Clinical Pharmacy Services Provided in Public Sector Hospitals in Nigeria: A National Survey

Authors: Arit Udoh[1*], Mary Akpan[2], Umar Idris Ibrahim[3,4], Basira Kankia Lawal[5], Kamilu Sarki Labaran[4], Ekpedeme Ndem[2], Kosisochi Amorha[6], Ayodeji Matuluko[7], Olubukola Tikare[8], Unoma Ohabunwa[8], Eneyi Kpokiri[9]

[1]College of Medical and Dental Sciences, University of Birmingham, Birmingham, United Kingdom

[2]Faculty of Pharmacy, University of Uyo, Akwa Ibom State, Nigeria

[3]Department of Clinical Pharmacy and Pharmacy Practice, Bayero University, Kano, Nigeria

[4]Department of Clinical Pharmacy and Pharmacy Practice, Ahmadu Bello University, Zaria, Nigeria

[5]Department of Clinical Pharmacy and Pharmacy Management, Kaduna State University, Kaduna, Nigeria

[6] Department of Clinical Pharmacy & Pharmacy Management, University of Nigeria Nsukka, Enugu, Nigeria

[7] School of Health and Life Sciences, Glasgow Caledonian University, Glasgow, United Kingdom

[8]Department of Pharmacy, Federal Medical Centre, Abuja, Federal Capital Territory, Nigeria

[9]Faculty of Infectious and Tropical Diseases, London School of Hygiene and Tropical Medicine, London, United Kingdom

***Corresponding author**

Postal Address: College of Medical and Dental Sciences, University of Birmingham, 5th Floor, Heritage Building ITM, B15 2TH, Birmingham, United Kingdom.

Email: a.e.udoh@bham.ac.uk

Phone: 0121 371 8459

ABSTRACT

Background: Studies show that clinical pharmacy services are effective in optimizing medicines use and patients' outcomes. This study aimed to determine the clinical pharmacy services provided in public sector hospitals in Nigeria.

Methods: This was an online survey of 296 primary, secondary and tertiary care hospitals sampled purposively across the 36 States and Federal Capital Territory in Nigeria. Data analysis was conducted descriptively, and via Chi-square test and multivariate analysis of variance (MANOVA).

Key findings: Responses were obtained from 272 hospitals in the country with a survey completion rate of 88%. This included 55 tertiary, 72 secondary, and 145 primary healthcare centres (PHCs). Pharmacists provided pharmaceutical care services in all the tertiary care hospitals, 94% of the secondary, and in only 6% of the PHCs surveyed. Most of the secondary and tertiary care hospitals provided medicines information, patient education and counselling, and in-patient dispensing services (n = 97(79%), 116(94%), 88(72%)), respectively. However, fewer than a third reported involvement in multidisciplinary ward rounds, medication chart review and antibiotic stewardship programmes (n = 18(15%), 33(27%), 22(18%), respectively). Further, medication error reporting and pharmacovigilance services were each routinely provided in only about half of the secondary and tertiary care hospitals (n = 62 (50%)), and this was not associated with the level of care ($p > 0.05$).

Conclusions: The findings of this study demonstrate disparity in clinical pharmacy service availability across the various levels of care in Nigeria and emphasizes the need to prioritize their integration within the primary care sector.

Keywords: Clinical pharmacy, pharmaceutical care, primary care, Nigeria

INTRODUCTION

In November 2019, the National Council on Establishments (NCE) approved the consultant pharmacist cadre for inclusion in the public sector schemes of service in Nigeria [1]. This approval was assented to by the Head of the Federal Civil Service in September 2020 [1], and represents government acknowledgement of the essential role of pharmacists as medicines experts within the multidisciplinary clinical team. This acknowledgement underscores pharmacists' evolving roles from the focus on medicines and medicinal products, to the provision of patient-oriented services. Globally, this patient-oriented practice model, which is the concept of clinical pharmacy; has been shown to optimize medicines use, assure medication safety, and improve patients' outcomes and quality of life [2].

The American College of Clinical Pharmacy (ACCP) defines clinical pharmacy "as that area of pharmacy that is concerned with the science and practice of rational medication use" [3]. Clinical pharmacy encompasses all patient care activities carried out by pharmacists in collaboration with other members of the health care team to promote health, prevent diseases, assess, monitor, initiate and modify medication use. The clinical pharmacists' process of care is presented in Figure 1 [3,4]. Although clinical pharmacy is well established in several high income countries [5–9]; its uptake has varied across the world regions and within nations [10–13]. Until recently, the delivery of these services in countries in Africa has been limited and/or non-existent [14–16]. The revised Basel Statements on the Future of Hospital Pharmacy, published in 2014, emphasized the pharmacists' role in the clinical team, including their influence on prescribing and monitoring of medicines use [17,18]. The increasing involvement in patient-oriented service provision underscores the imperative for the availability of appropriately trained pharmacists equipped with the requisite skills needed to provide enhanced pharmaceutical care.

In Nigeria, estimates show that hospital pharmacists make up about 20% of the licensed pharmacy workforce [19]. Although data on the distribution of pharmacists across the private and public sector hospitals in the country is lacking in the literature, anecdotally, the majority of the hospital pharmacists are employed in the public sector facilities. Research indicates that pharmacists provide medication therapy management services in about 47 - 85% of the hospitals in the North West region of Nigeria [20] while a separate study suggests that patient education and counselling is the main pharmaceutical care service provided in hospitals in the South East [21]. This information is missing in the literature for the other parts of the country. This study aimed to determine the clinical pharmacy services provided in public sector hospitals in Nigeria and pharmacists' perception of these services.

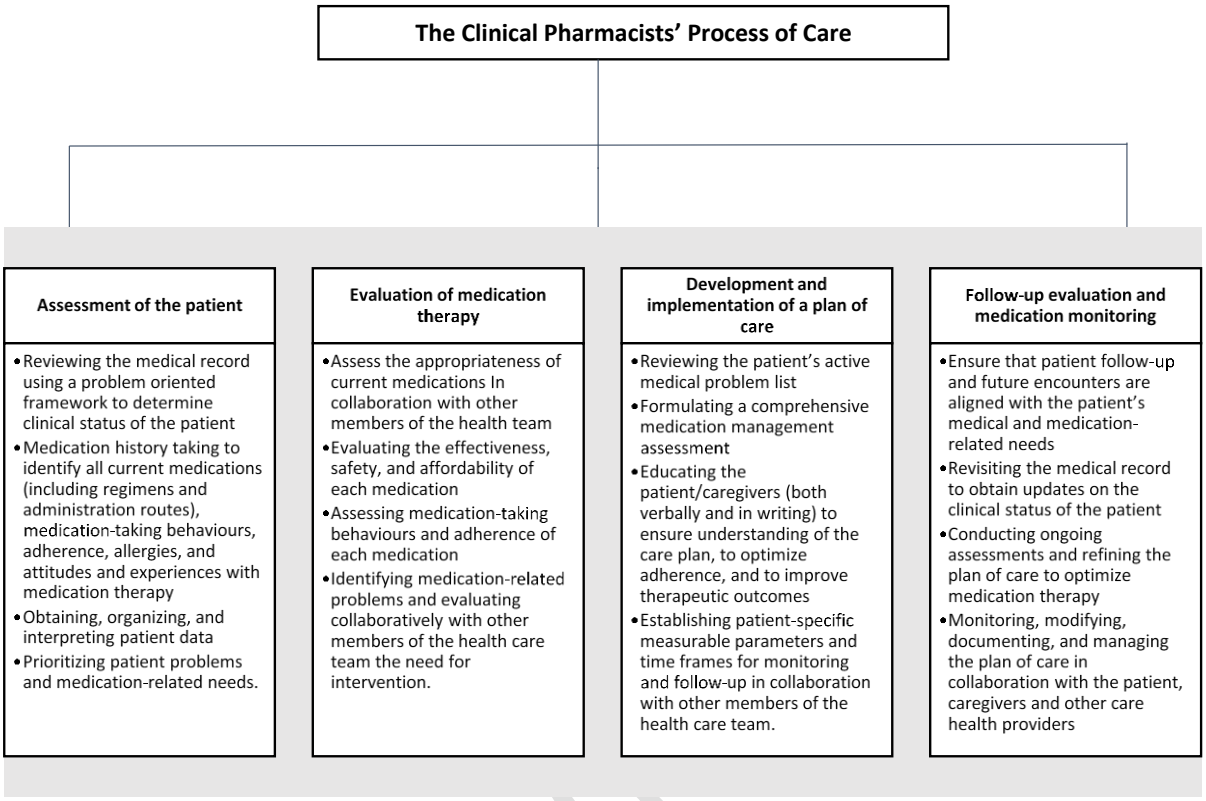

Figure 1: The Clinical Pharmacists' Process of Care as defined by the American College of Clinical Pharmacy (ACCP)

METHOD

Study setting

There are six geopolitical zones in Nigeria. These geopolitical zones are divided into 36 states and the Federal Capital Territory (FCT). Each of the states and FCT are further subdivided into 774 Local Governments Areas (LGAs). Hospitals in the country are distributed across the states, FCT and LGAs and about two-thirds are government owned [22]. These government-owned primary, secondary and tertiary care facilities are funded by the local, state and federal governments, respectively [23,24]. Although the tertiary care facilities are designed to serve as referral hospitals for complex and specialized care provision, these facilities are the preferred choice in population health seeking due to the limited health infrastructure, poor funding, as well as staffing and medicines shortages at the primary and in most of the secondary care hospitals [25].

Study design

This study was an online survey of public sector hospitals in Nigeria. The survey included public sector primary, secondary and tertiary care hospitals sampled across the 36 States and the FCT. To ensure that all the states and FCT in the country were duly represented in the survey; the hospitals per state were sampled purposively. Specifically, the Nigeria Health Facility Registry (NHFR) of the Federal Ministry of Health [26] was consulted to identify the public sector hospitals in the country. In total, 74 tertiary and secondary care facilities each, and 148 PHCs/health posts were selected for the survey. This comprised all the teaching hospitals and federal medical centres (FMCs) in the country, and where feasible, an additional federal government funded facility to make up two tertiary care hospitals per state and FCT. Also included were two general hospitals and four primary healthcare centres (PHCs)/health posts in each of the 36 states and FCT.

Data collection

Data collection was via the online Qualtrics® software (Qualtrics, Utah, USA). The hospital administrator, head of the pharmacy department or a designated senior pharmacist with managerial responsibility at each of the 296 target facilities was invited to complete the survey. Respondents for this survey were identified via the Association of Hospital and Administrative Pharmacists of Nigeria (AHAPN), the state chapters of the Pharmaceutical Society of Nigeria (PSN), and through the authors' professional network. The online survey link was shared with each respondent with consent to participate required prior to data completion. This survey was conducted over 12 months and data collection concluded on 30 July 2020. Ethical review and approval for this study was obtained from the National Health Research Ethics Committee (NHREC) of the Federal Ministry of Health in Nigeria (REF NO: NHREC/01/01/2007).

Survey Instrument

The data collection tool (provided in Appendix 1) was adapted from a previously validated instrument used in a survey of hospital pharmacy practice in Ireland [9]. The adapted questionnaire was pre-tested for face and content validity in a sample of five research active hospital pharmacists in managerial position who were not directly involved in this study. Feedback obtained from the pre-test was incorporated with further iteration resulting in a questionnaire comprising 23 items that required a combination of multiple choice, "Yes", "No", "Not applicable", or free text responses. The survey questions were presented over five pages.

To ensure completeness, all the survey questions were mandatory. Respondents had to provide an answer to the questions on a given page including the requirement to confirm consent on the first page in order to proceed to the next. Given the objective of this study and to ensure a meaningful interpretation of the survey findings; a filtering question was employed asking whether pharmaceutical care services were provided by pharmacists at the facility. This question was in the demographic section on page 2, and respondents who answered "No" were automatically taken to the end of the survey. For this study, pharmaceutical care was defined as all medicine-related and patient-oriented care services that are provided by pharmacists at the respective facilities.

Data Analysis

Quantitative data obtained in this study were analysed using SPSS v26 (IBM, USA). Descriptive statistics including frequency (counts, percentages), mean (standard deviation (SD)), median (interquartile range (IQR)) were used to summarize the data while the Pearson's Chi-square (X^2) was used to assess association between categorical variables. Disparity in the composition of the pharmacy department and the availability of clinical pharmacy services per level of care across the six geopolitical zones in the country, was assessed using the Pillai's Trace statistic (V) of the multivariate analysis of variance (MANOVA). The Pillai's Trace multivariate statistic was chosen because it is more robust to outliers and violation of normality [27]. Confirmatory post-hoc analysis was also conducted using the Bonferroni correction. The findings of this survey are reported in line with the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) guidelines [28].

RESULTS

The online survey link on Qualtrics was accessed 308 times. This included 272 respondents who provided complete responses to the questions, indicating a survey completion rate of 88%. The 36 accesses with incomplete responses included those who consented to participate on the first page of the questionnaire but did not attempt the survey questions (n=11), and others who attempted only some of the demographic questions (n=25). The incomplete responses were not useable and were therefore excluded from further analysis.

Demography

Of the 272 complete responses obtained, 55 were from tertiary care facilities and comprised all the teaching hospitals, FMCs and 11 other government-funded hospitals in the country; 72 were secondary care providers and these were all general hospitals, while the remaining 145 were PHCs. Geographically, responses were obtained from hospitals across the 36 States in the country including the FCT. Regionally, the highest number of responses were from hospitals in the North West (n = 51, 19%) while the least were from the South East (n = 36, 13%) regions (Table 1).

Hospital profile

Median hospital size with respect to number of beds varied across the three levels of care. The tertiary care facilities in the sample were generally larger compared to the secondary and primary care hospitals (Table 1). The size of the hospital was also reflected by the number of dispensing locations available. The PHCs and about 72% (n = 52) of the secondary care facilities had between one to three dispensing locations for pharmaceuticals while the majority (89%, n = 49) of the tertiary care facilities had about four or more (Table 1). Pharmaceutical care services were provided by pharmacists in all (100%) of the tertiary facilities, and in most of the secondary care hospitals (N = 68, 94%). However, pharmacists were only available in fewer than 10% of the PHCs in this survey (Table 1). Given the objective of this study, which was to determine the clinical pharmacy services provided; only the data obtained in the tertiary and secondary care facilities were further analysed hereafter.

Table 1: Hospital profile and demography

Hospital Profile		Hospital Level of Care		
		Primary (N=145)	**Secondary (N=72)**	**Tertiary (N=55)**
Geographical distribution, n (%)	North Central	28 (19)	11 (15)	9 (16)
	North East	23 (16)	12 (17)	8 (15)
	North West	27 (19)	14 (19)	10 (18)
	South East	20 (14)	9 (13)	7 (13)
	South South	23 (16)	12 (17)	11 (20)
	South West	24 (16)	14 (19)	10 (18)
Size of facility (Number of beds, n (%))	<100 beds	145 (100)	54 (75)	6 (11)
	101 – 250	0 (0)	18 (25)	16 (29)
	251 – 500	0 (0)	0 (0)	24 (44)
	≥ 501	0 (0)	0 (0)	9 (16)
	Median N (IQR)	15 (20)	100 (77)	368 (187)
	Min – Max	6 – 30	12 – 250	60 – 850
Pharmacy opening times, n (%)	< 24 hours	145 (100)	41 (57)	10 (18)
	24 hours	0 (0)	31 (43)	45 (82)
Number of dispensing locations at facility, n (%)	1 – 3	145 (100)	52 (72)	6 (11)
	4 – 6	0 (0)	20 (28)	15 (27)
	> 6	0 (0)	0 (0)	34 (62)
Pharmacist provide pharmaceutical care services at facility, n (%)	Yes	9 (6)	68 (94)	55 (100)
	No	136 (94)	4 (6)	0 (0)

Pharmacy department profile

This section of the analysis includes all the tertiary and the 68 secondary care hospitals that reported that pharmaceutical care services were provided by pharmacists (N = 123). Generally, the composition of the pharmacy department was comparable across the six geopolitical regions in the country (V = 0.383, F = 1.453, P = 0.06) with no statistical significant difference observed beyond the level of care provided in the respective hospitals (V = 0.522, F = 18.378, P = 0.001)**.** The total number of pharmacy staff in the respective cohorts varied with more pharmacists, pharmacy technicians and support staff employed in the tertiary care hospitals compared to the secondary care facilities (Table 2). This was reflective of the size of the hospitals in the respective cohorts. More than 70% of the pharmacists employed in the tertiary care hospitals were those with five or more years of practice experience, compared to the secondary care cohort with about 57% (Table 2). A higher proportion of the pharmacists in the tertiary care cohort had a post-graduate degree or professional recognition compared to the secondary care with about a third (Table 2).

Table 2: Pharmacy department profile

Pharmacy Profile		Hospital Level of Care		Total sample (N=123)
		Secondary (N=68)	Tertiary (N=55)	
Pharmacy staff gender profile, mean percent (±SD)	Males	53(24)	50 (19)	52 (22)
	Females	47 (24)	50 (19)	48 (22)
Number of licensed pharmacists employed at facility, mean (±SD)		5 (5)	30 (22)	16 (16)
Number of pharmacy technicians employed at facility, mean (±SD)		4 (4)	9 (8)	7 (7)
Number of pharmacy support staff, mean (±SD)		3 (3)	11 (10)	7 (6)
Proportion of pharmacists with <5 years' experience, mean percent (±SD)		43 (35)	27 (19)	32 (28)
Proportion of pharmacists with 5 – 10 years' experience, mean percent (±SD)		37 (32)	35 (19)	39 (25)
Proportion of pharmacists with > 10 years' experience, mean percent (±SD)		20 (28)	38 (27)	29 (26)
Proportion of pharmacists with post-graduate qualification or professional recognition, mean percent (±SD)		22 (21)	51 (31)	34 (33)
Compendial and drug reference resources available at facility	Yes, n (%)	62 (91)	53 (96)	115 (93)
	No, n (%)	6 (9)	2 (4)	8 (7)
Access to online medicine information	Yes, n (%)	29 (43)	40 (73)	69 (56)
	No, n (%)	39 (57)	15 (27)	54 (44)
Drug distribution system available at facility	Centralized, n (%)	34 (50)	22 (40)	56 (46)
	Decentralized, n (%)	12 (18)	25 (45)	37 (30)
	Patient-oriented service, n (%)	22 (32)	8 (15)	30 (24)
Pharmacist-led outpatient clinic available at site	Yes, n (%)	1 (2)	3 (6)	4 (3)
	No, n (%)	67 (98)	52 (94)	119 (97)
Outpatient clinic with significant pharmacist input available at site	Yes, n (%)	43 (63)	42 (76)	85 (69)
	No, n (%)	25 (37)	13 (24)	38 (31)
Type of outpatient clinic with significant pharmacist input	HIV/AIDs, n (%)	42 (62)	37 (67)	79 (64)
	Sexual health, n (%)	18 (26)	1 (2)	19 (15)
	Tuberculosis, n (%)	15 (22)	14 (25)	29 (24)
	Oncology, n (%)	2 (3)	10 (18)	12 (10)

About half of the secondary care cohort (n = 34) reported a centralized drug distribution system compared to the approximately 60% (n = 33) in the tertiary care cohort that reported a decentralized or a patient-oriented drug distribution system (Table 2). Pharmacist-led outpatient clinics were available in only four (3%) hospitals in the sample. Relative to the secondary care hospitals, other outpatient clinics with

significant pharmacist' input beyond dispensing were reported in more of the tertiary care hospitals (Table 2), however, this was not statistically significant (X^2 = 2.45, P = 0.12) (Table 2). On the other hand, sexual health clinics with significant pharmacist input were more likely to be available in secondary care (n = 18 (26%) vs 1(2%), X^2 = 13.59, P = 0.001), while oncology clinics were more likely to be reported in the tertiary care hospitals (n = 2 (3%) vs 10(18%), X^2 = 8.46, P = 0.004) (Table 2).

Clinical pharmacy services provided

The study showed that medicines information, patient education and counselling, in-patient and outpatient dispensing services were always available in the majority of the tertiary and secondary care hospitals in the sample (Table 3). However, fewer than a third of the respondents in either cohort indicated that pharmacists were routinely involved in multidisciplinary ward rounds, therapeutic guidelines development, antibiotic stewardship programmes, anticoagulant services, drug therapy monitoring, clinical trials, and parenteral nutrition service provision (Table 3). Comparatively, discharge counselling, drug utilization evaluation and review, compounding/extemporaneous preparations, and medical device services were more likely to be available in the tertiary care hospitals while vaccines services were more likely to be provided in the secondary care hospitals ($p<0.05$) (Table 3). Only about half of the hospitals in the overall sample reported the availability of a medication error, pharmacovigilance/adverse drug events (ADE) or adverse drug reaction (ADR) reporting service, and this was not associated with the level of care ($p > 0.05$) (Table 3).

Table 3: Availability of clinical pharmacy services

Clinical pharmacy services provided	Hospital Level of Care												X^2	P
	Secondary (N=68)						Tertiary (N=55)							
	Never		Rarely		Always		Never		Rarely		Always			
	n	%	n	%	n	%	n	%	n	%	n	%		
Multidisciplinary ward rounds	31	46	28	41	9	13	27	49	19	35	9	16	0.574	0.751
Medication Chart review	25	37	23	34	20	29	18	33	24	44	13	24	1.398	0.491
Medication error reporting	9	13	23	34	36	53	5	9	24	44	26	47	1.742	0.481
Therapeutic guidelines and protocol development	26	38	28	41	14	21	22	40	22	40	11	20	0.01	0.995
Inpatient dispensing	12	18	13	19	43	63	7	13	3	5	45	82	6.599	*0.037**
Outpatient dispensing	0	0	0	0	68	100	0	0	0	0	55	100	0	1
Medicines information	0	0	10	15	58	85	0	0	11	22	39	78	3.107	0.078
Antimicrobial stewardship	35	51	26	38	7	10	18	33	22	40	15	27	7.761	*0.021**
Contraceptive services	35	51	17	25	16	24	26	47	18	33	11	20	0.999	0.607
Vaccines services	13	19	12	18	43	63	19	35	19	35	17	31	12.179	*0.002**
Cold chain management	9	13	10	15	49	72	11	20	8	15	36	65	1.135	0.567
Anticoagulant services	46	68	16	24	6	9	25	45	14	25	16	29	9.947	*0.007**
Medical devices services	31	46	14	21	23	34	8	15	22	40	25	45	14.87	*0.001**
Compounding/Extemporaneous preparation	18	26	32	47	18	26	4	7	4	7	47	85	43.472	*0.001**
Pharmacovigilance/ADE/ADR reporting	5	7	33	49	30	44	2	4	23	42	30	55	1.851	0.396
Drug therapy monitoring	8	12	36	53	24	35	9	16	28	51	18	33	0.589	0.745
Medicines reconciliation/history	13	19	29	43	26	38	12	22	14	25	29	53	4.499	0.105
Involvement in clinical trials	54	79	14	21	0	0	23	42	22	40	10	18	23.143	*0.001**
Patient education & counselling	0	0	3	4	65	96	0	0	4	7	51	93	0.464	0.496
Discharge counselling	18	26	29	43	21	31	7	13	17	31	31	56	8.616	*0.013**
Drug utilization evaluation & review	20	29	29	43	19	28	6	11	19	35	30	55	10.838	*0.004**
Aseptic services	34	50	22	32	12	18	16	29	23	42	16	29	5.764	0.056
Parenteral nutrition support (TPN and enteral feeds)	41	60	15	22	12	18	23	42	18	33	14	25	4.162	0.125

The results also showed disparity in the availability of clinical pharmacy services across the six geopolitical regions (V = 1.293, F = 1.570, P = 0.001). Post-hoc analysis indicated that more of the North Central and South West hospitals (n = 5(26%), 9(36%), respectively) reported pharmacists' routine involvement in multidisciplinary ward rounds compared to the other regions with fewer than 5% each. The North Central, South West and South South respondents were more likely to respectively report routine availability of medication chart review (n = 12(58%), 8(35%), 10(43%), respectively) and therapeutic guideline development services (n = 6(32%), 6(26%), 8(35%)), compared to the other regions with fewer than 10% each. Although most of the hospitals in the North Central, North East, North West and South West regions provided compounding/extemporaneous preparation services (n = 16(79%), 11(56%), 12(52%), 12(52%), respectively); fewer than half of those in the South East and South South (n = 5(31%), 10(43%), respectively) reported this. Medication error services were reported by more than half of the North Central, North East, South South and South West (n = 13(63%), 11(55%), 12(52%), 17(70%), respectively) respondents compared with only about a third in the North West and South East region (n = 7(30%), 4(25%), respectively).

Respondents' perception of practice

Overall, only about a third of the respondents agreed that the available technology in the pharmacy department, the continuous professional development (CPD) opportunities, and the pharmacists' influence on prescribing was adequate or satisfactory at the respective hospitals (Table 4). This perception was not associated with the level of care provided in the hospitals ($p > 0.05$). The majority of the tertiary (n = 48(87%) and secondary care (n =53 (78%) respondents agreed that interdisciplinary collaboration in the hospital will raise the profile of the pharmacy department (Table 4). Generally, respondents' perceptions of practice within the respective levels of care was comparative across the six geopolitical regions (V = 0.333, F = 0.888, p = 0.681).

Table 4: Respondents' perceptions of practice and available resources

Pharmacists' perceptions of practice	Hospital Level of Care												X^2	P
	Secondary (N=68)						Tertiary (N=55)							
	Disagree		Neutral		Agree		Disagree		Neutral		Agree			
	n	%	n	%	n	%	n	%	n	%	n	%		
The technology in this pharmacy is adequate to support the provision of high quality pharmacy services	34	50	22	32	12	18	16	29	22	40	17	31	7.07	0.070
The pharmacy team has satisfactory influence over the policymakers and managers within the hospital	17	25	17	25	34	50	20	36	24	44	11	20	11.953	0.003*
More joint professional working and interdisciplinary collaboration would raise the profile of this hospital pharmacy team	0	0	15	22	53	78	2	4	5	9	48	87	5.940	0.051
We have the right mix of skills and qualifications among our staff to provide our current services	9	13	24	35	35	51	7	13	10	18	38	69	4.818	0.090
Staff here have many opportunities to develop high levels of expertise in general hospital pharmacy practice	16	24	22	32	30	44	6	11	19	35	30	55	3.429	0.180
Staff here have many opportunities to develop high levels of expertise in specific clinical areas of hospital pharmacy practice	19	28	20	29	29	43	9	16	19	35	27	49	2.320	0.313
There are many in-house CPD opportunities for staff	25	37	25	37	18	26	20	36	18	33	17	31	0.354	0.838
Hospital pharmacists are responsible and accountable for patients' medication-related outcomes in this hospital	16	24	25	37	27	40	6	11	21	38	28	51	3.577	0.167
Hospital pharmacists significantly influence the prescribing practice in this hospital	20	29	21	31	27	40	19	35	24	44	12	22	6.961	0.138

DISCUSSION

The findings of our study show disparity in the availability of clinical pharmacy services across the three levels of care in Nigeria, and between the states and respective geopolitical zones. Although outpatient clinics with significant pharmacist input beyond dispensing were available in about two-thirds of the hospitals in our survey; the disparity in service availability within the specific levels of care and across the various geopolitical regions indicate the need for national scale up. To the best of our knowledge, this is the first study to provide a comparative overview of the available clinical pharmacy services within the various levels of care and across the six geopolitical regions of Nigeria. The national scope of the study is a key strength, given the paucity of data in the subject area. However, as this was a survey with a purposive sample, our study estimates though accurate, are unlikely to be precise. This study relied on respondents' report of the services available at their respective hospitals. This approach may have introduced bias associated with the use of self-administered questionnaires [29]. Also, tertiary care data was missing for Kebbi while secondary care data was incomplete for Enugu and Oyo states. Despite these limitations, the broad similarities in service provision within the respective levels of care in our sample, provide an indication of the existing trends with respect to clinical pharmacy service availability across the states and geopolitical regions in the country.

In total, the survey link was accessed 308 times, suggesting that some respondents likely accessed the survey link more than once. As this is a known phenomenon in anonymised surveys, the "prevent ballot box stuffing" and "partial completion" feature on Qualtrics was utilized to protect against multiple submissions. Where the study authors had no direct contacts, the state chapters of the respective pharmacy organizations in the country assisted with the dissemination of the survey link to the relevant contacts in the selected hospitals. It was therefore not possible to confirm that the 296 hospitals selected for this research received the invite and accessed the survey site. As such, a response rate could not be calculated for this research. Instead, the survey completion rate (defined as the total number of complete survey responses received divided by the total number of times the survey was accessed) was reported as a response measure in line with the CHERRIES guidelines [28].

Several factors including significant workforce shortages, high attrition rate, poor remuneration and funding, and the available pharmacists' expertise are some of the factors reported to limit uptake of clinical pharmacy services in countries in Africa including Nigeria [11,14,20,21,30,31]. This may explain why some of the clinical pharmacy services assessed in this survey were more likely to be available in the

tertiary facilities compared to the secondary care hospitals; especially as the former tend to be larger, more funded and equipped with the capacity of employing more staff. On the other hand, this may also be related to the practice experience of the licensed pharmacists employed in the hospitals within the respective levels of care. Pharmacists in the tertiary care hospitals tended to be more experienced with a larger proportion possessing a post-graduate qualification or professional recognition. This suggests that the tertiary care pharmacists are more likely to have undertaken further post-registration training and are potentially more equipped to provide enhanced patient-oriented care services in their respective hospitals.

Pharmacists' are essential for attaining the goal of universal health coverage and equitable access to essential health services, particularly with respect to optimizing the safe and responsible use of medicines [32]. Existing reports indicate that pharmaceutical care services and medicines-related activities are carried out by non-pharmacists in the majority of the PHCs in Nigeria [33–35]. This was observed in our study as pharmacists were employed in only a fraction of the primary care facilities. This finding highlights the need to prioritize the integration of clinical pharmacists within the primary care system in Nigeria. This is essential, given the evidence from other countries that demonstrate the effectiveness of pharmacist-led primary care interventions in long term disease prevention, medication therapy management, and improvement in drug-related patient outcomes [36,37]. Studies in other countries demonstrate that the potential for medication errors and non-adherence to long term disease therapies are higher when pharmaceutical care services are provided by non-pharmacists [38,39], further emphasizing the need to integrate pharmacists in primary care.

The finding that online medicine information services were not available in close to half of the secondary care hospitals highlights the need to improve the available information technology infrastructure in the respective hospitals. This is necessary, so as to ensure pharmacists' access to current medicines information resources, especially as existing evidence demonstrates that professional practice that is consistent with up-to-date knowledge influence patient safety and clinical outcomes [40]. This was also emphasized by the significant proportion of study respondents in both the tertiary and secondary care hospitals who indicated that the information technology (IT) resources and CPD opportunities available were not adequate. More robust training infrastructure that would provide further opportunities for pharmacists to develop their skills and promote lifelong learning are therefore required in the country. Enhanced pharmaceutical care services such as medication chart review, medication error reporting, antibiotic stewardship programmes, and pharmacovigilance activities are important clinical services that

impact patient outcomes [2,41]. Prioritizing pharmacists' involvement in these key services in Nigeria is crucial in order to safeguard patients' health, ensure medication safety, and limit drug interactions.

Conclusions

This study provides evidence that was previously lacking with respect to the availability of clinical pharmacy services in public sector hospitals in Nigeria. The disparity in the availability of these services across the various levels of care highlight the need to scale up the uptake of these services nationally. Our findings also emphasize the need to prioritize the integration of clinical pharmacy services within the primary healthcare system, to ensure equitable access to medicines expertise and contribute to universal health coverage. The evidence in this study can inform national policy planning and development in the pharmaceutical sector in Nigeria, particularly in relation to ensuring the availability of enhanced patient-oriented services.

References

1. Obayendo T. Presidency Approves Consultant Pharmacist Cadre in Public Service. *Pharmanewsonline* 2020. https://www.pharmanewsonline.com/presidency-approves-consultant-pharmacist-cadre-in-public-service/ (26 November 2020, date last accessed)

2. Rotta I, Salgado TM, Silva ML *et al.* Effectiveness of clinical pharmacy services: an overview of systematic reviews (2000-2010). *Int J Clin Pharm* 2015;**37**:687–97.

3. American College of Clinical Pharmacy. The Definition of Clinical Pharmacy. *Pharmacotherapy* 2008;**28**:816–7. DOI: 10.1592/phco.28.6.816

4. The Joint Commission of Pharmacy Practitioners (JCPP). *Pharmacists' Patient Care Process*. The Joint Commission of Pharmacy Practitioners (JCPP), 2014:6. https://www.pharmacist.com/sites/default/files/files/PatientCareProcess.pdf (26 November 2020, date last accessed)

5. Carter BL. Evolution of Clinical Pharmacy in the USA and Future Directions for Patient Care. *Drugs Aging* 2016;**33**:169–77.

6. Canadian Society of Hospital Pharmacists. *Hospital Pharmacy in Canada Report 2016/17*. Ottawa, Canada: Canadian Society of Hospital Pharmacists, 2018. https://cshp.ca/sites/default/files/HPC%20Survey/Report%202018.pdf (1 October 2020, date last accessed)

7. Proper JS, Wong A, Plath AE *et al.* Impact of clinical pharmacists in the emergency department of an Australian public hospital: A before and after study. *Emerg Med Australas* 2015;**27**:232–8.

8. Studer H, Boeni F, Messerli M *et al.* Clinical Pharmacy Activities in Swiss Hospitals: How Have They Evolved from 2013 to 2017? *Pharm Basel Switz* 2020;**8**, DOI: 10.3390/pharmacy8010019.

9. The Pharmaceutical Society of Ireland. *Baseline Study of Hospital Pharmacy in Ireland: Final Report*. Dublin, Ireland: The Pharmaceutical Society of Ireland, 2012:205. https://www.lenus.ie/bitstream/handle/10147/275759/WordBaselFinalRet.sflb.pdf?sequence=1&isAllowed=y (1 October 2020, date last accessed)

10. Elliott RA, Perera D, O'Leary K. National survey of clinical pharmacy services and pharmacy technician roles for subacute aged-care inpatients. *J Pharm Pract Res* 2012;**42**:125–8. DOI: 10.1002/j.2055-2335.2012.tb00149.x

11. Hambisa S, Abie A, Nureye D *et al.* Attitudes, Opportunities, and Challenges for Clinical Pharmacy Services in Mizan-Tepi University Teaching Hospital, Southwest Ethiopia: Health Care Providers' Perspective. *Adv Pharmacol Pharm Sci* 2020;**2020**:e5415290.

12. Pawłowska I, Pawłowski L, Kocić I *et al.* Clinical and conventional pharmacy services in Polish hospitals: a national survey. *Int J Clin Pharm* 2016;**38**:271–9.

13. Yao D, Xi X, Huang Y *et al.* A national survey of clinical pharmacy services in county hospitals in China. *PLOS ONE* 2017;**12**:e0188354.

14. Auta A, Strickland-Hodge B, Maz J. Challenges to clinical pharmacy practice in Nigerian hospitals: a qualitative exploration of stakeholders' views. *J Eval Clin Pract* 2016;**22**:699–706.

15. Bronkhorst E, Gous AGS, Schellack N. Practice Guidelines for Clinical Pharmacists in Middle to Low Income Countries. *Front Pharmacol* 2020;**11**, DOI: 10.3389/fphar.2020.00978.

16. Njuguna B, Berhane H, Ndemo FA *et al.* Scaling up clinical pharmacy practice in Africa: Current challenges and the future. *JACCP J Am Coll Clin Pharm* 2020;**3**:966–72. DOI: 10.1002/jac5.1297

17. International Pharmaceutical Federation. *Revised FIP Basel Statements on the Future of Hospital Pharmacy*. The Hague, Netherlands: International Pharmaceutical Federation, 2014:6. https://www.fip.org/www/streamfile.php?filename=fip/FIP_BASEL_STATEMENTS_ON_THE_FUTURE_OF_HOSPITAL_PHARMACY_2015.pdf (2 November 2020, date last accessed)

18. Penm J, Moles R. Global developments in hospital pharmacy: the revised Basel statements. *J Pharm Pract Res* 2016;**46**:301–3. DOI: 10.1002/jppr.1244

19. Ekpenyong A, Udoh A, Kpokiri E *et al.* An analysis of pharmacy workforce capacity in Nigeria. *J Pharm Policy Pract* 2018;**11**:20.

20. Ma'aji HU, Khan F, Shuaibu A *et al.* Assessment of Hospital Pharmacy Services in North Western Nigeria. *Niger J Pharm Sci* 2018;**17**:90–7. Available at https://journals.abu.edu.ng/njps/pdf/302.pdf (2 November 2020, date last accessed)

21. Ogochukwu AM, Victoria U. Assessment of Hospital Pharmacy Services in South-Eastern Nigeria. *Int J Pharmagenesis* 2010;**1**:209–15. Available at https://oer.unn.edu.ng/read/assessment-of-hospital-pharmacy-services-in-south-eastern-nigeria (2 November 2020, date last accessed)

22. Makinde OA, Azeez A, Bamidele S *et al.* Development of a Master Health Facility List in Nigeria. *Online J Public Health Inform* 2014;**6**, DOI: 10.5210/ojphi.v6i2.5287.

23. International Organization for Migration. *Needs Assessment of the Nigerian Health Sector*. Abuja, Nigeria: International Organization for Migration, 2014:47.

24. Kombe G, Fleisher L, Kariisa E *et al. Nigeria Health System Assessment*. Bethesda, MD: United States Agency for International Development and Abt Associates Inc., 2009.

25. Asuzu M. The necessity for a health system reform in Nigeria. *J Community Med Prim Health Care* 2004;**16**:1–3. Article available at http://www.bioline.org.br/request?pc04001 (2 November 2020, date last accessed)

26. Federal Ministry of Health. Distribution of Hospitals and Clinics in Nigeria. *Niger Health Facil Regist HFR* 2017. https://hfr.health.gov.ng (2 November 2020, date last accessed)

27. Olson CL. Comparative Robustness of Six Tests in Multivariate Analysis of Variance. *J Am Stat Assoc* 1974;**69**:894–908. DOI: 10.1080/01621459.1974.10480224

28. Eysenbach G. Improving the Quality of Web Surveys: The Checklist for Reporting Results of Internet E-Surveys (CHERRIES). *J Med Internet Res* 2004;**6**:e34.

29. Demetriou C, Ozer BU, Essau CA. Self-Report Questionnaires. *The Encyclopedia of Clinical Psychology*. American Cancer Society, 2015, 1–6.

30. Bilal AI, Tilahun Z, Gebretekle GB *et al.* Current status, challenges and the way forward for clinical pharmacy service in Ethiopian public hospitals. *BMC Health Serv Res* 2017;**17**:359.

31. Salim AA, Elhada AA, Elgizoli B. Exploring clinical pharmacists' perception of their impact on healthcare in Khartoum State, Sudan. *J Res Pharm Pract* 2016;**5**:272. DOI: 10.4103/2279-042X.192459

32. Udoh A, Ernawati DK, Akpan M *et al.* Pharmacies and primary care: a global development framework. *Bull World Health Organ* 2020;**98**:809–11.

33. Alenoghena I, Aigbiremolen A, Abejegah C *et al.* Primary Health Care in Nigeria: Strategies and Constraints in Implementation. *Int J Community Res* 2014;**3**:74–9. Available at https://www.ajol.info/index.php/ijcr/article/view/107665 (2 October 2020, date last accessed)

34. Alliance for Health Policy and Systems Research. *Primary Care Systems Profiles and Performance (PRIMASYS)*. Geneva, Switzerland: Alliance for Health Policy and Research, The Bill & Melinda Gates Foundation and World Health Organization, 2016:8. http://www.who.int/alliance-hpsr/projects/AHPSR-Nigeria-300916.pdf (2 October 2020, date last accessed)

35. Christian Aid. *Assessment of Primary Health Centres in Selected States of Nigeria: Summary Report of Findings from Christian Aid Supported Communities in Anambra, Benue, Kaduna, Plateau States and the Federal Capital Territory (FCT).* Abuja, Nigeria: Christian Aid, 2015:38.

36. Tan ECK, Stewart K, Elliott RA *et al.* Pharmacist services provided in general practice clinics: a systematic review and meta-analysis. *Res Soc Adm Pharm RSAP* 2014;**10**:608–22.

37. Avery AJ, Rodgers S, Cantrill JA *et al.* A pharmacist-led information technology intervention for medication errors (PINCER): a multicentre, cluster randomised, controlled trial and cost-effectiveness analysis. *Lancet Lond Engl* 2012;**379**:1310–9.

38. Bobbins AC, Burton S, Fogarty T-L. Different models of pharmaceutical services and care in primary healthcare clinics in the Eastern Cape, South Africa: Challenges and opportunities for pharmacy practice. *Afr J Prim Health Care Fam Med* 2020;**12**, DOI: 10.4102/phcfm.v12i1.2323.

39. Bheekie A, Bradley H. Re-engineering of South Africa's primary health care system: where is the pharmacist? *South Afr Fam Pract* 2016;**58**:242–8. DOI: 10.1080/20786190.2016.1186365

40. Institute of Medicine. *To Err Is Human: Building a Safer Health System.* Washington DC: National Academy Press, 2000. http://www.nap.edu/openbook.php?record_id=9728 (4 November 2020, date last accessed)

41. Ourghanlian C, Lapidus N, Antignac M *et al.* Pharmacists' role in antimicrobial stewardship and relationship with antibiotic consumption in hospitals: An observational multicentre study. *J Glob Antimicrob Resist* 2020;**20**:131–4.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors

Conflict of Interest

None declared

Figure Legend

- Figure 1 – The Clinical Pharmacists' Process of Care as defined by the American College of Clinical Pharmacy (ACCP) [3]

Table Legend

- Table 1: Hospital profile and demography
- Table 2: Pharmacy department profile
- Table 3: Availability of clinical pharmacy services
- Table 4: Respondents' perceptions of practice and available resources

Author contribution

- AU – Conceptualization, methodology, data curation, formal analysis, original draft preparation
- EN, EK, UO, MA, UII - Conceptualization, methodology, data curation, validation, writing review and editing
- BKL, KSL, KA, AM, OT - Methodology, data curation, validation, writing review and editing

Acknowledgments

- The authors would like to thank the Association of Hospital and Administrative Pharmacists of Nigeria (AHAPN), the Pharmaceutical Society of Nigeria (PSN) and Olutope Arinola Akinnibosun for assisting with the data collection in this study.