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DESCRIPTIVE REPORT

Capacity-building and collaborative curriculum development: A transition from BPharm to PharmD degree at Nnamdi Azikiwe University in Nigeria

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Abstract

Introduction: The Nnamdi Azikiwe University (NAU) started its Bachelor of Pharmacy (BPharm) programme in the 2006-2007 academic year. However, NAU's BPharm curriculum was not clinically focused, and NAU lacked expertise in implementing the clinical pharmacy focus of a Doctor of Pharmacy (PharmD) programme. The NAU pharmacy programme set out to transition from the BPharm curriculum to a new PharmD curriculum. **Purpose:** The purpose of this article is to describe the capacity-building and collaborative development of the new PharmD curriculum at NAU. In consultation and collaboration with an expert Carnegie African Diaspora. **Description:** During a six-week visit, the collaborators co-designed a model didactic and experiential PharmD curriculum, harmonised course syllabi and content, and revised the Clinical Clerkship Logbook. **Conclusion:** The Faculty of Pharmaceutical Sciences applied for and obtained University approval for the PharmD degree as a graduate degree. The National University Commission approved the PharmD programme.

Introduction

Pharmacy education in Nigeria began in 1887 with the training of dispensers through apprenticeship, which later advanced to formal pharmacy education at the schools of pharmacy at Yaba Health College in Lagos (1927), Druggist and Chemist School - now known as Ahmadu Bello University in Zaria (1930), and University of Ibadan (1957-1962). The graduates earned the Chemist and Druggist diploma (Pharmapproach, 2021). The Bachelor of Pharmacy (BPharm) degree in Nigeria began in 1963 and continues to date, while the Doctor of Pharmacy degree (PharmD) started in 2016 and continues to date (Pharmapproach, 2021).

History of Nnamdi Azikiwe University and its pharmacy programme

The Nnamdi Azikiwe University (NAU) was previously one of the campuses of the former Anambra State University of Technology (a.k.a. ASUTECH), which was taken over by the Federal Government of Nigeria on July 15, 1992, after the split of the old Anambra State into Anambra and Enugu States in 1991 (NAU, 2022). The university started its BPharm programme in the 2006-2007 academic year. The Faculty of Pharmaceutical Sciences set out to transition from the undergraduate BPharm curriculum to a new PharmD curriculum. The BPharm curriculum at NAU had an industrial focus and was not clinically focused. The institution acknowledged that this curricular change demanded the addition of specialised clinical pharmacy training with a shift of focus from the traditional roles of the pharmacist in medication dispensing and compounding to more

patient-centred clinical pharmacy services. While NAU desired to close the gaps between the BPharm and PharmD curricula to ensure the training and graduation of independent practitioners that are competent in direct patient pharmaceutical care, it lacked expertise in implementing the clinical pharmacy focus of a PharmD programme. Hence, NAU had a dire need to collaborate with academic pharmacy practitioners from high-income countries to assist them with developing the PharmD curriculum and courses for both didactic and experiential education to match theory with practice. The pharmacy school also desired sessions on faculty and preceptor development. Therefore, in readiness for the matriculation of its inaugural PharmD class, NAU consulted a Carnegie African Diaspora Fellow with expertise in pharmacy education, clinical pharmacy practice, programme development, and professional pharmacy organisational leadership to assist with its PharmD curriculum development. During a six-week visit to NAU, the Carnegie Fellow collaborated with the Faculty of Pharmaceutical Sciences to develop the new PharmD curriculum. Of note, the Carnegie Fellow's institution has a signed Memorandum of Understanding (MOU) with NAU for the development of student and faculty exchange and research.

Purpose of the paper

The International Pharmaceutical Federation (FIP) published the FIP Development Goals in 2020 to support its mission of advancing pharmacy practice, science, and education (FIP, 2020). The 21 FIP goals include, among others, academic capacity and sustainability in pharmacy education. Due to the evolving global pharmacy landscape from the traditional BPharm to PharmD programme, and to align with international best practices and trends in pharmacy education and practice, Nigeria's National Universities Commission (NUC) approved the PharmD degree as the terminal degree in 2016. While the BPharm degree continues to be offered and BPharm degree holders can sit for the licensure exam and practice pharmacy, the pharmacy schools in Nigeria are no longer allowed to admit new students into the BPharm programme. Pharmacy practice in Nigeria is regulated by the Pharmacists Council of Nigeria (PCN). To meet the minimum standard set by NUC and align with FIP's goal of academic capacity and sustainability in pharmacy education, NAU consulted the US-based Carnegie Fellow to assist them with building their academic pharmacy workforce capacity to ensure the training of clinically competent pharmacy graduates and develop a new PharmD curriculum. There is a paucity of literature on the curricula transition from the BPharm to PharmD degree among Nigerian pharmacy schools. This paper seeks to describe the academic capacity-building and collaborative development of a new PharmD curriculum at NAU in Nigeria.

Literature review on BPharm-to-PharmD programme

The desire for curricula transition from the BPharm to the PharmD degree has been described and is similar among most African nations (Njuguna *et al.,* 2020; Koduah *et al.,* 2020; Supapaan *et al.,* 2019). One study completed a needs assessment and proposed possible solutions by conducting gap analysis, looking at the challenges, opportunities, and the future within African pharmacy education (Njuguna *et al.,* 2020). It would be prudent to explore the journey of some other nations toward their transition from one degree to another to understand Nigeria's challenges with the curricula transition from BPharm to PharmD. Several challenges facing clinical pharmacy practice in Africa were reported, including inadequate and insufficient didactic and experiential curricula, deficiencies in clinical pharmacy practice, and inadequate policies and legislation within healthcare institutions to enhance clinical pharmacy practice (Njuguna *et al.,* 2020). The status, gaps, and opportunities for scaling-up clinical pharmacy practice in Africa were described, and solutions were proposed, such as curriculum reform of the BPharm programme, increasing the number of PharmD programmes, and adopting innovative postgraduate pharmacy training programmes, e.g., residencies and fellowships. The need to improve the "breadth and quality" of the experiential education was highlighted to increase the clinical pharmacy workforce, and the advocacy role of professional pharmacy organisations.

A review aimed to reconstruct the history of pharmacy education in Ghana, including the curricula transition of pharmacy education from a "dispensing certificate", "Diploma and Certificate of Dispensing'', and BPharm, to PharmD (Koduah *et al.,* 2020). Key pharmacy personnel in Ghana were interviewed to get more historical information, which is a common practice in the Nigerian context. The change management principles method was employed by interviewing key stakeholders and academicians to obtain detailed history (Koduah *et al.,* 2020).

One study explored the transition from BPharm to PharmD in five countries, including the United States (US), Japan, South Korea, Pakistan, and Thailand (Supapaan *et al.,* 2019). It included the year that each country transitioned to an all-PharmD degree, the length of each academic program, and the availability of bridge programmes to allow for the conversion from BPharm to PharmD for previous graduates. The educational pathways and scope of pharmacy practice in each of the five countries were described. While PharmD curricula differed between countries according to their context, four common themes were consistent across the five

countries: (1) needs and context, (2) process, (3) barriers to the transition, and (4) impact/outcome. It was concluded that although the new PharmD degree was mandated, the number of trained academic staff and preceptors was insufficient, indicating the need for developing a framework or strategies to measure and monitor the impact and outcome of the PharmD degree.

Although recommended since 1950, the transition of curricula in the United States of America took 42 years to conclude, with the approval of the PharmD degree solely for entry-level pharmacy practice by the American Association of Colleges of Pharmacy (AACP) House of Delegates in 1992 (Carter, 2016). The University of Southern California became the first to implement the PharmD programme in 1950, followed by the University of California San Francisco in 1955 (Carter, 2016). The US went to an all-PharmD programme in 2000, and some colleges and schools of pharmacy continue to offer bridge programmes and non-traditional PharmD programmes to allow pharmacists with a BPharm degree to convert to a PharmD degree (Supapaan *et al.,* 2019). Moreover, clinical pharmacy practice has continued to advance since then and American pharmacists are getting board certified in several pharmacy specialities through the Board of Pharmacy Specialties (BPS) and/or residency and fellowship training.

Methods

The Dean of the NAU Faculty of Pharmaceutical Sciences appointed the Head of Department (HOD) for Clinical Pharmacy and Pharmacy Management to serve as the faculty champion and primary coordinator of the six-week fellowship. First, the Carnegie Fellow and the NAU pharmacy school leadership collaborated and completed a needs assessment using the strengths, weaknesses, opportunities, and threats (SWOT) analysis as an alternative for assessing NAU's pharmacy programme. Similar to an approach previously used (Njuguna *et al.,* 2020), collaborators held interactive and brainstorming sessions that allowed the Carnegie Fellow to ask questions not answered by the SWOT analysis. The responses from the SWOT survey are presented in Table I. Next, the Nigerian-based co-author of this paper sought and interviewed some Nigerian pharmacy school faculty to obtain information about their respective pharmacy programmes (Table II). The detailed methodology for this project is presented in Figure 1.

Table I: NAU SWOT Analysis Responses from Faculty for Needs Assessment

SWOT	Participants' responses
Strengths	• Nnamdi Azikiwe University (NAU) Faculty of Pharmaceutical Sciences (Faculty) has upper administrative support, well-trained faculty, adequate facility, favourable location, and a university teaching hospital. • The current NAU Vice-Chancellor (VC) is a pharmacist and a former Dean and professor at the Faculty. He understands and fully supports the curricular transition from BPharm to PharmD. • Faculty members hold PhD degrees; some have obtained their PharmD training and are clinical faculty members to assume responsibility for educating the PharmD cohort. Training continues for the remaining faculty body. • NAU is located within a large city and serves a wide catchment area. The NAU teaching hospital (NAUTH) will be used for clerkships and clinical experiential education. • The Fellowship facilitated the development of the didactic and experiential components of the new PharmD curriculum, and NAU received approval from the National University Commission (NUC) for the new PharmD programme shortly after the Fellowship visit. • There is good academic communication among the faculty, students, and administration. • The Faculty has various departments to cover the topics within the new PharmD curriculum and has new buildings and facilities under construction to accommodate more classrooms, laboratories, and offices. • The collaborative PharmD development with the Carnegie Fellow by American-trained clinical faculty is a great plus for NAU since it ensures that the new pharmacy programme will be in line with the global trends and best practices.
Weaknesses	• There are issues with the current BPharm curriculum not meeting the national demand for clinical expertise. • The faculty are concerned about lots of curricular overlap and limited translation of basic sciences into clinical applications. Some of the faculty are not fully PharmD-trained in the conversion program. • BPharm-trained faculty are concerned about the potential for lack of respect from the PharmD cohort for not possessing a PharmD degree. The qualifications of the laboratory technicians are a concern. • The pharmaceutical science researchers lack some state-of-the-art scientific equipment for natural product analysis and their samples are sent out to external laboratories for analysis.

SWOT	Participants' responses
	• Another weakness is the minimal clinical research collaboration with national and international organizations. • There is a concern about the strength of current experiential learning. While NAU has a teaching hospital, it is not within proximity to NAU's main campus, which impacts the exchange of ideas and collaboration with other health professionals. • The students live closer to the school of pharmacy, and transportation to and from the hospital would affect the smooth running of the pharmacy education, given that a majority of the students do not drive and would have to rely on public transportation. • The university plans to build student housing at NAUTH, but the faculty are concerned about their commute time to and from the teaching hospital campus. • The faculty members are also concerned about the additional load of work that would come with the new PharmD programme, office space, faculty remuneration, and preceptors' honoraria. • The campus has poor broadband connectivity, which affects the efficiency of students and faculty in navigating the necessary academic software and technologies. • The faculty would appreciate additional research funding and collaborations.
Opportunities	• There are opportunities for the VC to lobby for funding to ensure a seamless running of the new PharmD programme. • The faculty anticipated the new PharmD programme as an excellent opportunity for a programme that will meet a global standard and the graduation of leaders in clinical pharmacy practice. • The faculty sees an opportunity for more clinical departments. • There are opportunities for improving the interprofessional collaboration at the NAUTH, including the use of visiting faculty and collaboration with consultants. • Students would benefit from more research opportunities, and the PharmD programme would create opportunities for multi-institutional clinical research. There could also be more research training opportunities in drug evaluation and drug metabolism. • There are opportunities for faculty development workshops and training, especially for BPharm degree holders and the Faculty could fund the conversion programme for the remaining BPharm-trained pharmacists to obtain their PharmD. • The graduation of PharmD students could serve as a pipeline for recruiting qualified clinical pharmacists, clinical faculty and preceptors. • There are opportunities for financial support from external stakeholders to support the purchase of laboratory instruments and machinery to initiate diverse clinical research activities. • NAU has enough landmass for the development of infrastructure at the permanent site. • The relocation of the teaching hospital to a new site creates an opportunity for the faculty to participate in the planning to ensure that the facility needs are considered, including lecture rooms, faculty offices, and student housing. The NAUTH management could solicit funding from philanthropists to support the project.
Threats	• There are some unfavourable government policies: the NUC political statement on the PharmD degree conversion was a concern. Although this issue has been addressed, the faculty are still concerned about other related policies since the NUC supersedes the PCN. • Besides the concern for pharmacy schools competing for recruitment of students, there are concerns for brain drain as some students are looking forward to travelling overseas for better jobs and compensations following their PharmD education. • Some non-clinical faculty are hesitant to embrace the PharmD programme for fear of being disenfranchised. • There is a concern about the inadequate number of clinical pharmacy specialists to serve as preceptors in the PharmD programme. Some senior lecturers do not see the need for the PharmD programme since they are not interested in clinical pharmacy practice. However, failure to upgrade to PharmD will affect the programme. • There is a concern about poor NAUTH acceptance of clinical pharmacy practice; this will further threaten the success of the PharmD programme, especially if NAUTH denies the students access to clinical rotations at the hospital or access to patient medical records. • There are concerns that resistance from other healthcare professionals, especially physicians, would demoralise the students and hamper interprofessional collaborations. • Another concern is the poor road network that limits easy transportation to and from the pharmacy school campus, given the distance to NAUTH. • Sustainability of support from stakeholders is also a concern and a threat to the new PharmD programme.

SWOT: Strengths, Weaknesses, Opportunities, and Threats; VC: Vice Chancellor; NAU: Nnamdi Azikiwe University; NAUTH: Nnamdi Azikiwe University Teaching Hospital; NUC: National University Commission; PCN: Pharmacists Council of Nigeria

Table II: Models of Nigerian pharmacy programmes that transitioned/Are transitioning from the BPharm to the PharmD Curriculum

No.	Nigerian Pharmacy Schools and Locations	Year University Established	Ownership Status of University	NUC-Approved PharmD Programs	Pharmacy Curricular Model	Location (Region in Nigeria)
1.	#Bauchi State University, Bauchi State	2011	State	2020	Hybrid	North-East
2.	#Bayero University, Kano State	1975	Federal	2015	Hybrid	North-East
3.	#Federal University Oye-Ekiti, Ekiti State	2011	Federal	2019	Hybrid	South-West
4.	#Gregory University, Uturu, Abia State	2012	Private	2019	Hybrid	South-West
5.	Nnamdi Azikiwe University, Awka, Anambra State	1992	Federal	2022	Hybrid	South-East
6.	#University of Benin, Edo State	1970	Federal	2019	Hybrid	Mid-West
7.	#University of Calabar, Cross River State	1975	Federal	2020	Hybrid	South-South
8.	#University of Ibadan, Oyo State	1948	Federal	2019	Hybrid	South-West
9.	#University of Ilorin, Kwara State	1975	Federal	2019	Hybrid	Middle Belt
10.	#University of Jos, Plateau State	1975	Federal	2018	Hybrid	Middle Belt
11.	#University of Nigeria, Nsukka, Enugu State	1960	Federal	2018	Hybrid	South-East
12.	#University of Uyo, Akwa Ibom State	1991	Federal	2020	Hybrid	South-South

NUC: National University Commission, Hybrid: Both BPharm and PharmD programs offered.

#National University Commission Secretariat. (2021). Doctor of Pharmacy (Pharm. D) Programme in Nigerian Universities. NUC/ES/138/VOL.63/174.

The key to a successful project (changing from a BPharm to a PharmD curriculum) of this magnitude was the use of change management principles. The Carnegie Fellow applied Kotter's eight-stage change management model throughout the interactions with the host institution. The change management principles began with establishing a sense of urgency, creating a guiding coalition, developing a vision and strategy, communicating the change vision, empowering the faculty for broad-based action, generating short-term wins and consolidating gains, and producing more change (Kotter & Rathgeber, 2005). To create a sense of urgency and gain buy-in from NAU upper administration and the Faculty of Pharmaceutical Sciences faculty, the Fellow first had courtesy calls/visits to key stakeholders, including the Vice Chancellor of the University, and discussed the need for major changes in the didactic and experiential pharmacy curriculum. The initial efforts made to have the faculty at the host country conduct a needs assessment survey prior to the Fellow's visit were unsuccessful due to faculty hesitation to record their opinions for fear of retribution. The Fellow and the upper management had to mitigate the reticence and pushback and immediately deployed change management strategies, such as holding other interactive and brainstorming sessions to further assess the needs and readiness for change and learn more about the current BPharm curriculum.

Less than 10% of the NAU faculty had PharmD, as determined during the needs assessment by checking the number of faculty members with PharmD in the faculty staff register at baseline. The university initiated a retraining programme by sponsoring the faculty for the PharmD conversion programme. The first batch of 18 lecturers completed a two-tier conversion programme, while the second batch went mid-way into the conversion programme (Table III). Following the Fellow's presentations, more faculty members expressed interest in completing the conversion programme, which will continue until all clinical faculty members earn their PharmD. The basic science faculty are encouraged to complete the PharmD programme.

The curriculum was developed by a group comprised of representatives of the Joint Faculty Board, Heads of Departments, Curriculum Review Committee members, and lecturers from all six Faculty departments.

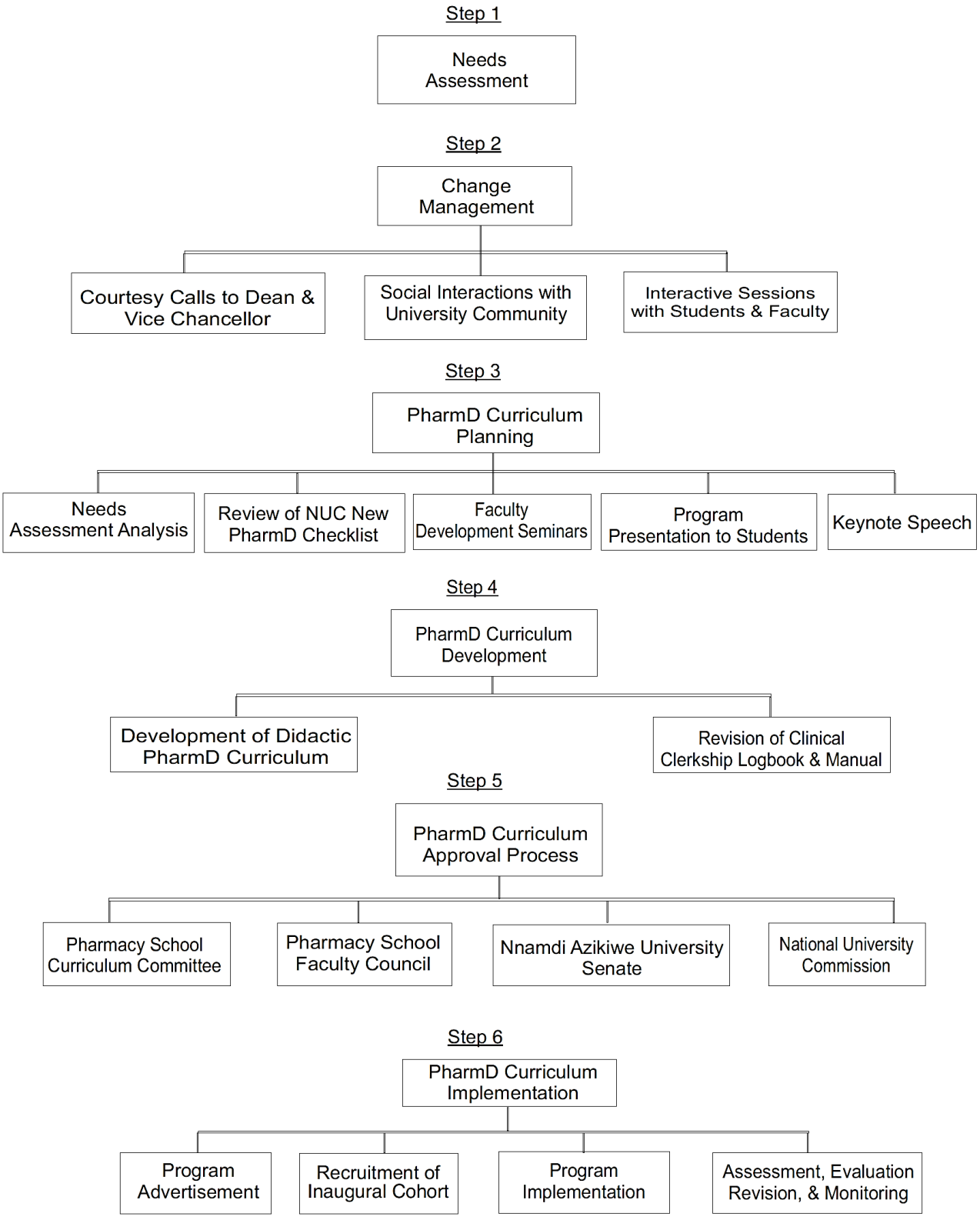

Figure 1: NAU PharmD curriculum methodology flowchart

Table III: Model and dynamics of PharmD development at NAU

Year	Descriptions/Remark	Programme focus	Faculty and staff qualifications
2006	5-year BPharm degree training started at NAU	Product-oriented	BPharm, BSc, MSc, PhD, FPCPharm, Post-Doc
2017	NAU's development of memorandum of understanding with U.S.-based university (University of Maryland Eastern Shore) for the development of faculty and student exchange programs, and research	Product-oriented	BPharm, MSc, PhD, Post-Doc, and PharmD.
2017-2019	BPharm-to-PharmD conversion training of the first batch of faculty	Patient- and Product-oriented	
2019-2021	BPharm-to-PharmD conversion training of the second batch of faculty	Patient- and Product-oriented	
2020	Resource verification visit by PCN	Patient- and Product-oriented	
2021	Arrival of the Carnegie Fellow from the U.S. to assist with NAU's new PharmD curriculum and programme development	Patient- and Product-oriented	
2021	Joint PharmD curriculum review and development: Need Assessment, seminars, brainstorming sessions, interactive sessions	Patient-oriented	
2021	Approval of the curriculum and commencement of 6-year PharmD programme by the NAU Senate for the 2022/2023 academic session	Patient-oriented	
2022	Approval of NAU's PharmD programme by NUC	Patient-oriented	
2022/2023	Commencement of NAU PharmD programme	Patient- and Product-oriented	

NUC: National University Commission; PCN: Pharmacists Council of Nigeria; UTME: Unified Tertiary Matriculation Examination; SIWES: Students Industrial Work Experience Scheme; IPPE: Introductory Pharmacy Practice Experience; APPE: Advanced Pharmacy Practice Experiential

Intern pharmacists who graduated from the Faculty were also present as observers and stakeholders to make contributions where necessary based on their experiences during their undergraduate years. The integrated exercise was based on promoting independent study time to promote experiential and problem-solving skills outside the classroom. Innovative approaches that foster teaching and learning and access to multicultural and interprofessional learning environments were considered. The group further integrated the dynamics of real-world scenarios, diversity and inclusiveness, evidence-based research, global perspective, discipline, and student assessment of learning and skills. Leadership and advocacy, essential to policy formulations, were integrated to promote a speedy drive of change and contextual framework as principles that underpin the pedagogical perspective.

The framework of the entire curriculum development was based on problem-solving, patient-centred care, and improvement of student learning, especially in clinical practice, while upholding good product development strategies and behavioural and humanistic approaches. The pedagogical principles employed were explanations, challenges, modelling, and feedback. Deliberate practice with these principles will be used during experiential education. Reconceptualisation, professionalisation, and academic approaches were also integrated into the content development to match the dynamics and trends of twenty-first-century pharmacy education.

Results

There were several barriers during the planning phase of the BPharm-to-PharmD transition at NAU. There were not enough faculty with PharmD degrees to execute the new PharmD programme. Despite earning PhD degrees in pharmaceutical sciences, faculty with a BPharm degree felt threatened that they might be disenfranchised and might not be respected by PharmD students. However, most of these faculty eventually completed the PharmD conversion programme.

The Fellow and the pharmacy administration, including the co-author, analysed the SWOT survey results and identified the following needs: (1) assistance with the transitioning from the traditional BPharm to the more clinical PharmD curriculum; (2) lack of syllabi for all courses; (3) lack of professional development resources for faculty and preceptors; (4) hesitancy of non-clinical faculty regarding the paradigm shift from the industrial focus of the BPharm to the patient-centred focus of the new PharmD programme; and (5) mentorship on career development for student pharmacists. During the

interactive sessions, the collaborators also discussed the SWOT analysis findings. The Fellow presented the proposed new curriculum changes and allowed input from the faculty and all HODs within the Faculty of Pharmaceutical Sciences. The interventions were based on the needs identified by the SWOT analysis and included workshops/seminars on specialised clinical pharmacy topics for faculty, preceptors, and students.

The parties collaboratively developed a model didactic and experiential education curriculum and harmonised course codes and content. They also revised the Clinical Clerkship Logbook and Manual, the experiential education document that contains the instructions, expected clinical skills, rubrics, and preceptor signatures for clinical clerkship rotations. The Fellow provided appropriate resources for the PharmD curriculum implementation and submitted a summary of the project and all materials to NAU. The NAU Faculty of Pharmaceutical Sciences applied for and obtained the University approval for the PharmD degree as a graduate degree and later the NUC approval for the new PharmD programme.

Table I presents a list of pharmacy programmes that have transitioned from BPharm to PharmD in Nigeria at the time of this publication. This information was obtained from the Faculty handbooks, document reviews, university periodicals, and through internet searches for supporting information. Table I includes the locations of the universities, the years they were established, the years in which pharmacy schools adopted the PharmD programmes, and the PharmD models adopted. In this setting, the term "hybrid" represents a model that utilises the patient-oriented PharmD curriculum but retains the product-oriented traditional BPharm content.

Innovations

Currently, PCN requires a six-year PharmD programme, after which the graduands must participate in an induction/oath-taking ceremony (formal graduation), apply for, and obtain the provisional pharmacy license, which will allow them to complete a year of national internship programme under the supervision of a licensed pharmacist. There are core clinical rotations that pharmacy graduates must complete, and these are uniform across the board; there is no room for educational pathways/tracks. Following the successful completion of the internship and before they qualify to sit for the full national pharmacy licensing examination, intern pharmacists will complete the one-year National Youth Service Corp, a national programme that requires all Nigerian university graduates (trained at home or abroad) to give back one year of service to the country as a condition for employment within the country.

The Carnegie Fellow designed a model PharmD curriculum and addressed strategies for preparing to teach the new PharmD programme based on the institutional goal of developing independent practitioners that are self-directed, self-regulated, and confident in providing direct patient pharmaceutical care. The didactic curriculum is a multidisciplinary, integrated curriculum model that will equip student pharmacists with the required clinical pharmacy skills for direct patient care and enable them to graduate as competent and confident pharmacists. It involves faculty from all the departments listed under section 6.0 of the NAU Faculty Manual (Departments and Codes in the Faculty of Pharmaceutical Sciences). The collaborators updated course contents to include clinical topics and rearranged the sequence for a better flow to promote the smooth transition of information and knowledge. They streamlined course contents and course distribution across academic levels and infused direct patient care contents throughout the professional year curriculum.

The new NAU PharmD curriculum

Year 1 (100 Level)

- Admission through UTME after successful completion of the Ordinary Level credits in English Language, Mathematics, Chemistry, Biology, and Physics or five-year Direct Entry with a first degree or Advanced Level pass (in no more than two sittings) in Chemistry, Physics, Biology/Botany/Zoology with credits in English and Mathematics
- Pre-professional year with the completion of general studies (prerequisites)

Year 2 (200 Level)

- Professional year with the completion of the remaining general study courses.
- Introduction of pharmaceutical science courses.

Year 3 (300 Level)

- The PharmD curriculum begins with the addition of the following clinical pharmacy courses:
  - Introduction to Clinical Pharmacy (direct patient care) in the first term of Year 3
  - Integrated Pharmacotherapy in the second term of Year 3
- Pharmaceutical science courses continue.

Year 4 (400 Level)

- Inclusion of seven courses on integrated pharmacotherapy.
- IPPE/Clinical Pharmacy Clerkship (6-8 weeks rotation per term).
- SIWES I (2 months)

- Longitudinal courses: Skills lab, pharmacy administration, and Drug Information.
- Pharmaceutical science contents continue.

Year 5 (500 Level)
- Inclusion of five courses on integrated pharmacotherapy.
- IPPE/Clinical Pharmacy Clerkship (6-8 weeks rotation per term).
- SIWES II (2 months).
- Longitudinal courses: Skills lab, Pharmacy Administration, and Drug Information.
- Pharmaceutical science contents continue.

Year 6 (600 Level)
- Specialised pharmaceutical science contents.
- APPE with clinical and industrial tracks (5 weeks per rotation).
- Concentrated Drug Information, Literature Evaluation, and Communication Skills.

The new experiential curriculum includes two education pathway offerings (clinical pharmacy practice and industrial pharmacy tracks) towards career choices for sixth-year (600 level) PharmD students. Once the students choose a clinical track, 50% of their experiential education (first term) will be focused on developing their selected areas of interest. The remaining 50% (second term) will be spent on completing other experiential rotations and group activities, such as journal club presentations, patient case and topic discussions, examination reviews, and interprofessional activities with other health professionals, to wrap up their PharmD education. Accordingly, the Fellow updated and revised the Clinical Clerkship Logbook and Manual for experiential education. The Faculty of Pharmaceutical Sciences has already planned for simulation laboratories in a new building under construction.

The Fellow analysed the strategies for establishing partnerships with experiential education practice sites, such as hospitals and community pharmacies. The Faculty submitted a proposal for honorary consultancy services for preceptors at the University, which will encourage preceptorship. During focused seminar sessions, student pharmacists were acquainted with firsthand information about the PharmD curriculum, admission modalities, and licensure for practice abroad, allowing them to gain an appreciation for the new PharmD model at NAU.

The Fellow worked very closely with the HOD of the Clinical Pharmacy and Pharmacy Management Department (co-author) to review the faculty, student, and preceptor development activities and execute all the interventions. The collaborators organised a focus group during which they identified institutional priorities and needs based on the SWOT analysis. Then, the collaborators planned and executed faculty and preceptor development activities for capacity-building in didactic and experiential education. The Fellow conducted seminars and workshops on specialised topics, including the Pharmacist Patient-Centred Care Process (Joint Commission of Pharmacy Practitioners, 2014) with an emphasis on direct patient care skills for a PharmD-trained pharmacist, the roles of a clinical pharmacist, and the depth and breadth of pharmacotherapy in the PharmD curriculum. There were sessions on student professional development to promote awareness and future uptake of the new PharmD curriculum and the conversion from a BPharm to a PharmD degree.

The Fellow participated in other activities to further build alliances with stakeholders, e.g., accompanying the Anambra State Pharmaceutical Society of Nigeria (PSN) Executive Board members to the National Agency for Food and Drug Administration and Control (NAFDAC). During the NAFDAC visit, the Fellow advocated for the use of NAFDAC as a major experiential education site for NAU pharmacy students. Through a special invitation, the Fellow attended the Anambra State PSN meeting, during which she addressed the audience, emphasising the importance of the PharmD student mentorship programme. She also advocated for the pharmacists' support of the new PharmD students.

The Fellow concluded with another courtesy call/visit to the Deputy Vice-Chancellor (Academics) of the University, during which she submitted a comprehensive summary report of her accomplishments, including a copy of the newly designed PharmD curriculum. The Fellow also submitted the revised Clinical Clerkship Logbook and Manual to the pharmacy department.

Discussion

The limitations to the BPharm-to-PharmD transition in Nigeria include the lack of interprofessional collaboration with physicians and the small number of clinically oriented pharmacists to serve as lecturers and preceptors (Ogbonna *et al.,* 2015; Okonta, Okonta & Ofoegbu, 2012; Oparah & Eferakeya, 2005). However, the emergence of clinical pharmacists trained at the West African Postgraduate College of Pharmacists (WAPCP) who obtained the FPCPharm recognition, pharmacists with master's and PhD degrees in clinical pharmacy and those who have done the PharmD conversion programme have contributed to bridging

the gap. Another limitation is the limited number of specialists and sub-specialities (Ogbonna *et al.,* 2015; Okonta, Okonta & Ofoegbu, 2012). However, some teaching hospitals have started to supply speciality training and retaining, in addition to creating niche and sub-speciality areas based on the available workforce to meet the need. Some hospitals sent their staff abroad to the US and the United Kingdom for further training, while others embarked on distance-learning programmes, professional development, and certifications by WAPCP and PCN. Poor remunerations for faculty members and preceptors have been a perennial problem, which has continued to challenge the process. However, different institutions devised internal strategies for dealing with their peculiarities.

The collaboration between the Carnegie African Diaspora Fellow and NAU contributed to the transformation and strengthening of NAU's pharmacy education from the BPharm to the PharmD degree and capacity building by strengthening the human resources development and structures for the smooth launch of the new PharmD curriculum. The outcomes and impact of the interventions are that a new PharmD curriculum was drafted and submitted to the NAU Faculty Senate, and the PharmD curriculum received the Faculty Senate approval. Following the fellowship, the NAU Faculty of Pharmaceutical Sciences underwent the NUC Resource Verification exercise in 2021, during which the pharmacy school had to show evidence of an appropriate programme structure, academic programmes, resources, students, and quality assurance mechanisms to embark on the new curriculum. NAU received approval to proceed with the new PharmD curriculum. The Faculty advertised the new PharmD curriculum for the matriculation of its inaugural class of PharmD students. The BPharm degree has been discontinued, but the students already enrolled in the BPharm degree programme are allowed to complete and graduate with the BPharm degree. There will no longer be admissions into the BPharm programme.

Strengths

Nigeria is still among the low- and middle-income countries; most countries within this range are still transiting to PharmD, while some have not started the process but are still comfortable with the traditional BPharm. Reproducibility is one of the key attributes of scientific research. The NAU model could serve as a case study for such countries to either adapt and/or adopt. It could serve as a template for varying modifications in today's increasingly dynamic world.

Although several Nigerian institutions have initiated PharmD curricula, the authors are not aware of any publications on the development of and transition to these curricula at the time of this manuscript preparation. This study has summarised the nature and extent of clinical practice in Nigeria and the efforts made by NAU to transition from a BPharm to a PharmD curriculum. The authors articulated the dynamics and importance of the Carnegie Fellow from a PharmD-awarding institution throughout the entire process. This study could serve as a guide and template for many pharmacy schools in low- and middle-income countries.

Limitations

This study did not consider the policy actors, legislation, ordinances, acts, and their antecedents from the early days of pharmacy practice in Nigeria. It was predominantly a mere description of one programme development and transition to a PharmD curriculum without the use of in-depth, rigorous quantitative and qualitative techniques.

Another limitation is that data about curriculum pathways/tracks at Nigerian colleges and schools of pharmacy are not readily available to compare with this PharmD curriculum. Hence, this information is not included in this report. There are several reasons why these kinds of data are not readily available on the Nigerian pharmacy school websites. Some universities have difficulties recruiting qualified IT personnel, and their websites may be out of date. Some institutions could view the data as intellectual property that should not be freely shared without proper consultation. Additionally, faculty scholarship activities tend to focus on sharing research results and not on the scholarship of teaching and learning, such as pharmacy curricula processes.

Future direction

International relations and collaborations are the way forward in breaking new frontiers in today's dynamic world. The Fellow will continue the follow-up with NAU to ensure the successful launch of the new PharmD programme and PCN accreditation. The Fellow is willing to provide further support to NAU during the implementation phase. Also, NAU is encouraged to monitor and evaluate the PharmD programme to assess the outcome and impact of the new didactic and experiential curriculum.

Conclusion

The authors have described the dynamics of capacity-building and collaborative development of a new PharmD curriculum at NAU. The Fellow's collaboration and capacity building were instrumental in advancing

and strengthening NAU's pharmaceutical education. The assessment of needs and the evaluation of academic staff (lecturers and preceptors) willingness and readiness for change from BPharm to PharmD was carried out. This step was followed by an exploration of the gaps between the teaching and curriculum of BPharm and PharmD programmes, and then brainstorming and seminar sections to bridge the gaps. The course contents, scopes, and descriptions were modified to align with the global trends in clinical pharmacy practice and FIP Goals of academic capacity and sustainability in pharmacy education.

The new PharmD curriculum was developed by integrating the syllabi and content of courses from the curricula of selected institutions in the United States of America into the traditional BPharm curriculum, which was aligned with the British framework. This work resulted in the introduction of outstanding clinical content while retaining the product-oriented framework of the BPharm programme for balanced and robust outcomes. Provisions and frameworks have been made for periodic follow-up and exchange programmes with international partners to consolidate the training of faculty, preceptors, and students while promoting the development of specialisations and sub-specialities. The NAU PharmD programme is ready to launch.

Conflict of interest

The authors certify that they have no actual or potential conflicts of interest to declare regarding the subject matter discussed in this manuscript.

Contributions

Both authors contributed to the writing and reviewing of the manuscript. Dr Nonyel conceived the ideas and concepts of the project and contributed to the majority of the manuscript writing and revision. Dr Ogbonna contributed to the writing of the sections of the manuscript specific to the Nigerian universities and confirmed the details regarding the host institution, NAU. Both authors read, revised, and approved the final version of this submission.

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