Original Article

Role of Prospective Audit in Antimicrobial Stewardship at the Surgery Department of a Tertiary Hospital in Lagos

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Abstract

Background: Prospective audit with intervention and feedback is one of the core strategies of antimicrobial stewardship. Goal is to preserve the current and future antibiotics against the threat of antimicrobial resistance, while improving patient safety and reducing healthcare costs. **Objective:** To perform a prospective audit of antimicrobial prescription and feedback as an antimicrobial stewardship strategy. **Methodology:** This audit was carried out in the Department of Surgery of a Teaching Hospital. Data were gathered from patients' clinical records. Each filled checklist was analyzed, and recommendations given based on the antibiotic guidelines. These recommendations were communicated to the prescriber(s) through the head of the antimicrobial stewardship committee in surgery department. Compliance to recommendations and reasons for non-compliance were noted. **Results:** Of 655 prescriptions audited, 133 (20%) were for surgical prophylaxis, while 522 (80%) were for treatment. Community acquired infections accounted for 464 (89%) of the treatment while those acquired in the hospital were 58 (11%). Reasons for antibiotic were documented for 522 (80%), sample collection before antibiotics administration in 56 patients (21%) of which 32 (57%) antibiotics were de-escalated based on laboratory results. Stop/review dates were indicated only in 77 (15%) of the treatment prescriptions. Appropriate prescribing was observed in 323 (49%) of 655 prescriptions (53 of 133 antibiotics for surgical prophylaxis and 270 of 522 for treatment). **Conclusion:** The compliance rate to the consensual antibiotic guidelines is still below average. The areas of inappropriateness included wrong choice of antibiotic, prolonged use, too many antibiotics. Engaging the prescribers to identify the reasons for non-compliance with the guidelines is crucial to improve appropriate antibiotic prescribing.

Keywords: *Appropriate prescribing, antibiotic guidelines, prospective audit with intervention and feedback*

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Introduction

Antimicrobial stewardship program (ASP) is a coordinated intervention designed to improve and measure the appropriate use of (antibiotic) agents by promoting the selection of the optimal (antibiotic) drug regimens including dosing, duration of therapy, and route of administration.[1] The goal of antimicrobial stewardship is to preserve the current and future antibiotics against the threat of antimicrobial resistance, while improving patient safety and reducing healthcare costs.[2] There are two core strategies of antimicrobial stewardship: antimicrobial restriction and preauthorization, and prospective audit with intervention and feedback.[3] Antimicrobial restriction and preauthorization are a strategy in which the prescriber obtains approval for the use of specific restricted antimicrobial agents before prescription to ensure appropriate antimicrobial use.[2] It involves reduction of some selected antimicrobials which can only be used after approval by designated personnel.[4] Though it leads to reduction in antimicrobial cost and utilization,

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it causes loss of autonomy for prescribers and delay in antimicrobial administration.[5]

Prospective audit with intervention and feedback is a strategy by which appropriateness of antimicrobial is evaluated daily in terms of type, dosage, and duration of administration after prescription.[2] It is a strategy used to encourage clinicians to change clinical practice based on some criteria or standard in a structured manner.[4] Though prospective audit with intervention and feedback is labor-intensive, it is more easily accepted by clinicians as there is no loss of autonomy; there are also opportunities to educate prescribers through follow-up.[5] Data on ASP implementation are limited in Africa. (a) Only three countries (Kenya, South Africa, and Tanzania) had national action plan on antimicrobial resistance (AMR) and antimicrobial stewardship.[6] In Nigeria, significant inadequacies in availability of ASP were observed, necessitating the need for urgent action to reduce AMR rates in Nigeria.[7]

The objective of the study is to perform a prospective audit of antimicrobial prescription and feedback as an antimicrobial stewardship strategy.

Materials and Methods

Study area

This audit was carried out in the Department of Surgery of a Teaching Hospital in Nigeria. The hospital is a large tertiary health institution with over 950 admission beds and an average of 11,000 admissions annually. The surgery department has eight units, which includes the General surgery, Orthopedic surgery, Pediatric surgery, Cardiothoracic surgery, Neurosurgery, Urology, Burns and Plastic unit, and Ear, Nose, and Throat surgery. Ethical approval was obtained from the ethical and research committee of Lagos university teaching hospital on the 20th of June 2019.

The ASP began in the institution in year 2012 with the formation of the stewardship committee. Since then, there has been gradual integration of the program in the clinical departments of the hospital, with each department adopting prospective audit with intervention and feedback as their antimicrobial stewardship strategy. ASP began in the surgery department with setting up of the departmental committee members which consist of the head of each surgical units.

Study population

These included all inpatients in the surgery wards who had antibiotic prescriptions during the period of the study.

Study design

This prospective audit lasted for 5 months. It was done to assess the appropriateness of antibiotics prescribed. It was carried out using an audit checklist, which was developed from antibiotic guidelines of the surgery department and antibiotic policy of the hospital.[6,8]

Intervention

There were initial sessions of presentation and discussion at surgery department clinical meetings, where the surgeons were given detailed education on antimicrobial stewardship including the goals and method to be employed. The surgeons were duly informed of the audit before it started. The information was communicated to them through the head of surgery department, head of antimicrobial stewardship team in surgery, and the head of each surgical unit. Prior to commencing the audit, a pilot test was carried out for 2 weeks (between February 1 and February 14, 2021); this was to give room for proper planning and preparation and areas for correction after which the audit began on March 1, 2021.

All patients on antibiotic prescription were audited daily. The prescriptions (including new and changed) were reviewed by checking through the case notes and treatment charts of every admitted patient. With use of a checklist, prescriptions of both surgical prophylaxis and treatment were audited.

The checklist for surgical prophylaxis contained information such as name of surgical procedure, type of surgery, class of surgical wound, and surgical prophylaxis given including dose, frequency, and duration. For treatment prescriptions, quality indicators were type of treatment, use of biomarker, culture sample collection before commencing antibiotics, antibiotic de-escalation or modification with laboratory results, type of infection, antibiotic regimen, reason written in notes, and the stop/review date [Appendix].

Each filled form was given to a clinical pharmacologist in the stewardship team, who in turn checked the prescription(s) for appropriateness. Appropriateness was determined through reviewing for the right antibiotic, dose, frequency, route of administration, and duration. The recommendations made for those regarded as inappropriate were communicated to the prescribing surgeons through the head of the antimicrobial stewardship committee in the surgery department. For those who did not follow the recommendations, they were approached to find out the reason(s).

Data analysis

Data were imputed on the Microsoft Excel (2016 version). Statistical analyses were done using Statistical

Program for Social Sciences, SPSS version 25.0 (SPSS Inc. Chicago USA). Logistic regression was used to analyze *P* values.

Results

A total of 655 prescriptions (from 367 patients) were audited. The patients' ages ranged between 5 hours and 83 years with 223 (61%) males being the predominant gender. Ninety-four (26%) patients had prophylaxis, 269 (73%) treatment, and 4 (1%) cases had overlap of prophylaxis and treatment. Two hundred and twenty-seven surgical procedures were performed; for some of the surgeries, treatment was commenced before the procedures and continued afterward.

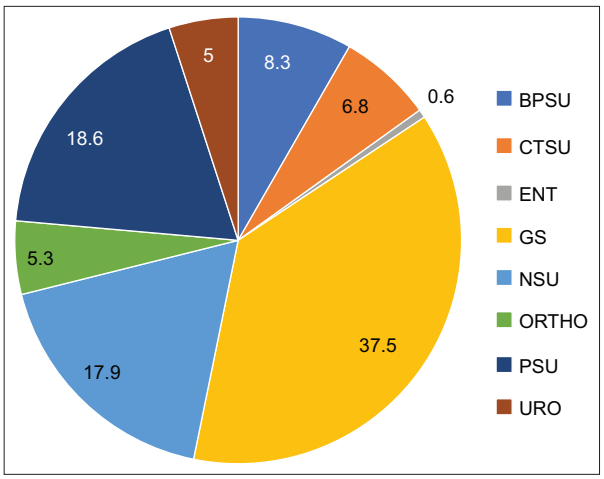

Figure 1: BPSU – Burns and plastic unit, CTSU – Cardiothoracic surgery, ENT – Ear, nose, and throat, GS – General surgery unit, NSU – Neurosurgery, ORTHO – Orthopedic surgery, PSU – Pediatric surgery, URO – Urology

Table 1: Antibiotics prescribed for surgical prophylaxis

Antibiotic	Frequency (%)
Ceftriaxone	41 (53)
Metronidazole	14 (18)
Vancomycin	12 (15)
Levofloxacin	5 (6)
Ceftazidime	3 (4)
Gentamicin	1 (1)
Amoxicillin/clavulanate	1 (1)
Amikacin	1 (1)
Total	78

Of the surgical prophylaxis, 65 (69%) patients were given one antibiotic, 28 (30%) had two antibiotics, and only 1 (1%) had three antibiotics. Also, just 2 (2%) of the patients took a single dose of prophylaxis, 19 (20%) patients had redosing of antibiotics within 24 hours, and 73 (78%) of them had antibiotics for more than 24 hours.

Prescription for community-acquired infections accounted for 464 (89%) of the treatment. Those acquired in the hospital were 58 (11%) with the majority from outside facilities accounting for 53% of the 58 prescriptions.

The observed quality indicators of antibiotic prescribing were reason-written notes in 522 (80%) of the prescriptions, empirical treatment accounting for 490 (94%). Only one treatment was based on biomarker (procalcitonin). Samples were collected before antibiotics were administered in 56 patients (21%), and de-escalation with laboratory results in 32 (57%) of them. Stop/review dates were indicated only in 77 (15%) of the treatment prescriptions.

Appropriate prescribing was determined based on choice of antibiotics, dose, route of administration, frequency, and duration of antibiotics (all according to guideline). Appropriate prescribing was observed in 323 (49%) of 655 prescriptions, 53 (40%) of 133 antibiotics for surgical prophylaxis, and 270 (52%) for treatment in 522 cases. The antibiotic most prescribed inappropriately was ceftriaxone, taking 53% of the surgical prophylaxis [Table 1]. It was also observed that E.N.T unit uses the same antibiotic (amoxicillin/clavulanate) for surgical prophylaxis and treatment, the same unit with the highest compliance rate [Figure 1]. The wrong choice of antibiotic as inappropriate prescribing was observed in 35% of the prescriptions [Table 2].

Table 2: Categories of inappropriate antibiotic prescribing, intervention, and acceptance rate of recommendations

Inappropriateness (Frequency)	Intervention (Frequency)	Compliance with intervention (%)
Wrong choice (211)	Change antibiotic (211)	89 (30.0)
Too many antibiotics (41)	Reduce number of antibiotics (41)	18 (29.0)
No de-escalation with laboratory results (6)	De-escalate antibiotic (6)	2 (40.0)
Antibiotic unnecessary (35)	Stop antibiotics (70)	39 (41.0)
Duration too long (39)	Reduce duration (4)	2 (40.0)
Wrong route of administration (0)		
TOTAL	332	151 (45.0)

Table 3: Reasons for noncompliance after intervention (*n*=181)

Reasons	Frequency (%)
Patient(s) seem to be doing well on already prescribed antibiotics	26 (14.0)
Lack of confidence in the infection control practices in the theater	28 (15.0)
Consultant preference for the patient	64 (35.0)
Surgical unit preference	48 (27.0)
No clear reason	15 (8.0)

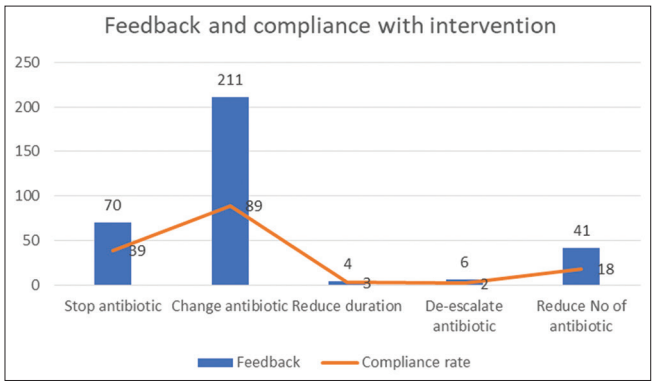

Figure 2: Feedback and compliance with recommendations

Discussion

Antibiotics are misused and overused a lot in surgery, especially for surgical prophylaxis. Surgical sites infections are not common after clean procedures, so there is usually no need for antibiotics in such cases; but studies show that despite this awareness, surgeons still give antibiotics (either prophylactic or continuous).[9] Most surgeons are aware of the problem of antimicrobial resistance, but they still underestimate it in the hospital.[10] Overprescribing (overuse, incorrect doses, incomplete doses) and inappropriate use of antibiotics contribute to emergence of AMR; hence, antimicrobial stewardship as a strategy to educate prescribers with emphasis on prudent prescribing is of utmost importance.[11] Since development of new antibiotics is not synchronous with the emergence of resistance, it is necessary that we preserve the few/limited antibiotics available to fight infections by reducing the rate of prescribing and irrational prescriptions.[12] There is a high prevalence of antimicrobial prescribing in Nigerian tertiary hospitals, with absence of guidelines, low reporting of a 'stop/review dates', and prolonged surgical prophylaxis in surgical wards.[13] Studies have shown that prospective audit and feedback can reduce the number of inappropriate antibiotic prescriptions.[14] This is to assist surgeons in promoting antibiotics stewardship through avoidance of prolonged courses of antibiotics, utilization of the narrowest spectrum of antibiotics, and the ability to ensure antibiotic de-escalation in a timely fashion. The study reviewed cases of antibiotic inappropriateness and feedback delivered directly to the surgeons with the goal of improving antibiotic use.

The compliance rate to the guidelines was only 45.7%, which was low; it may be because this is a new development for them, and some may find it difficult to make an instant change. The finding is like a study done in Ethiopia, and the compliance to guidelines for surgical prophylaxis was observed to be 13.7%; the noncompliance to guidelines was mostly attributed to wrong selection of antimicrobial agents.[15] Another cause of noncompliance is prolonged postoperative prophylaxis as observed by Satti *et al*.[16] The proper surgical prophylaxis compliance rate can be increased by continuously and actively educating and monitoring the prescribers (surgical resident doctors and consultants). Also, steps are currently being taken to ensure availability and regular supply of the recommended antibiotics.

Studies have shown the importance/advantage of compliance to treatment guidelines; a study showed that having a written guideline for the empirical treatment resulted in a significant increase in appropriate antibiotic use (through changing of prescription practice).[17] Another also showed that compliance with antibiotic guidelines was associated with improved survival among patients with community-acquired infections.[18] Implementing, educating, and monitoring treatment guidelines will have a major impact on patient care.

One of the reasons given for noncompliance to surgical prophylaxis given was lack of confidence in infection control practices in the theaters and on the wards [Table 3]. This can be solved by performing activities that reduce spread of hospital pathogens which are usually multidrug-resistant. The activities include periodic surveillance for multidrug-resistant organisms, regular auditing for hand washing compliance among healthcare workers, cleaning and decontamination equipment, and hospital environment.[19] In addition, appropriate isolation of infected or colonized patients and transmission-based precautions and timely removal of indwelling devices from patients when they are no longer required should be implemented.[19]

In addition, opposition from prescribers can serve as a hindrance and limitation to implementing antimicrobial stewardship.[4,20,21] There were some prescribers who had already preferred antibiotics; some gave it because they felt infection control was not adequate, while some had no reason for the choices [Figure 2].

Despite the reasons, it was possible to initiate antimicrobial stewardship in the hospital's surgical wards. Successful implementation of stewardship in surgery wards could be attributed to the fact that the necessary components for a workable and effective ASP were put in place.[22]

Limitations of the study

The study is only limited to one of the departments in the hospital and cannot be generalized or used to represent antibiotics stewardship in other departments in LUTH.

Conclusion

The prospective audit revealed the appropriateness of antimicrobial prescribing as well as compliance to recommendation rates as little less than 50%.

The areas of inappropriateness included wrong choice of antibiotics and too many antibiotics. The reasons for noncompliance were 'patients seem to be doing well on the prescribed antibiotic' and 'lack of confidence in the infection control practices.'

Though antimicrobial stewardship is a continuous program that requires timely auditing and feedback, it has been initiated in the surgery department. The compliance rates to the consensual antibiotic guidelines are still below average; 'wrong choice of antibiotic' is the topmost reason for inappropriate prescription. Attitudinal changes in approach to patient care by ensuring proper specimen collection for microbiology investigation in addition to or use of biomarkers before commencing antimicrobials in suspected cases of infection are necessary.

Recommendations

- Prospective audit with intervention and feedback to ensure compliance to the written antibiotic guidelines in the surgery department should be a continuous exercise.
- Periodic institutional monitoring and improvement in infection control practices in the hospital to boost confidence of the surgeons not to give prophylaxis when it is not required.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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Appendix

Antimicrobial stewardship Checklist for Surgery Department

Lagos University Teaching Hospital

1. Date of Admission:…… Patient ID:……
   Gender:…… Age:……
   Managing unit ……..
2. Admission Diagnosis:……
3. Date of surgical procedure ……..
4. Type of surgical procedure (a) Elective (b) Emergency
5. Was surgical prophylaxis given? Yes ( ) No ( )
6. If yes, which Antibiotics (with dose)……
7. Clinical diagnosis of infection Yes ( ) No ( )
8. Need for post-operative antibiotic? Yes ( ) No ( )
9. Post operative antibiotic(s) prescribed? Yes ( ) No ( )
10. If yes? Name (with dose)……..
    ……
11. Type of treatment? Empirical ( ) Targeted ( )
12. Is stop/review date of Antibiotic indicated? Yes No
13. Is the reason for the antibiotics written in the case note? Yes No
14. Was sample taken for culture before commencement of antimicrobial therapy? Yes No
15. Is choice of antibiotic prescription in compliance with the global antibiotic guidelines? Yes No
16. Is the reason for the antibiotic use written in the case note? Yes No
17. Was prescription based on biomarkers (CRP, Procalcitonin)/WBC done? Yes No
    If yes, which one?……
18. Was empiric antibiotic therapy de-escalated with lab result? Yes No N/A
19. Route of administration Antibiotic therapy IV Oral
20. Is IV therapy justified? Yes No
21. Was IV change to oral policy obeyed? Yes No N/A
22. Was an antibiotic prescription judged necessary? Yes No
    a. If no was the antibiotic(s) discontinued based on advice
    b. If yes, was the choice of antibiotic appropriate based on guideline? Yes No
23. If no to 22b, which alternative antibiotic was advised?……
    a. Was the antibiotic prescription changed based on alternative antibiotic advice? Yes No