COVID-19 and the potential long-term impact on antimicrobial resistance

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The emergence of the Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2) has required an unprecedented response to control the spread of the infection and protect the most vulnerable within society. Whilst the pandemic has focused society on the threat of emerging infections and hand hygiene, certain infection control and antimicrobial stewardship policies may have to be relaxed. It is unclear whether the unintended consequences of these changes will have a net-positive or -negative impact on rates of antimicrobial resistance. Whilst the urgent focus must be on controlling this pandemic, sustained efforts to address the longer-term global threat of antimicrobial resistance should not be overlooked.

The emergence of, and subsequent pandemic caused by, the Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2) has placed an immense strain on healthcare systems.1,2 This has required unprecedented responses to control the spread of infection and protect the most vulnerable.

In response to the pandemic, healthcare systems have rapidly adapted infection control policies to ensure adequate capacity to isolate patients with potential SARS-CoV-2 infection. Societal focus on the threat from this emerging infectious disease has driven a heightened awareness of the importance of personal hygiene, particularly hand hygiene, environmental contamination and increased use of personal protective equipment (PPE). However, the pandemic is also likely to require the relaxing of measures that prevent the spread of MDR organisms (MDRO), such as screening, isolation in single rooms and antimicrobial stewardship.

The paucity of available data makes it difficult to predict the impact that this pandemic may have on antimicrobial stewardship programmes and long-term rates of antimicrobial resistance (AMR). On one hand, the increased focus on hand hygiene, attempts to limit patient contact and social distancing may lead to reductions in healthcare-associated transmission of disease. On the other hand, the prioritized allocation of isolation rooms to COVID-19 patients, cohorting and/or management in open bays of patients colonized with carbapenemase-producing Enterobacteriaceae (CPE)/VRE/MRSA/Clostridioides difficile and the inevitable higher workload of healthcare workers may potentially lead to a greater number of hospital transmissions.

The potential propagation of AMR may also be exacerbated by increasing rates of antimicrobial prescribing and potential breakdowns in well-established stewardship programmes. For example, despite few reports of bacterial coinfection, 62% of patients with COVID-19 had received antimicrobial therapy in a recent International Severe Acute Respiratory and Emerging Infections Consortium (ISARIC) report.3 These prescriptions tended to be broad spectrum in nature.4 In addition to excessive and inappropriate antimicrobial prescribing, the spread of other pathogens and MDROs may also be affected by day-to-day practicalities of an emergency focus on a single primary pathogen, which may affect the depth of sampling for other organisms. The redeployment of antimicrobial stewardship teams and laboratory capacity to support the workload associated with SARS-CoV-2 is likely to compound this further.

With predictions that the current pandemic could continue to consume the focus of individual national healthcare systems such as those in the UK and the USA for up to 18 months,5 urgent analysis of its impact on AMR is required. This will support the development of contingency interventions to mitigate the potential impact of the pandemic on rates and transmission of AMR. Learning early lessons from countries currently affected will be important in supporting evidence-based guidance for those regions not yet burdened by an exponential rise in COVID-19 cases. In particular, the unintended consequences, whether positive or negative, of these health-system changes need to be described and where negative impacts are identified these must be mitigated.

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| Affected area                                                                 | Potential impact                                                                 | Potential interventions                                                                                                                                 |
|------------------------------------------------------------------------------|----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Increased focus on hand hygiene in hospitals                                | Reduction in the spread of AMR within healthcare settings                        | Ensure adequate resources and equipment available to support increase in demand (e.g. hand sanitizer)                                                  |
|                                                                               |                                                                                  | Ensure that routine surveillance systems remain in place to monitor rates of AMR within healthcare settings                                                 |
| Social distancing in the community                                           | Reduction in antimicrobial-seeking behaviours by members of the public, leading to reductions in antimicrobial prescribing | Reinforcement through public engagement                                                                                                              |
| Less opportunity for isolation of infectious/MDRO patients                   | Potential spread of MDRO                                                        | Hand hygiene and barrier nursing                                                                                                                     |
|                                                                               | Potential for suboptimal management of other public health challenges (e.g. TB) | Sustaining MDRO surveillance                                                                                                                         |
|                                                                               |                                                                                  | Staff and patient education and training                                                                                                              |
|                                                                               |                                                                                  | Clustered cohorting of patients by risk factor (e.g. COVID-19 and CPE; COVID-19 and MRSA)                                                            |
| Pre-emptive discharge of patients and cancellation of routine procedures to enhance bed capacity | Reduction in patients carrying MDRO, such as CPE, within the hospital environment | Stringent surveillance systems to detect and track the spread of AMR on reintroduction of these patients to healthcare services | |
| Diversion of all PPE for SARS-CoV-2 patients                                 | Potential spread of MDRO                                                        | Hand hygiene and barrier nursing                                                                                                                     |
|                                                                               |                                                                                  | Sustaining MDRO surveillance                                                                                                                         |
|                                                                               |                                                                                  | Staff and patient education and training                                                                                                              |
|                                                                               |                                                                                  | Appropriate stratification of PPE for different indications in line with evidence-based guidelines                                                  |
| Increased rates of empirical antimicrobial therapy for patients presenting with respiratory symptoms | Potentiation of AMR                                                             | Clear guidelines for empirical therapy in suspected SARS-CoV-2 patients, specifically delineating the requirement for anti-pseudomonal and/or atypical coverage |
|                                                                               |                                                                                  | Education and emphasis on local stewardship within all healthcare workers                                                                        |
|                                                                               |                                                                                  | Re-establishment of AMS oversight as soon as possible                                                                                              |
|                                                                               |                                                                                  | Upskilling of staff within the organization (e.g. nurses and pharmacy technicians) to take on broader roles and responsibilities                        |
|                                                                               |                                                                                  | Development of rapid diagnostics to support prescribing decisions, including a clear role for the use of procalcitonin to detect bacterial infection |
|                                                                               |                                                                                  | Ensuring that pandemic preparedness is part of future IPC and AMS strategy                                                                      |
|                                                                               |                                                                                  | Need for education and specialist support to develop AMS strategies for telemedicine                                                             |
| Increased rate of telemedicine within primary and secondary care and outpatient services | Possible increase in community rates of antimicrobial prescribing as part of safety-netting | Engagement with community-based pharmacies, who may not be confident in screening secondary care medicines                                           |
|                                                                               | Possible reduction in community antimicrobial prescriptions due to social distancing and reduced access to pharmacies | Need for development in technology to support risk stratification                                                                              |
| Redeployment of antimicrobial stewardship teams to deal with healthcare strain due to pandemic | Loss of developed stewardship frameworks within local healthcare environments    | Focus on education and responsibility of individual teams for promotion of appropriate antimicrobial usage                                           |
|                                                                               |                                                                                  | Addressing current social hierarchies within healthcare and upskilling of staff within the organization (e.g. nurses and pharmacy technicians) to provide routine AMS services |
|                                                                               |                                                                                  | Integration of AMS/IPC teams                                                                                                                         |
|                                                                               |                                                                                  | Education and training                                                                                                                               |
| Maintenance of institutional memory and team dynamics within organizations experiencing rapid reorganization and recruitment of staff | Loss of best practice and leadership within local team environments              | Focus on fostering positive behaviours towards antimicrobials and infection control                                                               |
|                                                                               |                                                                                  | Ensuring that structures are agile enough to absorb new individuals with minimal impact of process and patient care                                  |

Continued
against to ensure that efforts to address the long-term and devastating threat of AMR are sustained.

Table 1 outlines some of the core antimicrobial stewardship efforts affected by the SARS-CoV-2 pandemic, suggesting potential interventions to help mitigate the impact of the pandemic response on AMR.

With the rapid redeployment of side rooms and PPE to protect patients and staff from respiratory viral infections and saturation of any isolation capacity, the ability to adhere to isolation policies normally deployed to prevent the spread of MDROs is likely to be challenged. Whilst increased hand hygiene may help prevent transmission, pragmatic solutions are required to ensure sustained surveillance for MDROs in both SARS-CoV-2-positive and -negative patient cohorts.

Table 1. Continued

| Affected area                                      | Potential impact                                                                 | Potential interventions                                                                 |
|---------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| Overcrowding associated with overloading of healthcare systems | Major driver for the transmission of AMR                                         | Stringent surveillance systems to detect and track the spread of AMR                    |
| Depletion of structural resources                  | Loss of side-room capacity leading to propagation of SARS-CoV-2 infection due to cohorting of positive and negative patients | Ensuring that routine MDRO screening still takes place in the face of increased viral screening |
|                                                   |                                                                                  | Cohorting of high-risk patients                                                         |
|                                                   |                                                                                  | Contingency plans for rapidly responding to detected outbreaks                          |
|                                                   |                                                                                  | Stringent pathways for segregation of cases                                             |
|                                                   |                                                                                  | Rapid diagnostics to facilitate rapid identification                                    |

AMS, antimicrobial stewardship; IPC, infection prevention and control.

In summary, before the outbreak of SARS-CoV-2 in December 2019, major national and international interventions had begun to focus on reducing the potential future impact of AMR on society. The consequences of the current pandemic have the potential to stretch well into the post-COVID-19 era. With increased societal sensitization towards emerging threats from infectious diseases...
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