BSAC Vanguard Series: The future of infection prevention and control: how COVID is already transforming our approach to antimicrobial resistance

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COVID-19 stimulated enormous focus on, and change in, infection prevention and control (IPC), not just in the healthcare sector but also among the general public. While global cooperation and guidance are important, there is also an essential role and benefit from national policies that respect local circumstances and cultural differences. Hospitals will have a new role and data sharing and cooperation between areas such as acute and long-term care will be even more important. Further integration of infection control, microbiology and infectious diseases staff in IPC teams is needed. The digital and AI revolutions have roles to play in how and where patients are seen and diagnosed. The built environment may have longer-term influence on changing the behaviour of health professionals than education and training. One constant is the need for highly trained, flexible and motivated staff in these IPC teams.

COVID-19 is the first global pandemic any of us has experienced, finding ourselves on common but unpredictable ground. I have never seen so many infection prevention and control (IPC) dogmas being torn apart, guidelines changed at lightning speed, cooperation and interest from other medical specialties, and whole nations becoming IPC specialists—or at least having strong opinions on what to do. While many believe that this should be a time for international cooperation and guidance (with the obvious advantage of high-level collaboration on vaccine research, for example), I have also experienced the benefit of focusing on national policies and regional proficiencies and harmonization, respecting local circumstances, and cultural differences.

In the post-COVID era, hospitals will have a new role within their region. Part of the way they deliver care will change thanks to good prevention (with the help of general practitioners), early diagnostics, and an efficiency-driven change of the patient-mix (adequate patients in the correct domain). More care will also be delivered digitally, instead of face-to-face, leaving patients with more-complex needs in more-specialized hospitals—leading to certain groups of healthcare professionals working in different physical places.

Long-term care will receive a certain part of the hospital population, which makes cooperation between acute and long-term care even more important. IPC has already anticipated the need to cooperate across different healthcare settings (switching from hospital infections to healthcare infections), but should furthermore implement a regional network, that shares data without restriction, harmonizes guidelines, and is a sounding board for professionals, truly solving problems instead of ‘discharging’ them to a different setting. This type of cross-setting cooperation will become essential with changing health policies, leaving only the sickest patients in hospital beds and pushing complex care into other settings. Consequently, IPC teams will no longer act within their ‘silo’.

In some countries, infection control, microbiology, and infectious diseases are still seen as three different specialties, with a difference in the perceived ‘added value’ and acceptance among other medical specialists. Integration of these subspecialities in one team, where all members cover all aspects (obviously to a different degree depending on their background) will change the perception of the IPC advice given, most certainly in the view of other medical specialists.

While some believe that the future will bring far-reaching disruptive changes, I believe that all of us presently working in IPC need to ensure that we anticipate or join the emerging changes now. Health policies and economic restrictions, societal expectations with regard to prevention (‘from cure and care to health and lifestyle’), involvement of non-healthcare stakeholders (not limited to implementing technology and engineering solutions but disrupting current health delivery), have already started to change our healthcare system. The new players in healthcare, such as tech giants (Google, Apple), retailers (Amazon, Walmart), and financials (JP Morgan Chase) will direct their activities toward data (collection, connection, and safety), data-analysis, and personalized interventions. In general, new care solutions will not only come from people working in care-related fields thinking out of the box, but from totally different boxes altogether. If the COVID pandemic has taught us one thing, it is that simple technology...
(such as that of supporting ‘digital first’ which has been talked about for years), has become ‘the new normal’ in less than a year. ‘Virtual Healthcare’ is not limited to how we contact our patients or give/receive training but will change the patient-mix and patient population in our hospitals and will influence the architecture (‘more bytes—less bricks’), and thereby the places, in which patients actually receive their care—and its complications. As a consequence, IPC has to adapt and transform (with regard to key activities such as surveillance, for example).

In addition, classic surveillance will be taken over by artificial intelligence (AI) and cognitive automatization and will—combined with rapid diagnostics and sophisticated typing systems—broaden surveillance to include more and other endpoints as well as allow for real-time interventions. At some point we not only need to re-define ‘nosocomial’ but might need new definitions of nosocomial infections and other outcome indicators, better geared to AI and automation. These changes, as well as the analysis of ‘big data’ create the need for a different skilset within the IPC team to include more sophisticated data analysis and epidemiology.

Other important changes may come due to more attention and possibilities with regard to the built environment. With the growing understanding of water as a source of nosocomial infections or transmission of drug-resistant micro-organisms, and the importance of ventilation with regard to the prevention of SARS-CoV-2 transmission or operating theatre air quality, ‘engineering-out’ problems with water and air safety must be a high priority. Over time, an important part of the built environment discussion has been focused on the number of beds in a patient room. Starting from Nightingalian halls to four-bed rooms, and initially single-bed ICU cubicles to now single-bedroom-only hospitals, my feeling is that many people have had different ideas about what the patients want and what the finances allow, but few did what should be most logical, namely to involve the patients in hospital design. While the advantages of single-bed rooms are clearly visible at present with regard to patient admittance and cohorting during the COVID-19 pandemic, I believe that in some circumstances patients might need a roommate as an example and a motivation of how to behave e.g. after arthroplasty. Still, the built environment goes further than just water and air and the number of single bedrooms. Surface treatment and surface characteristics can possibly influence the contamination (and consequently transmission) of micro-organisms but can certainly affect cleaning budgets. By influencing the workflow, the chances for contamination can be avoided and/or hand hygiene moments reduced. Colour, light, and even the smell of the building, not only contribute to the feeling of wellbeing of patients, but can be used to nudge healthcare workers into certain positive behaviours. In general, influencing healthcare workers’ behaviour has been, is, and will be an important part of IPC. On a personal note, given the chance of improving healthcare workers’ behaviour by using technology, engineering, and structural solutions to help and guide them might be a safer and less-cumbersome choice, than trying to change their behaviour through training and education alone.

In order to be prepared for the future, IPC teams need to expand their physical boundaries, their knowledge of different healthcare settings, their skill set, and the type of professionals they employ, while simultaneously reducing the kinds of activities they do today as some of their present problems will be automated or engineered out. I realize that this is a limited view on a future of IPC that will hold so many more details such as cleaning-robots, self-disinfecting storage rooms, IPC training in virtual reality, sensor- and video-based ‘observations’ of procedures, etc. What will remain and what will always be needed, are highly trained and motivated professionals who are able to see what is going wrong, to recognize what is going well, and who are masters in communication with their clinical colleagues.

**Transparency declarations**

This article first appeared as one of a series of blog posts celebrating the fiftieth anniversary of the founding of the British Society for Antimicrobial Chemotherapy.

**Further reading**

1. Topol E. The Patient Will See You Now: The Future of Medicine is in Your Hands. Basic Books, 2014.
2. Engelen L, Jacobs F. Augmented Health(Care). The End of the Beginning. Lucien Engelen Holding, 2018.
3. Have a look at talks by Lucien and most certainly by Daniel Kraft, Peter Diamandis and Ray Kurzweil as Singularity University speakers online, such as: https://www.youtube.com/watch?v=kOJNeBQyxaA.
4. Babcock HM. Looking to the future of infection prevention and control. https://www.researchamerica.org/blog/looking-future-infection-prevention-and-control.
5. As an example and reminder to look at the blogs of our US colleagues, such as Hilary Babcock, Mike Edmond, Dan Diekema, Tom Talbot and Scott Fridkin. http://haicontroversies.blogspot.com.
6. Otter JA. Reflections from Infection Prevention 2015: beating the bugs, improving the systems and thinking outside the box. J Infect Prevent 2016; 17: 37-41.
7. As an example and reminder to look up the UK/European blog with great minds like Jon Otter, Martin Kiemen, Marc Bonton and smart guests. https://reflectionsipc.com.
8. Drohan SE, Levin SA, Grenfell BT et al. Incentivizing hospital infection control. Proc Natl Acad Sci USA 2018; 115: E3463–70.
9. Look up CDDEP, their publications and blogs. https://cddep.org/publications.