PIONEERING DIAGNOSTICS

EXCLUSIVE

Learning Lounge Viewpoints Series:

SEPSIS AND ANTIMICROBIAL RESISTANCE: A DEADLY INTERSECTION

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Sepsis and antimicrobial resistance (AMR) represent two of the most pressing challenges in modern healthcare, forming a deadly intersection that threatens patient outcomes worldwide.[1,2] With the rise of AMR, the pool of effective antibiotics continues to shrink, leaving more patients vulnerable to severe infections that can rapidly escalate to sepsis.[3] Unless we address AMR and empower clinicians to swiftly identify and manage sepsis according to evidence-based protocols, the global impact of these concurrent issues could intensify, placing greater strain on healthcare systems and patient outcomes worldwide.

In this exclusive interview with Cecilia Carvalhaes, MD, PhD, global medical affairs advisor at bioMérieux, she shares firsthand how sepsis and AMR are impacting clinical practice, and the collaborative strategies and innovations she trusts can improve patient care.

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bioMérieux: As both sepsis and AMR mortality rates rise globally,[1,2] how do these crises interact to create a "deadly cycle" in clinical practice?

Dr. Carvalhaes: AMR and sepsis are closely linked in clinical practice. One way is that patients with infections caused by resistant pathogens are more likely to receive inappropriate initial antimicrobial therapy and consequently can progress to worse clinical conditions such as sepsis and septic shock.[4] On the other hand, for patients suspected of having sepsis, delayed antimicrobial treatment has been associated with increased mortality risk,[2] so broad-spectrum antimicrobial therapy is frequently administered before confirming diagnostic results. This can lead to excessive antibiotic exposure which

may facilitate the selection and spread of multi-drug-resistant organisms (MDRO).[1,3] Together, this contributes to a vicious cycle of increased AMR and sepsis-related mortality.

bioMérieux: The 1-hour sepsis bundle faces implementation challenges in resource-limited settings.[5] What systemic adaptations could make rapid diagnosis/treatment protocols more achievable without exacerbating AMR through antibiotic overprescribing?

Dr. Carvalhaes: Implementing the 1-hour sepsis bundle[6] is challenging in many clinical settings, but particularly those with limited resources.[5] Overcoming these barriers requires establishing clear institutional protocols and strategically allocating resources to critical areas. Adapting protocols based on local realities, through targeted research and workflow assessment, can enhance both feasibility and effectiveness. Tailoring the sepsis bundle to local needs can facilitate prompt sepsis diagnosis that supports timely and appropriate therapy, especially when coupled with strong antimicrobial stewardship guidance.[3]

Ongoing medical education is also essential. Regular training ensures that healthcare professionals and clinical teams understand the importance of the 1-hour bundle, adhere to protocols, and recognize the role of appropriate antimicrobial use in preventing resistance. By integrating stewardship principles and customizing implementation to local contexts, healthcare systems can improve bundle compliance, reduce unnecessary antibiotic exposure, and ultimately have a positive impact on patient outcomes—even in settings with limited resources.[3]

bioMérieux: With the potential for AMR to increase sepsis treatment costs,[3] how can labs and clinicians collaborate and leverage fast diagnostics to improve outcomes while containing expenses?

Dr. Carvalhaes: AMR increases the complexity and cost of sepsis care by leading to longer patient hospital stays, more intensive interventions, and the need for expensive or combination therapies.[3] To address these challenges, effective collaboration between laboratories and clinicians is essential. Implementing diagnostic tools that can quickly identify causative pathogens, and their resistance profiles, allows for earlier targeted therapy.[2] This approach not only improves patient outcomes by preventing disease progression and reducing mortality, but also limits unnecessary use of broad-spectrum antibiotics – which delivers medical and economic benefits.[1] Ultimately, achieving these goals requires coordinated, multidisciplinary efforts to ensure that fast and accurate diagnostic testing is integrated into clinical workflows and actionable results are used to guide timely, appropriate patient therapy decisions.

bioMérieux: What key performance indicators (KPI) should health systems track to simultaneously improve sepsis survival rates and AMS compliance?

Dr. Carvalhaes: To drive continuous improvement in both sepsis outcomes and AMS, health systems should establish and routinely track a set of key performance indicators. Fighting against sepsis and AMR requires the involvement and collaboration of many departments within an institution — sepsis survival rates and AMS compliance indicators are great tools for monitoring performance and raising team member awareness and motivation. Among AMS KPIs are the timeliness of empirical antimicrobial administration, the rate of blood cultures collected before antibiotics are initiated, and the turnaround time

for antimicrobial susceptibility test results.[1,2] Monitoring adherence to stewardship protocols, duration and appropriateness of antibiotic therapy, and the incidence of antibiotic-resistant infections are also essential KPIs.[1,3] Regular evaluation of patient outcomes, such as sepsis-related mortality and length of hospital stay, provides valuable insights into the effectiveness of interventions.[2] By systematically tracking these metrics, institutions can better identify gaps in care, implement targeted improvements, and foster a culture of accountability and best practice adherence across multidisciplinary teams.

bioMérieux: Emerging technologies like AI-driven solutions[7] and phage therapy[8] are trending topics in AMR. Which innovation do you see as most transformative for the sepsis-AMR relationship in the next 5 years?

Dr. Carvalhaes: We are witnessing transformative approaches in the way we monitor our health, diagnose, and treat medical conditions. AI-driven solutions are now used to analyze medical images with remarkable accuracy. More than that, advanced algorithms can analyze vast amounts of patient data from electronic health records, lab results, and vital signs that may detect early sepsis and help predict deterioration.[7] By integrating data from various sources, AI can help tailor appropriate treatment plans to individual patients, supporting antimicrobial selection, dosing, and monitoring to enable more personalized therapy.[7]

In parallel, innovative and non-traditional therapies such as phage therapy, immunotherapy, and bacterial virulence inhibitors, are already being used for difficult-to-treat-infections [8,9] These emerging therapies represent a shift toward more targeted and innovative approaches in the fight against sepsis and AMR. Each of these methods has the potential to significantly improve patient outcomes and reduce the reliance on traditional antibiotics. However, the greatest impact will likely come from integrating rapid diagnostics, AI-driven decision support, and innovative therapies to enable earlier intervention, optimize patient treatment, and reduce the spread of AMR.[7,8]

bioMérieux: Do you have any final thoughts to share?

Dr. Carvalhaes: Fast diagnostic testing solutions, clinical method advancements, and ongoing education and training are pivotal in breaking the deadly cycle between sepsis and AMR by:

- Enabling earlier, more precise identification of pathogens and their resistance profiles
- Tailoring the sepsis bundle to local needs
- Guiding appropriate treatment decisions
- Leveraging emerging technology and AI-driven tools

Together, they can help shorten exposure to broad-spectrum antimicrobials, reduce the time to appropriate therapy, and contribute to improved clinical outcomes. As healthcare systems embrace timely diagnostic testing and data solutions alongside stewardship best practices, they move closer to safeguarding current and future generations from the dual threats of sepsis and AMR.

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