

EDITORIAL

THE LABORATORY MUST DO MORE THAN REPORT RESISTANCE: REIMAGINING ITS ROLE IN ANTIMICROBIAL STEWARDSHIP

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Dear Editor,

Antimicrobial resistance (AMR) is often described as a prescribing problem. Physicians prescribe antibiotics, pharmacists dispense them, and patients use them. Yet one of the most important players in antimicrobial stewardship is sometimes left at the edge of the discussion: the diagnostic laboratory. In many hospitals, the laboratory identifies the organism, performs antimicrobial susceptibility testing, releases the report and considers its job complete. In the era of AMR, this passive model is no longer enough.

The scale of the problem demands a different approach. The World Health Organization (WHO) reported that approximately one in six laboratory-confirmed bacterial infections causing common infections worldwide in 2023 was resistant to antibiotic treatment. Resistance increased in more than 40% of the pathogen-antibiotic combinations monitored between 2018 and 2023.¹ The laboratory therefore sits at a critical point between the emergence of resistance and the clinical decisions that determine whether antimicrobial pressure is increased or reduced.

A susceptibility report is valuable only if it leads to the right decision. A perfectly accurate report that arrives too late, contains unnecessarily broad treatment options, or is interpreted without local resistance data may have limited influence on patient management. Laboratories should therefore move beyond simply documenting resistance to actively

supporting the decisions that follow it. This begins even before a specimen reaches the laboratory. Diagnostic stewardship means ensuring that the right test is performed for the right patient, at the right time, and that its result is used appropriately. WHO has emphasized diagnostic stewardship as an integral component of both AMR surveillance and patient management.²

More recently, the WHO AMR Diagnostic Initiative has placed laboratory capacity and appropriate diagnostic use at the centre of efforts to improve antimicrobial stewardship, infection prevention and surveillance.³

Poor diagnostic practices can themselves drive inappropriate antimicrobial use. Cultures collected after antibiotic initiation, contaminated blood cultures, inappropriate urine cultures and inadequate specimens may produce misleading or uninterpretable information. The consequence may be prolonged empirical therapy or unnecessary escalation to broader-spectrum antibiotics. Laboratory professionals should therefore engage with clinical teams on specimen selection, collection and interpretation rather than functioning only as recipients of specimens.

Diagnostic stewardship is increasingly recognized as a core responsibility of modern clinical microbiology laboratories.⁴ What happens after testing is equally important. Antimicrobial susceptibility reports should not simply present every antibiotic

tested. The way results are reported can influence prescribing behavior. Selective or cascade reporting allows laboratories to prioritize appropriate narrower-spectrum agents and withhold broader-spectrum options unless they are clinically indicated or resistance to preferred agents is detected. Current susceptibility-testing approaches specifically recognize selective and cascade reporting as tools that laboratories and antimicrobial stewardship teams can adapt to local needs.⁵ This does not mean that laboratories should prescribe treatment. It means that laboratory reports should be designed to support responsible prescribing. Such policies should be developed collaboratively by microbiologists, pathologists, infectious disease specialists, pharmacists and other members of the antimicrobial stewardship team. A report is not a neutral document. The order in which antibiotics appear, which agents are suppressed or released, and whether an unexpected resistance pattern triggers direct communication can all affect the next clinical decision.

Timeliness matters as much as content. Critical resistance findings should not remain unnoticed in an electronic laboratory system. Detection of carbapenem resistance, methicillin resistance, vancomycin resistance or other epidemiologically important patterns may require rapid communication to both the treating team and infection prevention personnel. Laboratories can also identify unusual clusters before individual clinical teams recognize that an outbreak may be developing. In this setting, the laboratory becomes an early warning system rather than merely a testing facility.

Perhaps the most underused laboratory resource is not an individual culture result but the thousands of susceptibility results accumulated over time. When

these data are transformed into reliable cumulative antibiograms, they can guide empirical antibiotic choices before an individual patient's culture result becomes available. Unit-specific or specimen-specific resistance patterns may provide even greater value where sufficient data exist. Local prescribing guidelines developed without local microbiological evidence risk becoming generic documents with little relevance to the hospital in which they are applied.

This issue is particularly important in Pakistan. The country's National Action Plan for Antimicrobial Resistance 2.0 (2024–2028) acknowledges important implementation gaps. It notes that facility-based antimicrobial stewardship programs have not been widely implemented and identifies limitations in surveillance and diagnostic capacity. The plan also identifies the lack of a national antibiogram and calls for facility-specific antibiotic-use guidelines in tertiary care that take local antibiograms and the WHO AWaRe framework into account.⁶

These priorities provide an opportunity for laboratories to assume a much stronger institutional role. Every tertiary-care hospital does not need the most expensive molecular platform before it can begin meaningful stewardship. A laboratory with reliable organism identification, quality-assured susceptibility testing, appropriate specimen practices and organized data can already contribute considerably. Studies from low- and middle-income countries show that lack of microbiology support and unreliable institutional antibiograms are important barriers to antimicrobial stewardship, while prompt laboratory support and accessible local antibiograms facilitate its implementation.⁷

The solution therefore cannot be limited to purchasing more equipment. Laboratory strengthening must

also mean better use of the information laboratories already generate. Hospitals should expect their laboratories to produce and regularly update antibiograms, communicate priority resistance patterns, participate in antimicrobial stewardship committees, support the development of empirical treatment guidelines, educate prescribers about interpretation of susceptibility results, and contribute data to local and national AMR surveillance.

At the same time, this expanded role requires investment in laboratory quality. Poor-quality susceptibility data can be more harmful than no data at all. Standardized methods, internal quality control, external quality assessment, competent personnel and consistent interpretation of antimicrobial susceptibility testing remain fundamental. Surveillance systems are only as reliable as the laboratories contributing to them. There is also a need for a cultural change within laboratory medicine. Laboratory professionals should see themselves not simply as generators of numbers and reports but as partners in clinical and public-health decision-making. Likewise, clinical teams must view the laboratory as a source of expertise rather than a distant service department. Antimicrobial stewardship works best when laboratory information enters the clinical conversation early enough to change management. The battle against AMR will not be won by discovering resistance after it has occurred. It will depend on how effectively resistance data are converted into action. Every culture result can inform one patient's treatment. Every antibiogram can inform hundreds of prescribing decisions.

Every unusual resistance pattern can provide an early warning to a hospital or surveillance network.

The laboratory must therefore do more than report that resistance exists. It must help ensure that the information changes what happens next.

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