PIONEERING DIAGNOSTICS


# LEARNING LOUNGE EXCLUSIVE:

# The Importance of Diagnostics and Antimicrobial Stewardship in the Context of COVID-19

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*COVID-19 and antimicrobial resistance (AMR) present as dual threats to infectious disease management and public health today. In addition to the ongoing burden of COVID-19 to patient health, there is evidence the pandemic may have accelerated the rise of AMR. As new research improves our understanding of COVID-19 and its impact on hospital populations, healthcare providers are becoming better equipped to diagnose and manage bacterial coinfections within the current infectious diseases landscape. Diagnostics can help identify the presence or absence of bacterial coinfections and support antimicrobial stewardship (AMS) goals.*

**Timothy Miles Rawson, PhD**, discusses the value of diagnostic solutions in this original bioMérieux Learning Lounge article. Dr. Rawson is an NIHR Academic Clinical Fellow in Infectious Diseases and Medical Microbiology and an honorary clinical lecturer at Imperial College London.

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## The Impact of COVID-19 on Management of Bacterial Infection

According to a study published in *Clinical Microbiology and Infection*, up to 72% of hospitalized COVID patients received antibiotics in early 2020, while only 8% presented evidence of a bacterial coinfection.[1] Another analysis of available literature from this time period further supports that a low rate of bacterial coinfections was observed in hospitalized COVID patients.[2]

Although secondary and tertiary healthcare experienced an overall increase in inappropriate antibiotic use, outpatient prescribing actually decreased in 2020.[3] This may be due in part to the effectiveness of COVID infection prevention measures and public health practices that lessened the spread of other respiratory illnesses. However, it is also possible that some individuals with bacterial infections did not seek medical care as a result of closed clinics and limited appointment availability.[3]

Several factors likely contributed to elevated levels of inappropriate antibiotic prescribing in hospitals. In early 2020, there was little data available on rates of bacterial coinfection associated with COVID-19 until data could be collected and published.[4] Prior experience from other respiratory viral pandemics suggested high rates of secondary bacterial infections could be likely. Additionally, symptoms of the virus could also be consistent with lower respiratory bacterial infections.[5] Patients would often have significantly raised markers of inflammation, such as C-reactive protein (CRP) and x-ray changes that could be consistent with bacterial infection. Faced with deteriorating patients and no access to appropriate and rapid means of diagnosing bacterial infection, some healthcare providers opted to prescribe antibiotics empirically to cover this eventuality.

Patients in critical care experienced especially high levels of empiric antibiotic prescribing. Critical care patients often required extended periods of invasive mechanical ventilation and being managed prone, issues that can all increase the risk of healthcare-associated infections (HAIs). In areas with surges in COVID-19 cases, ICU capacity reached up to 200% normal occupancy whilst simultaneously dealing with significant reductions in staffing levels. Overcrowding limited the ability of providers to maintain standard infection prevention and control procedures. Changes in personal protective equipment (PPE) use to protect healthcare workers, the introduction of immunosuppressive treatments for COVID-19, and the redeployment of antimicrobial stewardship resources to support the management of COVID-19 provided the perfect environment for development and transmission of HAIs.

## Impact on Antimicrobial Resistance (AMR)

Inappropriate antibiotic use negatively impacts patient health today by contributing to the growing problem of AMR. A study associated with the Infectious Diseases Society of America (IDSA) found that U.S. hospitals experienced an additional 24% of hospital-onset multidrug resistant organisms (MDROs) than expected between March and September of 2020.[6] The U.S. was not alone. Data from Europe demonstrates a similar experience with MDRO outbreaks and increased episodes of HAIs in critical care settings.[7,8] Recent data also supports that limited resource settings experienced similar challenges in terms of antimicrobial use and rising levels of AMR.[9,10] In many ways, the pandemic provided a natural experiment demonstrating what happens when infection prevention and control and antimicrobial stewardship (AMS) strategies start to break down on both a regional and international level.

A survey by the WHO shows that 90% of countries reported that COVID-19 had a negative impact on their national plans to tackle AMR.[11] COVID diverted attention and resources from other critical interventions in healthcare. This included the focus on development and implementations of National Action Plans in support of the Global Action Plan on AMR. Delays in the development and implementation of national action plans may have led to further propagation of AMR, particularly given the disruption to healthcare caused by COVID-19.

However, there could be some positives to come out of the pandemic that may eventually have a beneficia impact on the fight against AMR. For example, the pandemic has highlighted the potential consequences of transmissible infections and also the capacity of humans to work together to solve complex problems. For the public, it has highlighted the importance of diagnostic technologies. If we can effectively communicate the challenge of the silent pandemic of AMR and its global importance to society, both from a health and economic perspective, we may be able to generate significant public engagement to help combat this worldwide problem moving forward.

## Diagnostic Solutions for Improved AMS in the COVID Era

Molecular diagnostics have the potential to enhance antimicrobial stewardship (AMS) and improve infectious disease management through informed antibiotic prescribing. Given the low pre-test probability of someone with COVID-19 having a respiratory bacterial coinfection at presentation to the hospital, providers could withhold antimicrobial therapy for stable patients until a hypothesis is either confirmed or refuted. Current practice recommends COVID positive and negative patients be treated in a similar fashion with routine infection work-up required for all.

### *Syndromic Testing*

Syndromic testing using molecular diagnostics can help support diagnosis of bacterial infection and significantly reduce the turnaround time to results, particularly for organism identification and the detection of common AMR genes. This can help ensure that appropriate antimicrobial therapy is delivered in a timely fashion and can also help support early de-escalation of therapy, supporting stewardship practices.

It is worth considering how syndromic testing approaches could support optimized decision-making around antimicrobial use within a local setting. These need to be linked with robust antimicrobial and diagnostic stewardship frameworks and clear outcome metrics for these technologies. Syndromic testing in its present form does not replace culture-based diagnostics as phenotypic antimicrobial susceptibility testing is needed to help guide truly targeted, individualized therapy in many cases. However, with developments in rapid antimicrobial susceptibility testing (AST), syndromic platforms are likely to play an important role in supporting optimized antimicrobial use in a range of clinical situations.

### *Antimicrobial Susceptibility Testing*

Phenotypic AST provides individual, *in-vitro* results that tell the likelihood of success or failure of individual antimicrobials in the treatment of a specific infection. AST can help deliver optimal treatment and also provide confidence in delivering narrow, targeted therapy. With the rise in AMR, AST will become increasingly important, with a focus on automation and reduced time to results.

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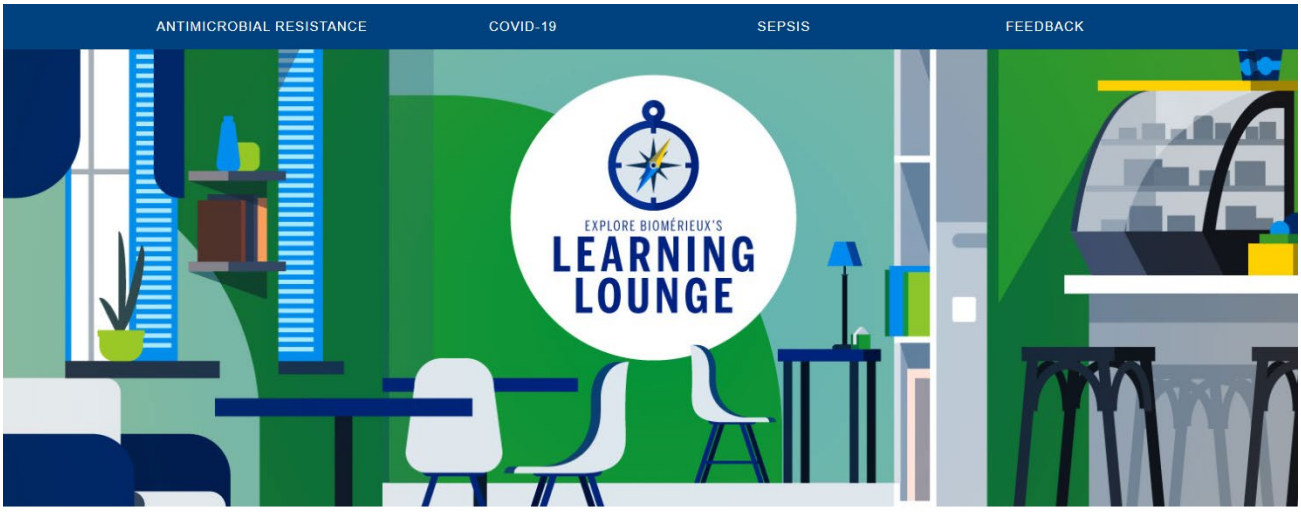


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