Unlocking the Value of Rapid Diagnostic Tests in Combating Antimicrobial Resistance

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In his influential 2016 report on antimicrobial resistance (AMR), Lord Jim O'Neill said: "I find it incredible that doctors must still prescribe antibiotics based only on their immediate assessment of a patient's symptoms, just like they used to when antibiotics first entered common use in the 1950s". He boldly advocated for a change, stating that by 2020, it should be mandatory to employ rapid diagnostics before prescribing antibiotics. Despite his strong appeal, the reality in 2023 remains disheartening: nearly half of global antibiotic treatments lack a proper diagnosis, often leading to the use of incorrect drugs.

Empowering precision in infection management

Central to effective infection management is antimicrobial susceptibility testing (AST), a cornerstone of personalised and precision approaches to antibiotic prescribing. By determining the susceptibility of bacterial pathogens to specific antibiotics, AST empowers healthcare professionals with the information they need to make informed decisions. Moreover, AST serves as a valuable tool for assessing the efficacy of infection control measures, ultimately leading to improved patient outcomes and saving lives.

However, while AST platforms offer considerable value to clinical diagnostic microbiology laboratories, they bring significant challenges. Cost, relatively long time-to-result, and lack of automation hinder their broader utilisation. Notably, the European Congress of Clinical Microbiology and Infectious Diseases (ECCMID) in Copenhagen this year showcased a wave of innovative rapid AST solutions, highlighting a growing interest and advancements in this field.

Critical role of rapid diagnostics in battling bloodstream infections and AMR

The impact of rapid diagnosis becomes particularly apparent in the context of bloodstream infections (BSIs). Even a minor delay in treatment can trigger severe consequences, rapidly escalating to life-threatening sepsis. BSIs stand out as a major infectious syndrome that significantly contributes to the global burden of antimicrobial resistance. As per 2019 data, these infections accounted for a staggering 2.91 million deaths worldwide, with around 13% directly attributable to AMR and 40% associated with it.

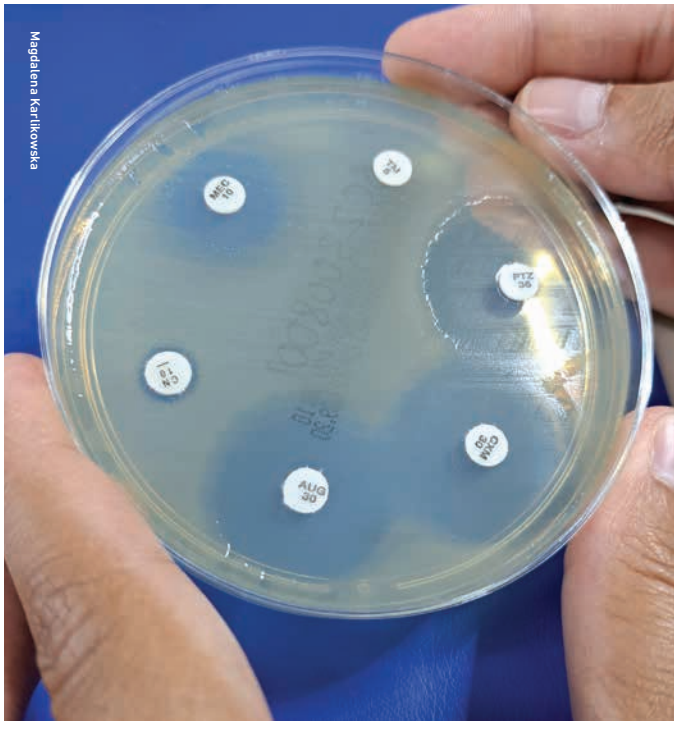
Yet, establishing effective antimicrobial stewardship practices for BSIs and sepsis poses considerable challenges. The lack of rapid and accurate diagnostics, coupled with the severity of these infections, often results in patients receiving suboptimal therapy, such as empirical broad-spectrum antibiotics. Addressing these challenges, the Antibiotic Review Kit introduced in 2019 focuses on expediting antibiotic review within 72 hours and facilitating treatment revisions or cessation. The timely availability of AST results is pivotal in implementing such change. Rapid access permits quicker adjustments in treatment, including de-escalation to narrow-spectrum agents, which reduces the impact on the patient's microbiome and minimises selective pressure for AMR spread. Indeed, the clinical importance of diagnosing bloodstream infections led NHS England to call for improvements in the diagnostic pathway earlier this year.

Reimagining AMR strategy evaluation: harnessing the power of rapid diagnostics

The journey towards improved sepsis management necessitates collaboration across healthcare professionals, diagnostic laboratories, researchers and technology developers. Partnerships that stimulate innovation and involve clinicians in early developmental stages ensure diagnostic tools closely align with clinical needs.

However, the challenge extends beyond technology innovation: the funding landscape for diagnostics poses a significant hurdle. Adequate funding must be allocated to support the implementation and maintenance of these diagnostic tools. Researchers and policy-makers must collaborate to quantify the costs of antibiotic resistance, providing a basis for necessary funding to preserve antibiotics for future generations.

To fully capture the benefits of diagnostic strategies and assess the value of interventions against AMR, economic evaluations must go beyond traditional approaches. They should consider not only immediate health gains but also the future health outcomes of those infected by resistant pathogens or receiving alternative treatments due to increased resistance. This broader perspective offers a better understanding of rapid diagnostic test value in preventing AMR and its impact on public health.



Furthermore, the selection of appropriate health outcome measure remains a challenging task. Economic evaluations of AMR containment strategies require measures that offer valuable insights for global health prioritisation. Alternatives such as the Disability-Adjusted Life Year (DALY) and cost-benefit analysis (CBA) can help in this regard. DALY captures the disease burden, whilst CBA offers a comprehensive assessment of individuals' willingness to pay to avoid resistant infections or secure future treatment benefits. Adopting a broader societal perspective in economic evaluations is crucial, including long-term indirect costs. This approach provides a comprehensive understanding of the economic impact of AMR containment efforts.

Moreover, economic evaluations must stretch beyond short-term direct health effects. They should factor both direct and indirect costs across adequate time horizons, acknowledging that the implications of AMR accumulate over the long term and need to be included in the evaluation process. Lastly, considering how people value time matters for tacking AMR strategies. Divergent time preferences – some prioritising the future, others focusing on the present – can significantly impact decisions like antibiotic use. For example, some people choose to use antibiotics carefully to safeguard their effectiveness for the future, while others want to use them immediately. Understanding these perspectives helps create better solutions for addressing AMR.

Recent guidance from the National Institute for Care and Health Excellence (NICE) provides a thought-provoking lesson, introducing an innovative model to assess the value of new antimicrobials. Alongside direct health benefits, it includes elements like insurance, diversity, transmission and enablement. Applying this approach to rapid diagnostics has the potential to drive transformative benefits across the healthcare landscape.

Firstly, rapid diagnostics can function as an insurance policy against inappropriate treatment by precisely identifying resistant infections. Additionally, rapid diagnostics respond to diverse patient requirements, offering personalised treatment plans. Recognising that various infections may require distinct antimicrobials, these tests quickly pinpoint exact pathogens, enabling optimal interventions. By facilitating timely infection control measures, rapid diagnostics prevent the further transmission of infectious agents. This reduces the spread of infections within healthcare settings and the community, thus alleviating the overall burden of disease. Lastly, the integration of rapid diagnostics provides healthcare practitioners with real-time information, facilitating well-informed decisions. This rapid access to accurate results enables clinicians to promptly administer targeted treatments, enhancing patient outcomes and reducing reliance on broad-spectrum agents.

As AMR continues to pose global challenges, maximising the value of rapid diagnostics becomes very important to control its spread. Collaboration, innovative financing, comprehensive evaluation and understanding diverse time preferences will be the bedrock on which effective solutions are built, ultimately safeguarding public health and economies.

Further reading

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Biography

As the CEO of Cytecom, a University of Warwick spinout, Magdalena is leading the development of an innovative diagnostic test that shortens the time for targeted antibiotic therapy selection from days to minutes. She holds a PhD in microbiology and has 9 years of academic and industrial research experience with a special interest in tuberculosis and clinical diagnostics.

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