

Report: Optimising Antimicrobial Use During the COVID-19 Pandemic in UK Acute Care Settings (2020-2024) – Insights from Three Sequential Studies

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Abstract

A research project was conducted at a UK acute care setting, from March 2021 to September 2023. It comprises three sequential studies: a systematic review identifying key antimicrobial stewardship (AMS) strategies, a patient record review highlighting shifts in antibiotic prescribing, and a healthcare professional survey. Our data showed the essential role of multidisciplinary teams (93%), increased inappropriate antibiotic prescribing from 16% to 20%, and significant pandemic-induced disruptions in AMS activities. Our research emphasizes the urgent need for strategic adaptations in AMS to address healthcare challenges, aimed at reducing the threat of antimicrobial resistance and preserving patient lives.

Keywords

Antimicrobial Stewardship, Antibiotic Prescribing, COVID-19 Impact, Acute Care Settings, Antimicrobial Resistance

Introduction

Investigating Antimicrobial Stewardship (AMS) prior to and during the COVID-19 pandemic is crucial for responsible antibiotic use and combating Antimicrobial Resistance (AMR) in secondary care settings [1, 2]. The pandemic has significantly altered healthcare practices, emphasizing the need for robust AMS strategies. From 12 March 2021 to 20 September 2023, our research offers an in-depth analysis of AMS and antibiotic prescribing through three sequential studies: a systematic literature review, a retrospective examination of patient records, and a prospective survey questionnaire. This project, undertaken at an English NHS Foundation Trust, addresses the escalating AMR crisis [1] – a global health concern leading to treatment failures and impacting patient safety [2]. By emphasizing AMS as a pivotal response to AMR, this research focuses on the critical aspects of antibiotic management – selection, dosing, and administration [3]. It acknowledges the added complexities introduced by COVID-19 to the ongoing AMR challenge [4], underlining the urgent need for collaborative efforts. This study not only enhances the academic understanding of AMS during a

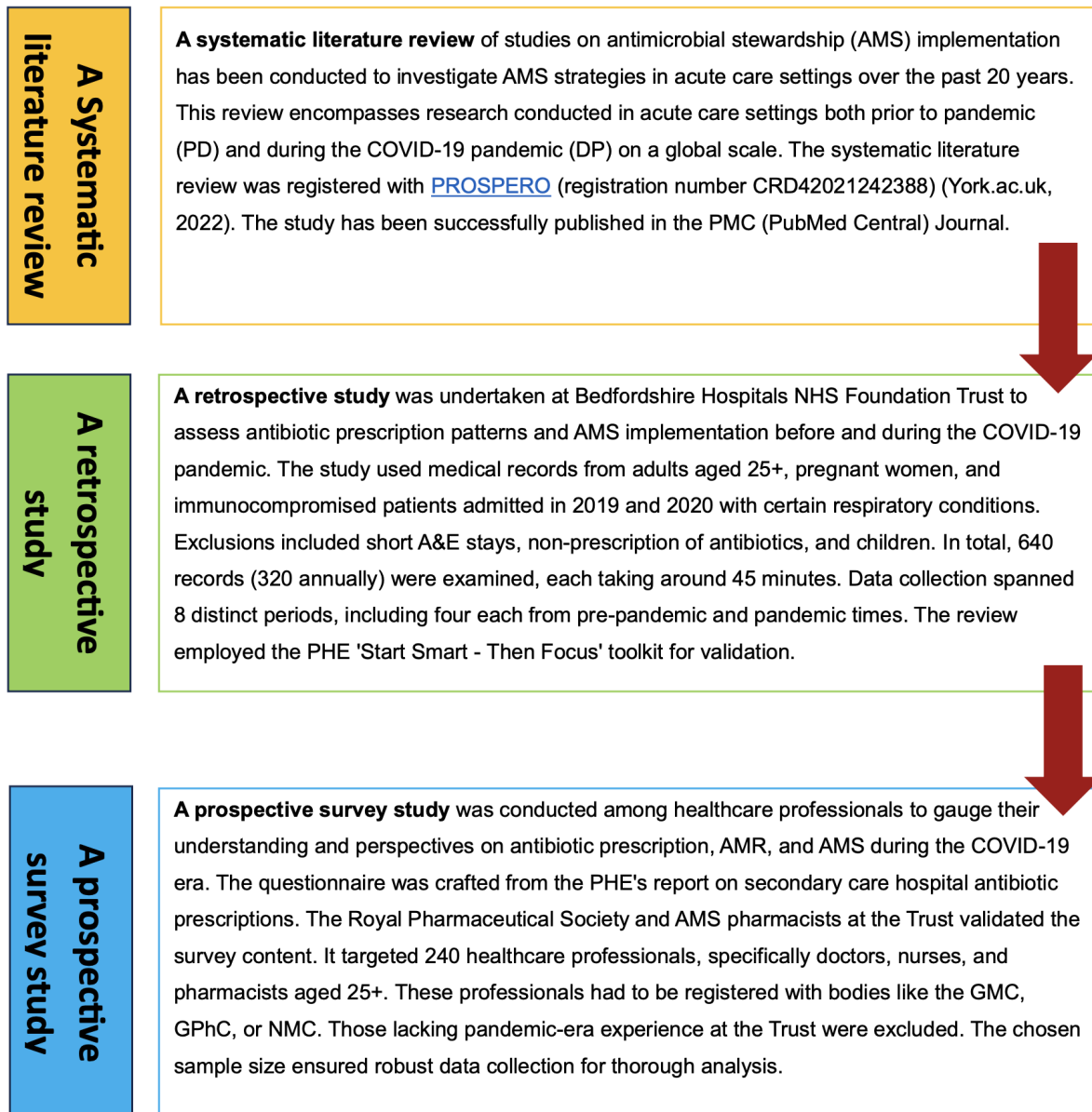
global health emergency but also guides future strategies for antibiotic use, AMS implementation and AMR mitigation in healthcare settings.

Materials and Methods

This research project encompassed three sequential studies, each pivotal in examining AMS and antibiotic prescribing in acute care settings during the COVID-19 pandemic. Initially, a comprehensive systematic literature review, registered with PROSPERO [5], analyzed global AMS strategies and measures spanning two decades, from 2000 to 2021, both prior to and during the pandemic [6]. Subsequently, a retrospective study was conducted at Bedfordshire Hospitals NHS Foundation Trust, focusing on assessing antibiotic prescribing patterns. In this phase, 640 patient records were analyzed, focusing on particular demographics, using a validated data extraction tool. This tool was developed based on the literature review and the "Start Smart, Then Focus" AMS Toolkit provided by Public Health England. [7]. Before undertaking the patient records review study, a pilot extraction involving 80 patient records was performed to ensure the validity and reliability of the data extraction tool. Given that AMS is a strategic approach to ensure the prudent use of antibiotics, a comprehensive evaluation of the impact of COVID-19 on AMS necessitates an immediate investigation into healthcare professionals' knowledge, attitudes, and perceptions regarding antibiotic prescribing during the pandemic. The final phase was a prospective survey targeting 240 healthcare professionals. This survey was designed to explore their knowledge, attitudes, and perceptions towards antibiotic prescribing, AMR, and AMS practices during the pandemic. Before launching the survey study, a pilot involving 50 participants was carried out to validate and confirm the reliability of the survey questionnaire. The data collected were analyzed using descriptive statistics in IBM SPSS, ensuring both reliability and validity of the survey. The insights from the survey have significantly contributed to the existing body of knowledge on AMS.

This research project is officially registered in the ISRCTN registry, and its findings are published in Octopus [8, 9]. Involvement of the public and patients was ensured by consulting with the Citizens Senate, which helped align the study with patient care concerns, ensuring its relevance and responsiveness.

Figure 1. Description of research methods, this research project consists of THREE sequential studies



Results

In the initial phase of the study, a comprehensive systematic literature review was conducted, retrieving 8,763 articles from various databases. From these, 13 full-text articles were selected based on the inclusion criteria for the review. The studies focused on AMS implementation, categorizing strategies into core and supplemental, along with AMS measures like BP and DP. This phase underscored the vital need for effective AMS, especially during the COVID-19 pandemic. The review highlighted the importance of a multidisciplinary team approach in AMS, evident in 93% of the reviewed studies. Prospective audits and feedback were prominent in 92% of the studies. Additionally, 77% included quality improvement initiatives, while antibiotic reviews, AMS education, and guideline implementation were featured in 69% of the studies, underlining their significance in AMS strategies and measures [6]. Tailoring AMS interventions to local resources and executing

proactive audits and reviews were especially effective during the pandemic. Implementing guidelines, establishing clinical pathways, and launching educational programs emerged as critical for the success of AMS [6].

The second phase of this research project entailed a detailed review of 640 patient records, focusing on antibiotic prescribing patterns for respiratory tract infections (RTIs), including pneumonia, during the years 2019 and 2020 at a UK acute care setting, NHS Foundation Trust. This phase, guided by the WHO's AWaRe classification, aimed to assess the pandemic's impact on antibiotic prescribing and AMS [10]. A significant portion of the study's participants, primarily aged 66-85 years, accounted for 48.8% in 2019 and 46.3% in 2020. Community-Acquired Pneumonia (CAP) was the most common diagnosis, affecting around 39.4% of patients prior to pandemic and 42.5% during the pandemic. The timing of antibiotic reviews post-admission usually occurred within 48-72 hours, with no notable difference between 2019 and 2020. However, the pandemic saw significant shifts in AMS interventions, such as 'Continue Antibiotics' and 'De-escalation', indicating changes in clinical decision-making. The usage of amoxicillin/clavulanic acid increased slightly, whereas azithromycin prescriptions rose substantially, reflecting a shift in prescribing trends. Despite these changes, the consumption of some antibiotics remained consistent [7].

In terms of evaluating the five rights of antibiotic safety, as defined by the Institute for Healthcare Improvement (IHI), this phase of the study also revealed an increase in inappropriate antibiotic prescribing without proper indication, rising from 16% in 2019 to 20% in 2020 [11]. Inappropriate routes of administration increased slightly, while inappropriate drug choice remained stable. Interestingly, inappropriate dosing rose, but inappropriate duration decreased slightly [12]. In terms of AMS participation, the involvement of pharmacists increased slightly, while that of physician decreased. However, combined collaboration among healthcare professionals showed a significant increase. These findings emphasize the evolving nature of antibiotic use during the pandemic and the critical role of robust AMS measures [12]. This phase reinforces the importance of integrating the AWaRe classification into prescribing decisions for enhancing patient safety and mitigating antibiotic misuse [7].

The last phase, this cross-sectional study, carried out between June and October 2023 within the same acute care setting, involved surveying 240 healthcare professionals (HCPs). The survey comprised 12 close-ended questions, developed based on the Public Health England (PHE) literature review focusing on behaviour change and antibiotic prescribing [13]. The survey results revealed that the majority of respondents were pharmacists (52%), with doctors (30%) and nurses (18%) following. The most represented age group was 32-41 years (40%), and a significant 86% of participants held postgraduate degrees. The findings showed a median knowledge score of 50.13%, indicating a moderate level of understanding regarding AMS and antibiotic prescribing practices. The study also highlighted the impact of COVID-19 on AMS activities, with notable disruptions in stewardship education (81.3%), ward rounds (74.6%), and audit feedback (70.0%). Interestingly, only a small

percentage (15.8%) observed a positive impact on multidisciplinary team meetings. For comprehensive results, please refer to Supplement Report 1.

Recommendations

This research project underscores the urgent necessity to address the escalating misuse of antibiotics, a situation exacerbated by the COVID-19 pandemic. Key recommendations include the formation of multidisciplinary AMS committees in each healthcare Trust and the regular update of local antibiotic guidelines informed by ongoing surveillance. It is crucial to conduct regular AMS ward rounds, enhance professional training, and establish connections across different healthcare settings. Further, integrating AMS measures into electronic systems and promoting AMS research are essential steps.

From an academic standpoint, embedding AMS in the curricula of both undergraduate and postgraduate healthcare disciplines is vital. This should be complemented by interprofessional education and dedicated AMS-focused registration programs. In clinical practice, appointing AMS leads, conducting frequent antibiotic reviews, and improving documentation practices are imperative. Aligning local antibiotic policies with updated guidelines and ensuring their accessibility are also critical.

Key research outputs include the development of an AMS Roadmap, a Dynamic Dashboard, and a comprehensive training program, all of which contribute significantly to the efficacy and implementation of AMS. These tools are particularly useful for adapting AMS strategies to overcome challenges posed by the pandemic. In the post-pandemic landscape, the role of pharmacists in AMS is highlighted as increasingly important. For detailed recommendations, refer to Supplement Report 1.

Future research directions should focus on assessing both the short-term and long-term impacts of AMS on a global scale, particularly in terms of clinical, economic, and resistance outcomes. This involves evaluating the effectiveness of AMS programs after their implementation, continuously updating antimicrobial medicine guidelines, and expanding surveys to capture diverse perspectives on antibiotic use.

Conclusion

This comprehensive study, encompassing a literature review, patient record analysis, and a healthcare professional survey, highlights the critical aspects of antimicrobial stewardship (AMS) during the COVID-19 pandemic. Key findings include the necessity of a multidisciplinary team approach in AMS (93%), the importance of audits and feedback (92%), and the role of quality improvement initiatives (77%). The review of 640 patient records at an NHS Foundation Trust revealed significant shifts in antibiotic prescribing, with a rise in inappropriate prescribing from 16% in 2019 to 20% in 2020. The survey of 240 healthcare professionals showed a moderate understanding of AMS (average score: 50.13%) and highlighted the pandemic's disruptive impact on AMS activities.

These results underscore the need for robust AMS measures, tailored interventions, and continuous education to enhance patient safety and mitigate antibiotic misuse. The study advocates for strategic, multidisciplinary approaches in AMS to effectively manage antimicrobial resistance in the evolving healthcare landscape.

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Author contributions. RE: Formal analysis, Investigation, Methodology, Validation, Visualization, Writing – original draft. NU: Supervision, Visualization, Writing – review & editing. ZA: Supervision, Visualization, Writing – review & editing.

Patient consent. The retrospective study did not require informed consent due to its nature.

Ethics approval. Ethical approval for this study was granted by the Health Research Authority (HRA), with the Research Ethics Committee (REC) assigning reference number 22/EM/0161. In compliance with this approval, the study protocol underwent review and received approval from the University of Hertfordshire (UH) ethics committee under the reference LMS/PGR/NHS/02975.

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