Using Blended-Learning Approach to Improve Education on Antimicrobial Stewardship for Healthcare Providers in Abia State (Nigeria): Study Protocol

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ABSTRACT

Background: Antimicrobial resistance is on the rise in Nigeria and globally. Antimicrobial stewardship training programs for healthcare professionals are evidence-based and cost-effective means of curbing antimicrobial resistance. The purpose of this training is to understand the current landscape of antibiotics use in Abia State of Nigeria. The study also aims to develop and deliver antimicrobial stewardship training using a blended learning approach for health professionals and patent medicine vendors in Abia State Nigeria.

Methods: This study will involve health professionals who typically prescribe, dispense, or conduct tests on antibiotics, as well as students in relevant undergraduate programs. Participants will be recruited from Abia State, although the course is open to people from other parts of Nigeria. Patent medicine dealers in the 17 local government areas of Abia State will be recruited through their various organizations. Six modules of online courses lasting 6 weeks and a 3-day face-to-face will be organized and participants assessed using a series of pre and post-tests. scores.

Expected Results: We expect that health professionals and patent medicine vendors will have improved knowledge and competence in handling antimicrobials and make practice changes whilst also establishing antimicrobial stewardship programs in their localities.

Conclusion: This training will equip participants with requisite skills in the use of antimicrobial and reduction of antibiotic resistance in Abia State and Nigeria as a whole.

1.   Introduction

Globally and in Nigeria, there is an increase in the development of resistance to antibiotics by bacteria. Although resistance is a natural phenomenon of microbes, the rising prevalence and spread in recent years are largely due to inappropriate use of antibiotics both in health facilities and the community[1]. Factors that contribute to inappropriate antibiotics use in Nigeria include self-medication, patronage of over the counter (OTC) vendors, weak restrictions on antibiotics advertisement, and limited antibiotics-related knowledge among healthcare providers [2]. The impact of rising resistance includes the rising cost of treatment, increasing morbidity and mortality in the community. Infections with drug-resistant organisms are known to be associated with poor clinical, economic, and humanistic outcomes of drug therapy [3, 4]. Antimicrobial stewardship programmes (ASPs) can reduce antimicrobial resistance (AMR), but this practice is not common in Abia State, like the rest of Nigeria.

Antimicrobial stewardship programs (ASP) are evidence-based initiatives that seek to optimize antimicrobial prescribing and dispensing to improve individual patient care, reduce treatment costs and slow the spread of antimicrobial resistance [5, 6]. Most antibiotic stewardship programs currently operational in Nigeria are based in the teaching hospitals, whereas a significant proportion of antibiotics abuse occurs in the community through patent medicine vendors[3]. Conan et al[6] recommended that improving antimicrobial stewardship should include a multidisciplinary effort that takes into consideration the context where such a program will be implemented. It also recommends education and monitoring of the use of antibiotics as viable approaches to institutionalize antimicrobial stewardship. Given that Abia State is gradually developing a cancer control framework[7], it is important to establish a sustainable antimicrobial stewardship project to help protect cancer patients who often have lower immunity [8,9].

Also, blended learning has been proposed as a means of improving the competence of clinicians. This approach, which follows the tradition of self-directed learning in continuing medical education, involves the use of electronic (online) and face-to-face classes (e.g. workshops) to teach clinical concepts. This method is effective in several clinical areas including family medicine, orthopedics, breast cancer clinical pathway, and undergraduate medical education [10, 11]. This project intends to develop a blended-learning course that will train people who prescribe/dispense medications and undergraduate students in these disciplines in Abia State on antimicrobial use and to participate in an antimicrobial stewardship program in the state.

The Objectives of this research include:
1. To explore the current landscape in Abia State regarding the use of antibiotics (indications and common drugs used), among different categories of participants.
2. To develop a blended learning training course on antimicrobial stewardship (online and face-to-face), which will be tailored to the needs of the diverse audience.
3. To evaluate the impact of the course on the use of antibiotics through comparison between pre-course knowledge scores and post-course knowledge scores.

This research seeks to answer the following questions:
1. What is the current antimicrobial-related knowledge and pattern of antibiotics prescription and dispensing among the multidisciplinary professionals involved in antibiotics prescription and dispensing in Abia state?
2. To what extent does a blended learning approach impact knowledge about antimicrobials stewardship among prescribers and dispensers in Abia State?
3. What is the effect of blended learning intervention on the pattern of antibiotics use in Abia State, in terms of the appropriateness of antibiotics prescribed/dispensed for selected diseases?

2. Materials and methods

2.1 Study setting and participants
The study population will be drawn from Abia State, although it will be open to people from other parts of Nigeria. Abia State is in southeastern Nigeria, between latitude 4°49.30'N - 6°02'N and between longitude 7°08'E - 8°04'E. It has an estimated population of about 4 million spread across 17 Local Government Areas (LGAs). Like most Nigerian states, Abia lacks an organized antimicrobial stewardship program[3].

The target participants for this educational research include individuals who typically prescribe and/or dispense antibiotics in the Nigerian context. These include doctors, nurses/midwives, pharmacists, medical laboratory scientists, and patent medicine vendors in Abia state. Training will be extended to students in relevant professions (i.e. medicine, nursing, pharmacy, and medical laboratory science) in Abia State. Participants will be recruited through various professional organizations in Abia State, including the Nigerian Medical Association, Pharmaceutical Society of Nigeria, National Association of Nigerian Nurses and Midwives, Association of Medical Laboratory Scientists, as well as primary health care service providers in government health facilities.

These organizations have collaborated in previous educational interventions and usually mobilize their members through social media/networking sites (e.g. Facebook® and WhatsApp®). Patent medicine vendors will be recruited through the Department of Pharmaceutical Services Abia (State Ministry of Health), in collaboration with the National Association of Patent and Proprietary Medicines (NAPPMED). The professional organizations (e.g. Nigerian Medical Association) will be requested to allocate continuous professional education points to this course. Interested individuals will be required to register online or in-person for the course, at no charge.

2.2 Course Design
This course will use the blended-learning approach, comprising electronic and face-to-face workshops. The blended learning approach has been proposed in the extant literature as a means of improving the knowledge and

competence of healthcare providers [12-14]. This approach, which follows the tradition of self-directed learning in continuing medical education, involves the use of electronic and face-to-face classes to teach clinical concepts. This method is effective in several clinical areas including family medicine, orthopedics, and undergraduate medical education[11].

The online course (Appendix 1 and 2) will be divided schematically into 4 modules, which will run over 6 weeks. Course content will mirror standardized courses on the subject, such as those by the World Health Organization. Module 1 will focus on an introduction to the State Antimicrobial Stewardship Project while Module 2 will emphasize rational antibiotics use based on local guidelines). In the 3rd module, participants will be introduced to patient counseling relevant to antibiotics use (e.g. safer sex, cough hygiene, and handwashing). They will also be taught how to manage patient expectations when antibiotics are not needed. Module 4 will introduce antimicrobial stewardship and approach to the 2019 novel coronavirus (COVID-19). The workshop module will revisit the content of the previous modules. Participants will use standardized patients to practice essential counseling skills as well as collaborative care.

Meanwhile, participants will be grouped into each of 2 cohorts for both the online and workshop modules based on prescribers/dispensers (Doctors, Nurses, Pharmacists, and Technicians) and Testers (Medical Laboratory Scientists and Technicians). The online modules will be accessible using computers and mobile devices. This will require class interaction, quizzes, and reflective writing, to demonstrate mastery of course materials. It is estimated that participants will require about 3 hours to complete each online module, while module 4 will require about 9 hours; total contact will be about 24 hours per participant. Each of the online modules will run for about one week. These will consist of

presentations, videos, interactive simulations, and reference materials. It will be hosted online by Marjorie Bash College of Health Sciences and Technology. To enhance the course experience, we will supplement the online course with a WhatsApp chat group. This will help the course organizers to promptly address any technical challenges, as many of the potential participants may not be familiar with online learning platforms. Following the online modules, participants will be exposed to in-person workshops which will be focused on practical skills relevant to antimicrobial stewardship.

Patent medicine vendors will participate in the workshop only and their training curriculum (Appendix 3) will be modified to keep the content and scope appropriate to their education level while maintaining the objective. In the 6th week, there will be a face-to-face workshop to summarize the previous five modules and provide simulated, collaborative experience in developing antimicrobials stewardship programs. We will also provide an opportunity for participants to practice essential skills, such as antibiotics counseling, cough hygiene, and handwashing. They will also develop skills in collaborative antimicrobials stewardship. It is expected that the workshops will last three days. We will hold at least three different workshops, one for each senatorial district in the state. Also, this module will involve the evaluation of learning and course delivery, using standardized metrics.

2.3 Course Evaluation

A variety of strategies will be used to evaluate the various components of this project. Within the course modules, a series of pretests and post-tests measures will be used to access the knowledge gained by participants. It is expected that the average antibiotics-related knowledge score by all participants will rise above the 62.9% baseline score that was reported as in the Needs Assessment Survey (Figure 1).
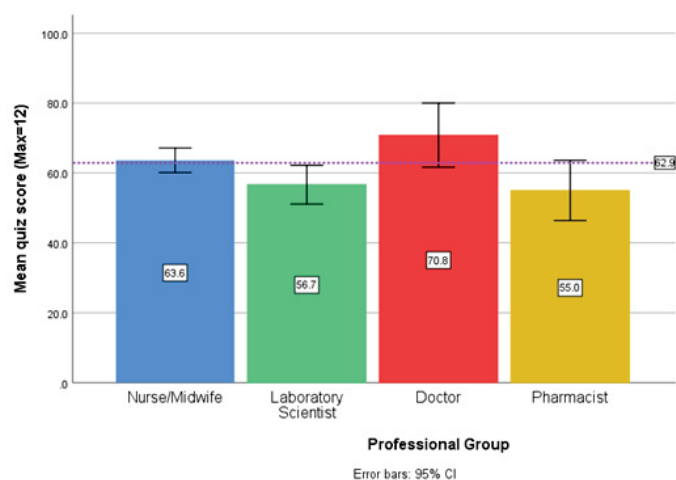

Figure 1 Performance on Antimicrobial Knowledge Quiz

Through the proposed surveillance of antibiotics use, we expect that the proportion of people who prescribe antibiotics for 'resistant malaria' will drop significantly from the current 22%. Essentially, we expect that there will be a positive relationship between participation in the course and improvements in objective knowledge gain regarding antimicrobial use ($p < 0.05$), measured through comparing pre-course and post-course test scores.

A post-course survey will be used to collect data from course participants regarding their satisfaction and perception of effectiveness regarding the course content. We will also hold focus group discussions with participants to further understand how the course might have been helpful, and how the antimicrobial stewardship program will be administered. As course participants will voluntarily join a WhatsApp chat group to facilitate course administration, discussions on this forum will be analyzed for common themes regarding course experience. Course evaluation questions will be adapted from existing resources that were developed and validated by Laks et al[28]. The impact of the course will be evaluated by monitoring antibiotics prescription and dispensing among participants for the first three months after the course, using self-reported data focusing on appropriateness of antibiotics use (e.g. proportion of people who prescribe antibiotics for 'resistant malaria').

Data will be analyzed using descriptive statistics, t-test, and analysis of variance to demonstrate baseline assessment and change in assessment after the course. Spearman's correlation coefficient will be used to compare trends in antibiotics prescription/dispensing before the start of the course and three months after course completion. Qualitative data will be transcribed and analyzed to identify common themes about course effectiveness and satisfaction. Results will show how the blended learning approach worked. Essentially, the quantitative data (pre/post tests) will describe the change in self-reported competence among the study sample, while the rich qualitative findings (focus groups) will illuminate the course experience. It is expected that over 70% of participants will report improved knowledge regarding antimicrobial stewardship, a medium effect size, after taking the course.

2.4 Ethical consideration

Ethics approval has been obtained from Abia State Ministry of Health. This research will not collect personal health information, outside of the study instrument. All potential participants will be informed of their right to withdraw from the study before joining the course.

Research data will be managed according to international standards. Although individuals who participate in the focus group discussion may not remain anonymous, pseudonyms will be assigned to protect their identity. We will ensure high ethical standards, including respect for human dignity; respect for free and informed consent; respect for vulnerable persons; respect for privacy and confidentiality; respect for justice and inclusiveness; and, balancing harms and benefits by minimizing harm and maximizing benefits.

3. DISCUSSION

The current COVID-19 pandemic has made it necessary for clinicians to rethink their approach to continuing professional education, especially considering physical distancing requirements [16,17]. This course would enhance the use of online platforms for continuing education. It is possible that the findings would change the current local approach to continuing professional education. Similarly, the multidisciplinary nature of the participants in the proposed course will hopefully promote interprofessional collaboration regarding antimicrobial stewardship. The need for interprofessional collaboration in Nigeria has been recognized as key to effective patient care[18].

Meanwhile, when this course is successfully executed it would provide more insight into the current landscape of antibiotics use among participants. It would also provide an opportunity for professionals, such as Pharmacists to collaboratively dissuade patent medicine dealers from their current abuse of antibiotics in Nigeria[2]. The proposed innovative use of an App to track antibiotics use would enable providers to institute local, data-driven, antimicrobial stewardship programs.

By the proposed use of self-reported data on prescription and dispensing of antibiotics by participants post this course. We will have made tracking of antimicrobial prescription, dispensing and usage in general easier. This will further afford the health community the avalanche of reproducible data for both research and policy changes.

There will be establishment of antimicrobial stewardship programs in the various parts of the state and other researchers will be able to leverage on this milestone to organize antimicrobial stewardship courses or research in the state and around the country.

4. EXPECTED RESULTS

The results from this study will potentially provide insight into the following issues:

- The current antimicrobial-related knowledge among the healthcare professionals (HCP) involved in antibiotics prescription and dispensing in Abia state
- The current COVID-19 related knowledge among HCP in the state, alongside their current pattern of antibiotics prescription and dispensing (i.e. use) in

Abia State

- The effect of blended learning intervention on the pattern of antibiotics use among prescribers and dispensers in Abia State, including the appropriateness of such use.

It is expected that there will be improvements in the participants' knowledge of antibiotics, prescription, dispensing and end usage, measured by comparing participants' quiz scores between the pre and post-tests.

5. CONCLUSION

This innovative study would be the first application of the blended learning approach in training clinicians on Antimicrobial Stewardship. It has the potential to reduce antibiotics resistance in Abia State and beyond. The findings from this study will be shared through other publications upon completion of the study.

Conflict of interest: We do not have any conflict of interest to declare.

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Appendix 1

Consolidated Course Outline for Doctors, Nurses and Pharmacists

Module	Topics (ABX=antibiotics)	Learning Objective	Duration
Welcome to Abia Antimicrobial Stewardship Project	● Welcome to Google Classroom ● Introduction to Abia Antimicrobial stewardship project ● Introduction to ABX resistance ● Professional roles in controlling resistance.	Understand the use of course platform and expectations Understand how antibiotics resistance develops, its impact, contributing factors as well as a practical approach to controlling resistance.	1 week
Module 2 Introduction to Antibiotics and Stewardship	● Basics of ABX therapy ● Introduction to rational ABX use ● Introduction to antimicrobial stewardship and Abia guideline ● How to use Spectrum Clinical Decision App (doctors, pharmacists & nurses)	Understand how antibiotics work as well as rational use Understand the concept of antimicrobial stewardship, how to structure local action for stewardship, including surveillance. Understand the local guideline for common infections.	1 week
Module 3 Antibiotics Counselling, Surveillance, and general infection control	● Essentials of ABX counseling ● Essentials of Infection prevention and control ● Surveillance for antibiotics use	Gain practical skills in providing relevant counseling as well as managing conflicts with patient expectations Understand ongoing data collection methods using the Bugs n Drugs App	1 week
Module 4 Introduction to COVID-19	● Management approach to Coronavirus disease 2019 (COVID-19 ● Infection control related to COVID-19	Understand how to approach the triage of patients to help isolate potential COVID-19 cases	1 week
Workshop	● Overview of the previous online modules ● Simulation of counseling ● Simulation of collaborative antimicrobial stewardship ● Simulation of triage, infection prevention & control for COVID-19 Demonstration of Apps ● Bugs n Drugs ● Spectrum	Practice skills that are relevant to antibiotics therapy and stewardship	1 day

Appendix 2
Consolidated Course Outline for laboratory Scientists

Module	Topics (ABX=antibiotics)	Learning Objective	Duration
Module 1 Welcome to Abia Antimicrobial Stewardship Project	• Introduction to course platform • Introduction to Abia Antimicrobial stewardship project • Introduction to ABX resistance • Professional roles in controlling resistance	Understand the use of course platform and expectations Understand how antibiotics resistance develops, their impact, contributing factors as well as tangible approach to controlling resistance.	1 week
Module 2 Introduction to antimicrobial susceptibility testing (AST)	• Overview of good laboratory practice and biosafety • Introduction to Antimicrobial Susceptibility Testing (AST) • AST by disc diffusion method • MIC by dilution & E test methods	Understand basics of performing and interpreting antimicrobial susceptibility testing of commonly isolated bacterial isolates, using different methods	1 week
Module 3 Interpretation, CLSI Guidelines ATCC Storage, Revival & Subculture	• AST by Chromogenic Agar • AST standards • Quality control strains • ATCC strains storage, revival and subculture guidelines	Understand the identification of pathogens from clinical specimen and reporting culture results	1 week
Module 4 Stewardship, Antibiograms and COVID-19	• Introduction to antimicrobial stewardship • Introduction to Antibiogram • Bugs n Drugs data collection and reporting of susceptibility • Infection control related to COVID-19 • Overview of Coronavirus Preparedness for Laboratory Personnel	Understand how to report data from culture in Abia. Also how to develop local a antibiogram. There is also content on how to manage laboratories in the era of COVID-19	1 week
Workshop	• Demonstration of use of ChromAgar Orientation • Demonstration of data collection using Bugs n Drugs App • Simulation of collaborative antimicrobial stewardship (how can we work together)	Practice skills that are relevant to antibiotics therapy and stewardship	1 day

	● Simulation of infection prevention & control for COVID -19		

Appendix 3

Special curriculum for patent medicine dealers (one day)

Patent medicine dealers working in Abia State will be hosted to a one-day special workshop on antimicrobial stewardship. Details of the course curriculum are found below.

- Review of operating guidelines for patent medicine dealers in Nigeria
- Basic business management and records keeping for patent medicine dealers
- Approach to common conditions
  - Malaria (rapid testing, common drugs, side effects)
  - Acute respiratory infections (focus: discourage irrational use of antibiotics)
  - Diarrhoea
  - Reproductive health (focus on STIs to promote early referral)
  - Local referral network