and LC channels ($p<0.01$). Compared to 'flexible payment timelines, 'timeliness of supply' and 'competitive pricing' did not have significant effects in influencing supply preference in the MNL ($p>0.05$).

There are practice implications to be gleaned from the outcomes of this study for practitioners and researchers operating in LMICs;

a. Provide an empirical guide to quality decision-making in particular when there are key parameters to consider. Hence, there is the need to improve or enhance the quality of decisions taken during the procurement process using a ranking system or algorithm of key considerations.

b. Improves the overall efficiency in supply chain mechanisms to ensure timely delivery and pricing to improve cost-containment and eventually lower costs to patients.

c. In keeping with the expanded roles of community pharmacies in primary healthcare delivery, there is the need to focus on the role of continuous medical education (CME) to update and

d. Inform community pharmacists of current procurement trends and how to improve practice,

e. Information planning,

f. Continuous improvement delivery; stakeholders involved in the supply chain of medicines, who should invest time and resource to on quality-of-service delivery to promote a shift in perception.

This study, however, had some limitations such as there is a need to expand the scope of the research work beyond the southwestern part of Nigeria to improve the generalizability of study outcomes. Secondly, there is a need to include other constructs in the list of buying factors to address other relevant factors in the model. This will enhance the interpretability of the results.

## CONCLUSIONS

In developing countries like Nigeria, medicine procurement is primarily intuitive and based on basic trading principles on the individual level. There is a need to evaluate the key factors influencing the choice of supply channel among community pharmacists (CPs) using a preference model. Study outcomes showed that quality assurance is the most important determinant of procurement decisions among respondents, and the least was Value-added service from respective supply channels. This study provided an understanding of the purchasing behavior of community pharmacists in addition to an idea into the priority considerations informing buying decisions from various channels of drug supply in a developing country. The study provided sufficient justification for the use of scoring and multinomial regression modeling to improve understanding of the relative odds involved in decision-making as it relates to preference.

## AUTHOR'S CONTRIBUTION

**OAMEN TE:** Writing original draft, review, literature survey, editing, methodology, data curation.

## DATA AVAILABILITY

Data will be made available on reasonable request.

## CONFLICTS OF INTEREST

None to declare.

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