



local prescribing standards, especially regarding documentation of indication and duration. At the Princess Alexandra Hospital NHS Trust, antimicrobial guideline adherence audits from previous years revealed gaps in documentation and inconsistent review practices, particularly on medical wards with frequent staff turnover. A medical ward managing complex infections was selected for this audit to evaluate prescribing behaviors, measure compliance with Trust AMS standards, and assess whether pharmacist-microbiologist interventions could improve and sustain antimicrobial-prescribing practices across two audit cycles. The primary aim was to evaluate compliance with three antimicrobial prescribing standards: (1) adherence to Trust guidelines, (2) documentation of an indication, and (3) documentation of duration. The audit was conducted in two cycles, each consisting of baseline data collection, a structured intervention period with microbiology and pharmacy input, and post-intervention re-audit. The goal was to assess both the immediate and sustained impact of stewardship interventions on prescribing behaviors.

## Aim and Standards

### Aim

To measure and improve antimicrobial-prescribing compliance with Trust guidelines and documentation requirements.

### Standards

1. 100% of prescriptions should comply with Trust antimicrobial guidelines.
2. 100% should record a clear indication.
3. 100% should document a duration of antibiotics with a start and stop date.

### Methods

This prospective two-cycle clinical audit was conducted on a medical ward, a 28-bed acute medical ward at the Princess Alexandra Hospital NHS Trust, Harlow, United Kingdom. The first audit cycle was carried out from December 2022 to March 2023, and the second cycle from February to April 2024. Each cycle consisted of a 4-week baseline period, a 4-week pharmacist-microbiologist

stewardship intervention, and a 1-week post-intervention re-audit. All adult inpatients ( $\geq 18$  years) who received systemic antibiotics during the data collection periods were included. Prescriptions for prophylactic or topical antibiotics, or those started in other clinical areas before transfer to the medical ward, were excluded. A total of 335 antibiotic prescriptions were reviewed in cycle 1 and 348 in cycle 2.

Baseline data were collected by reviewing prescriptions by using the Electronic Prescribing and Medicines Administration (EPMA) system, medical notes in the electronic patient care record, and laboratory results in the Integrated Clinical Environment (ICE). All patients receiving systemic antibiotics during data collection windows were included. Intervention was carried out by a consultant microbiologist and an antimicrobial pharmacist by conducting regular AMS ward rounds, providing real-time feedback, correcting non-compliance, and educating prescribers to record indication and duration correctly on the EPMA system. Compliance with antimicrobial-prescribing standards - guideline adherence, documentation of indication, and documentation of duration - was assessed using a structured data-collection tool. The audit was registered locally with the Patient Safety and Quality Department (registration ID 4281).

### Results

A total of two complete audit cycles were conducted, each demonstrating marked improvement in antimicrobial-prescribing standards following pharmacist-microbiologist stewardship interventions.

In cycle 1, baseline compliance was 63% for guideline adherence, 79% for indication documentation, and 83% for duration documentation. Post-intervention, compliance rose to 83%, 92%, and 94%, respectively. In cycle 2, baseline performance again started at 63% for guideline adherence, but indication documentation had declined to only 25%, while duration documentation remained high at 90%. Following the repeated intervention, compliance improved to 85% (guideline), 69% (indication), and 92% (duration).

The intervention produced reproducible and sustained improvements across both cycles. Greatest relative gain occurred in indication documentation during cycle 2 (+44%), reflecting the effectiveness of direct feedback and

**Table 1.** Compliance outcome for antimicrobial prescribing standards during cycle 1 (December 2022-March 2023).

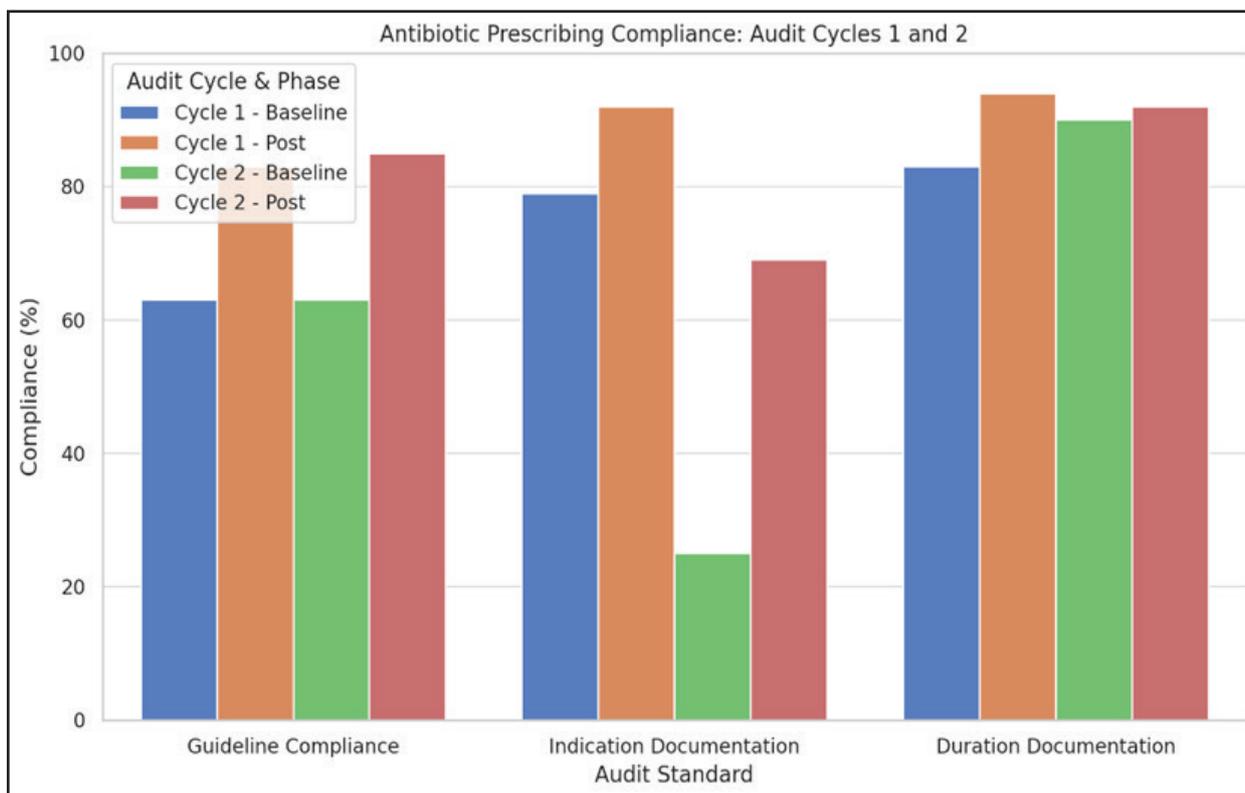
STANDARD	BASELINE (%)	POST-INTERVENTION (%)	IMPROVEMENT
Guideline compliance	63%	83%	+20%
Indication documentation	79%	92%	+13%
Duration documentation	83%	94%	+11%

Baseline and post-intervention compliance rates showing percentage improvement following pharmacist-microbiologist antimicrobial-stewardship ward rounds on the medical ward.

**Table 2.** Compliance outcomes for antimicrobial prescribing standards during cycle 2 (February-April 2024).

STANDARD	BASELINE (%)	POST-INTERVENTION (%)	IMPROVEMENT
Guideline compliance	63%	85%	+22%
Indication documentation	25%	69%	+44%
Duration documentation	90%	92%	+2%

Baseline and post-intervention compliance rates showing percentage improvement following pharmacist-microbiologist antimicrobial-stewardship ward rounds on the medical ward.



**Figure 1.** Comparison of antibiotic-prescribing compliance across audit cycles 1 and 2. Percentage compliance with guideline adherence, indication documentation, and duration documentation at baseline and post-intervention during both audit cycles, demonstrating reproducible improvement following pharmacist-microbiologist AMS ward-round interventions on the medical ward.

prescriber engagement in addressing previously identified gaps. Compliance outcomes for antimicrobial prescribing standards are shown in Tables 1 and 2. Comparative results from both cycles are illustrated in Figure 1, which shows improvement in all three audit standards following interventions in both cycles, with the greatest relative gain observed in indication documentation during cycle.

### Action/Discussion

This audit demonstrated reproducible improvement in antimicrobial-prescribing compliance following structured pharmacist-microbiologist interventions. The findings confirm that ward-based stewardship activity can effectively enhance guideline adherence, documentation of indication, and duration of therapy. The magnitude of improvement observed - particularly in indication documentation - aligns with previous multicenter evaluations showing that targeted feedback and pharmacist

engagement are among the most effective AMS interventions in hospital settings [5,9].

In both audit cycles, compliance with guideline standards increased by more than 20%, and documentation indicators improved substantially after focused stewardship input. These outcomes are comparable to results from national audits in England and Scotland that reported 10%-25% improvement following structured AMS ward rounds and prospective audit-and-feedback initiatives [5]. The decline in baseline compliance at the start of cycle 2 reflects the high turnover of junior medical staff and highlights the necessity of embedding stewardship education within clinical induction programs - a recommendation also emphasized by Dyar et al. [9], who identified training and sustained leadership as key to maintaining AMS gains.

To sustain and expand these gains, a structured stewardship plan has been implemented. Consultant

microbiologists and antimicrobial pharmacists now conduct daily multidisciplinary AMS ward rounds that review patients receiving antibiotics in real time, ensuring appropriate indication, antibiotic choice, duration, intravenous-to-oral switch, and culture result follow-up. Mandatory fields for indication and planned review or stop date have been incorporated into the electronic prescribing system, prompting prescribers to review therapy within 48-72 hours. Antimicrobial-stewardship principles and guideline access are embedded in junior-doctor induction, pharmacist education, and for locum doctors to maintain awareness and accountability.

Audit findings and learning points are discussed within AMS group meetings, and examples of safe and effective prescribing are shared to reinforce good clinical practice. Future work will include the development of ward-specific feedback dashboards and the expansion of stewardship monitoring across other clinical areas to maintain compliance above 90%.

This single-ward audit with short follow-up limits generalizability, and longer-term sustainability of improvements remains to be evaluated. Future work includes expanding stewardship interventions Trust-wide and conducting longer-term audits to sustain and monitor compliance.

Overall, this audit supports evidence from international studies showing that multidisciplinary, feedback-based AMS interventions lead to measurable improvements in prescribing quality [5,6,9,10]. This integrated approach has transformed AMS from a project-based initiative into a routine element of daily clinical care, integrating stewardship principles throughout the organization. Embedding stewardship activities within routine care not only optimizes antibiotic use but also strengthens patient safety, reduces the risk of AMR, and promotes a culture of continuous improvement within the hospital setting.

### What's New?

This study presents a two-cycle ward-based AMS audit demonstrating measurable and reproducible improvement in antibiotic guideline compliance within a district general hospital.

It integrates real-time electronic prescribing data (JAC, Nervecentre, and ICE) to target feedback and guide stewardship actions.

The project used a joint microbiology-pharmacy intervention model, showing that regular ward-round engagement maintains prescribing standards despite staff turnover.

It highlights a sustainable, scalable framework for embedding AMS practice into daily clinical workflow - providing a practical example of how to operationalize the Start Smart - Then Focus strategy at the ward level.

### List of Abbreviations

AMR antimicrobial resistance  
AMS antimicrobial stewardship

EPMA Electronic Prescribing and Medicines Administration  
ICE Integrated Clinical Environment

### Conflict of interest

The authors declare that they have no conflict of interest regarding the publication of this article.

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None.

### Ethical approval

Registered audit ID 4281. No patient-identifiable data used.

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### References

1. World Health Organization. Global action plan on antimicrobial resistance. Geneva: WHO; 2015.
2. Public Health England. English surveillance programme for antimicrobial utilisation and resistance (ESPAUR) report 2020. London: PHE; 2020.
3. National Institute for Health and Care Excellence (NICE). Antimicrobial stewardship: systems and processes for effective antimicrobial medicine use (NG15). London: NICE; 2015.
4. Pulcini C, Binda F, Lamkang AS, Trett A, Charani E, Goff DA, et al. Developing core elements and checklist items for global hospital antimicrobial stewardship programmes: a consensus approach. *Clin Microbiol Infect*. 2019;25(1):20–5. <https://doi.org/10.1016/j.cmi.2018.03.033>
5. Davey P, Marwick CA, Scott CL, Charani E, McNeil K, Brown E, et al. Interventions to improve antibiotic prescribing practices for hospital inpatients. *Cochrane Database Syst Rev*. 2017;2(2):CD003543. <https://doi.org/10.1002/14651858.CD003543.pub4>
6. Rawson TM, Moore LSP, Castro-Sánchez E, Charani E, Davies F, Satta G, et al. Antimicrobial stewardship: from specialised programs to the entire health care system. *Clin Microbiol Rev*. 2017;30(1):171–201.
7. Charani E, Ahmad R, Tarrant C, Bonetti D, Stanton N, Sevdalis N, et al. Opportunities for system-level improvement in hospital antimicrobial prescribing: a multisite qualitative investigation. *BMJ Open*. 2021;11:e045304.
8. Howard P, Pulcini C, Levy Hara G, West RM, Gould IM, Harbarth S, et al. An international cross-sectional survey of antimicrobial stewardship programmes in hospitals. *J Antimicrob Chemother*. 2015;70(4):1245–55. <https://doi.org/10.1093/jac/dku497>
9. Dyar OJ, Huttner B, Schouten J, Pulcini C; ESGAP (ESCMID Study Group for Antimicrobial stewardship). What is antimicrobial stewardship? *Clin Microbiol Infect*. 2017;23(11):793–8. <https://doi.org/10.1016/j.cmi.2017.08.026>
10. Huttner B, Harbarth S. Antimicrobial stewardship and the evolution of clinical microbiology. *Clin Microbiol Infect*. 2019;25(10):1221–3.