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Rapid Diagnostics in Antimicrobial Stewardship: Present and Future Opportunities

Ennevia Ommations*

Primary Healthcare Research Unit, Memorial University of Newfoundland, Canada

***Corresponding author:**
Ommatins Ennevia

Ennevia.o@phr.mu.ca

Primary Healthcare Research Unit, Memorial University of Newfoundland, Canada

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Abstract

Rapid diagnostic technologies (RDTs) for infectious diseases (ID) have risen in popularity and development over the last several years. The goal of these platforms is to detect causal bacteria faster and target antimicrobial therapy sooner, resulting in better patient outcomes. Rapid diagnostic testing (RDT) can identify infectious organisms quickly and accurately, and it's an important part of antimicrobial stewardship (AMS) programmes. However, in Asia Pacific, their use is less common than in Western countries. Costs might be exorbitant, especially in areas with limited resources. Differentiating bacterial from viral infections and identifying regionally relevant tropical diseases will require a targeted approach, maybe focused on the commencement of antimicrobials. More data on RDT use in AMS is needed across Asia Pacific, with an emphasis on the effects on antimicrobial usage, patient morbidity and death, and cost effectiveness. Furthermore, regional consensus statements to guide clinical practise are necessary in the absence of explicit guidelines. These will include a regionally applicable definition for RDT, a deeper understanding of its function in infection management, advice on implementation and overcoming challenges, and recommendations for maximising human resource capacity. The outcomes of AMS programmes should improve as a result of resolving these challenges.

Keywords: Rapid diagnostic testing (RDT); ID; Antimicrobials; Healthcare

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Introduction

RDT procedures allow for the rapid and precise identification of infectious organisms as well as the assessment of antibiotic susceptibility. RDTs could thus be an important part of the multimodal antimicrobial stewardship (AMS) programmes' coordinated actions. Despite the expanding availability and scope of these technologies, no global or regional agreement on what defines an RDT exists at this time. Even the meaning of 'fast' in this context hasn't been established yet. Any suitable diagnostic tests that could produce results within 24 hours were included in a year of meta-analysis [1]. However, because throughput times have decreased, more stringent criteria may now be required. RDTs should be able to provide data to clinicians in 4-6 hours at the most. If this isn't possible, results delivered within 24 hours may suffice. Before the second dosage of antibiotic is given, results from a preferred RDT can be used to guide treatment. Peptide nucleic acid fluorescent in situ hybridization (FISH), matrix-assisted laser desorption/ionization–time of flight (MALDI-TOF) mass spectrometry, polymerase chain reaction (PCR), nanoparticle probe technology, lateral-flow enzyme-linked immunoassays (ELISA or LFA), nuclear magnetic resonance, and computed tomography are all examples of technologies that could be included in this definition [2]. Depending on the exact technology employed, an RDT's definition should be independent of where the test is performed, which could be close to the patient (perhaps at the bedside) or far away (an offsite laboratory). Furthermore, while different technical platforms may be called RDTs, any definition should include the identification of nonbacterial pathogens as well as bacterial species to help limit unnecessary antibiotic use. Furthermore, RDT implementation must be customised to the specific situation, especially in the Asia Pacific area, which includes countries with varying degrees of economic development and a diverse range of infectious diseases. High specificity and the technology's cost-effectiveness are also important considerations. The major benefit of RDT within an AMS framework is that it facilitates the sensible use of Antimicrobials in general, and Antibacterials in particular [3]. When evaluating the patient pathway, RDTs may have an impact on three major antimicrobial decision nodes: treatment commencement, treatment initiation, and treatment de-escalation or discontinuation. RDTs are especially important in the start, but they may be regarded desirable rather than necessary at other stages because 'nonrapid' diagnostic tests are less expensive (particularly in less resource-replete settings). Rapid testing, along with other antimicrobial stewardship interventions like infection control and patient education, should be part of the antimicrobial stewardship mix to ensure that

patients get the correct medicines at the right time, at the right dosage, and for the right duration. With a turnaround time of less than 2 hours, rapid diagnostic tests (RDTs) for infectious illnesses are promising tools that could improve patient care, antibiotic stewardship, and infection prevention in the emergency department (ED) [4]. Antimicrobial stewardship plans (ASPs) have become a requirement for health care facilities in recent years as a result of the growing problem of antibiotic resistance affecting patient care. Antimicrobial stewardship programmes (ASPs) aim to improve patient outcomes by ensuring that antimicrobials are used appropriately. Microbiologists, infectious disease physicians, infectious disease pharmacists, nurses, infection control practitioners, information technology specialists, and hospital epidemiologists are part of the ASP interdisciplinary teams that work together to achieve this goal. In their ability to facilitate ASP-directed proper antibiotic usage, rapid diagnostic tests (RDTs) have proven themselves as game-changers toward this goal. Improved RDT technology and physicians' knowledge of how to act on these rapid results will lead to future advancements in the clinical care of patients with infectious disorders who require immediate medical attention. Until now, the focus has been on RDT that follows the same time sequence as traditional blood culture procedures. For more than a decade, we've known that each hour spent waiting for antibiotics increases the chance of death in septic shock patients [4]. Although broad-spectrum antibiotics may offer coverage for the causal infection, obtaining more timely microbiological data to guide focused antibiotic therapy is the ideal option. RDTs are becoming more common in the field of ID and continue to be a game changer in healthcare. As technology advances in this sector, these platforms must continue to progress for all culture sites so that we can improve outcomes for patients with a variety of infectious diseases other than bloodstream infections. Optimizing therapy in a timely manner is a core AMS practise, and these technologies should be integrated into the daily workflow to support us with patient care. To acknowledge the entire cost of these platforms, future studies should continue to assess the economic impact of RDT on both patients and health systems.

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