



The Impact of COVID-19 on Antimicrobial Stewardship and Antimicrobial Resistance

Professor Pierre Tattevin

APUA Board Chair / Infectious Diseases and Intensive Care Unit, Pontchaillou University Hospital, Rennes, France

The impact of the COVID-19 pandemic on health care systems will probably never be fully characterised, as it extends to so many topics. Antimicrobial stewardship (AMS) is no exception, as documented by the rich and expanding medical literature in the field. One of the most striking features of the data on this issue is the heterogeneity of this impact according to the health care systems and the robustness of pre-existing AMS programmes: the same trigger (COVID-19 pandemic) could have the opposite impact, from a dramatic decrease, to a dramatic increase in antimicrobial consumption. Interestingly, most studies that extended during a long period documented an improvement of this impact, as if a better knowledge of the features of COVID-19 pneumonia allowed the prescribers to decrease their rate of antibiotic prescriptions as they gained expertise in this puzzling disease.

The impact of respiratory virus outbreaks on antibiotic use was documented long before COVID-19 and is not unexpected given that i) respiratory viral diseases may mimic bacterial infections; ii) the use of rapid diagnostic tests that would discriminate bacterial from viral infections remains limited in most settings; iii) respiratory viral infections may be associated with bacterial coinfections and superinfections, that would in turn lead to increased antibiotic use¹. In addition, COVID-19 is responsible for a tricky viral pneumonia, with a clinical and radiological presentation very close to that of bacterial pneumonia, which led to a 100% rate of antibiotic prescriptions for cases managed early in the pandemic². Furthermore, severe COVID-19 cases that require intensive care unit (ICU) admission could be considered as a perfect storm for increased use of antibiotics as i) it commonly occurs in patients with comorbidities; ii) it requires treatments that induce immunosuppression (dexamethasone, etc.); iii) the duration of mechanical ventilation and ICU stays may extend to several weeks; iv) ICUs were often largely understaffed during the pandemic and health care workers with limited experience in ICUs were involved in patient care, which is a well-known risk factor for increased antibiotic use³. The combination of these factors led to an increased risk of antimicrobial resistance (AMR)⁴.

However, the COVID-19 pandemic was also associated with parameters that may decrease antibiotic use, including the postponement of non-essential surgeries and the decreased risk of human-to-human transmission of many pathogens, due to increased use of personal protective equipment (masks, hand hygiene), and decreased social interactions (lockdowns). In addition, as we gained experience with COVID-19 pneumonia, it became clear that bacterial coinfections or superinfections were rare, estimated at, respectively, <5%, and <20% in patients admitted for COVID-19⁵. However, in ICU patients, inadequate empiric antibacterial therapy was associated with increased mortality in COVID-19 patients, which justifies the use of broad-spectrum antibiotics in patients with high suspicion of bacterial infections¹¹.

The resulting effect on antibiotic use has been dramatically heterogeneous according to country and timing of the pandemic, as illustrated in the meta-analysis by Langford *et al*⁶. In some countries, (e.g. Canada), antibiotic use in the community decreased by >30% during the first wave of the pandemic⁷. In France, similar trends were observed overall, although the use of antibiotics initially thought to be active on COVID-19 pneumonia (e.g. azithromycin), increased. Other countries documented a dramatic increase of antibiotic use, and, as could be expected, of AMR^{8,9,10}. Despite this heterogeneity, most studies found that antibiotic use decreased over time, illustrating that prescribers improve when they gain experience with a disease⁴.

What are the main take-home messages from this overview on the impact of the COVID-19 pandemic on AMS and AMR? Firstly, keep in mind that bacterial infections, and superinfections, are rare in COVID-19 pneumonia. Hence, most patients admitted with COVID-19 pneumonia should not be treated with antibiotics. As for the motivational poster produced by the British government in 1939 in preparation for World War II, 'Keep calm and carry on' would apply for the physicians fighting this unprecedented crisis. Secondly, the heterogeneity of COVID-19 impact on antibiotic use worldwide illustrates the importance of AMS programmes: when these programmes were in place for a long time, with dedicated staff, antibiotic use tended to decrease during the pandemic, while it dramatically increased in other countries. This advocates for increased investment on AMS programmes worldwide.

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