



Infection Prevention and Antimicrobial Stewardship Program Collaboration During the COVID-19 Pandemic: a Window of Opportunity

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Abstract

Purpose of Review We describe the similarities between antimicrobial stewardship programs (ASPs) and infection prevention programs (IPPs), and we discuss how these similarities lend themselves to synergy between programs. We also discuss how the COVID-19 pandemic has generated further opportunities for future collaborations that could benefit both programs.

Recent Findings The COVID-19 pandemic has created new needs, such as real-time data and access to personnel important to both programs, such as information technologists and infectious diseases specialists. It has also increased concerns about rising rates of antimicrobial resistance and healthcare-associated infections, both of which overlap significantly and are key focus areas for both ASPs and IPPs. These emergent issues have highlighted the need for enhanced program infrastructure and new team models. The shift towards telecommunication and telework has facilitated the creation of enhanced infrastructures for collaboration on activities ranging from data access and reporting to providing telehealth services to remote hospitals. These enhanced infrastructures can be leveraged in future collaborative efforts between ASPs and IPPs.

Summary Collaboration between IPPs and ASPs can mitigate setbacks experienced by health systems during the current pandemic, enhance the performance of both programs in the post-pandemic era and increase their preparedness for future pandemic threats. As health systems plan for the post-pandemic era, they should invest in opportunities for synergy between ASPs and IPPs highlighted during the pandemic.

Keywords Antimicrobial stewardship · Infection prevention · Coronavirus disease 2019 · COVID-19 · SARS-CoV-2

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Introduction

Antimicrobial stewardship programs (ASPs) and infection prevention programs (IPPs) are separate health system-based programs which share a goal of improving patient outcomes. Whereas ASPs focus on optimizing antimicrobial use with a key goal of decreasing the emergence of resistance, IPPs are focused on reducing healthcare-associated infections (HAIs). Preventing HAIs caused by multidrug-resistant organisms (MDROs) and *Clostridioides difficile* infections (CDI) lies at the intersection of ASPs and IPPs [1]. Antimicrobial selective pressure facilitates both the development of MDROs, as well as CDI. ASPs optimize antimicrobial use, and their work has been shown to improve patient outcomes and reduce the incidence of infection and colonization with MDROs, as well as the incidence of CDI [2]. Public awareness around

antimicrobial resistance was galvanized by a Centers for Disease Control and Prevention (CDC) report in 2013 that estimated the national burden of antibiotic-resistant infections at a minimum of 2 million cases per year, with an associated cost of 20 billion dollars [3]. A subsequent CDC report in 2019 indicated that antibiotic-resistant infections remain on the rise, with an estimated burden exceeding 2.8 million cases per year [4]. The initial 2013 CDC report, as well as mounting evidence supporting the role of ASPs in combating antimicrobial resistance, led to the development of national policies and guidelines to guide the implementation of ASPs [5]. The Joint Commission began mandating ASPs in hospitals and health systems as of 2017 [6]. In contrast to ASPs, IPPs are already well-established within institutions. Institutions are required by the Joint Commission and Centers for Medicare and Medicaid Services (CMS) to publicly report certain HAIs to the National Healthcare Safety Network (NHSN), and they have been subject to longstanding financial penalties related to HAI metrics, as well [7]. These quality-based reimbursement and mandatory reporting models have provided institutions with incentives to invest in building, expanding and supporting IPPs. While ASPs can report data on antibiotic use and resistance metrics to the NHSN, this is presently not mandatory. Current antibiotic use data that can be extracted from NHSN are less directly meaningful to front-end providers and institutional leaders than HAI-related data output. As ASPs and IPPs have similar goals, strategies and metrics, there is great potential for synergy, and an integrated model can benefit both programs. ASPs have been shown to be effective when implemented alongside infection control measures such as hand hygiene, compared to when functioning independently [2]. IPPs have also drawn benefits from ASP contributions, particularly in outbreak settings [8]. The potential for collaboration and synergy has never been more apparent than during the current coronavirus-19 (COVID-19) pandemic [9••]. The emergence of antimicrobial resistance as well as an increase in HAIs are both of high concern given the pressures on institutions related to the pandemic. Data exists indicating a rise in central-line associated bloodstream infections (CLABSIs), for example [10]. Collaboration or integration of ASPs and IPPs may be a silver lining of the pandemic, both in terms of mitigating the setbacks experienced by health systems during the current pandemic and potentially enhancing the activities and resilience of programs in the post-pandemic era.

Rationale for Collaboration

ASPs and IPPs share many similarities in terms of infrastructure, strategies and metrics (Fig. 1) [11••]. Opportunities for collaboration can readily be conceived from these similarities. Support from senior institutional

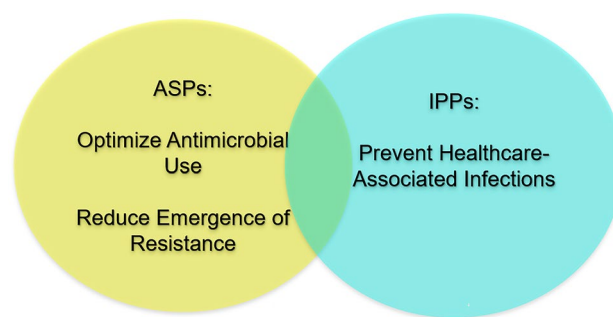


Fig. 1 ASPs and IPPs overlap in their goals, infrastructure, strategies and metrics

leadership is critical to the success of both programs. Since IPPs typically already have regular access to senior leadership at compulsory infection control committee meetings, these meetings can serve as a forum for ASPs to access senior leaders and to regularly present data pertaining to stewardship metrics to key stakeholders. Both programs are built on a similar multidisciplinary model, whereby each program is ideally co-led by an infectious diseases-trained physician. Each program is also heavily dependent on collaboration with Information Technology (IT) and microbiology specialists, among others. Such multidisciplinary models require dedicated professionals with adequate training and experience in infection prevention (IP) or antimicrobial stewardship (AS). Access to Full-Time Equivalent (FTE) support commensurate with the size and scope of the work required is a common challenge faced by both IPPs and ASPs. Daily activities of both programs rely heavily on third party software platforms or highly customized electronic medical records platforms. ASPs and IPPs utilize these platforms for data surveillance, review and reporting, and to generate line lists for targeted interventions. ASPs and IPPs can collaborate in the use of these technology resources to cut down on individual program costs and IT support needs.

ASP and IPP outcome metrics are inherently linked and often overlap. IPPs track HAIs, while ASPs track infections associated with antibiotic use, namely infections by MDROs and CDI. Healthcare-associated CDI, as well as infections with certain MDROs like methicillin-resistant *Staphylococcus aureus*, are tracked by IPPs. Both ASPs and IPPs report to NHSN using a similar mechanism. Currently, reporting is optional for ASPs. ASP and IPP collaboration might cut down on duplicate efforts with data submission, analysis and local reporting. Additionally, infectious diseases trained physician epidemiologists (working within IPPs) often have advanced training in data interpretation and communication; these skills can be utilized by ASPs to improve data analysis and reporting.

In addition to sharing resources and personnel, there are numerous opportunities for IPPs and ASPs to collaborate on activities. Data review, monitoring and reporting, as well as interventions such as audit and feedback and healthcare worker education, are processes that are critical to the function of both ASPs and IPPs. Integrating these activities can reduce redundant work and make for a more efficient workflow for both programs. Both ASPs and IPPs cannot succeed without influencing the behaviors of their target groups. The overlap between the target groups of ASPs and IPPs should serve as an incentive to join forces in order to maximize influence and impact potential and advance each other's individual and common agendas. On the education front, ASPs and IPPs can design combined curricula for incorporation into the formal required education of their target groups. The implementation of a combined AS and IP curriculum targeting a range of learners and providers has been modeled and was shown to influence knowledge and attitudes in the short term, setting an example of a powerful integrative effort between ASPs and IPPs that advances the educational agendas of both [12]. ASPs and IPPs can create joint institutional management guidelines for areas of intersection, such as surgical prophylaxis. Another readily apparent common goal between ASPs and IPPs is reducing CDI. Instead of working in parallel, ASPs and IPPs can work jointly to promote test stewardship, decrease cross-transmission and optimize system-level antibiotic use. There is ample potential for integration on the diagnostic front, as ASPs and IPPs often review and intervene on the same diagnostic data. Timely bidirectional communication of actionable test results, such as the detection of MDROs, can allow for timely optimization of antibiotic therapy by ASPs as well as timely implementation of appropriate isolation and other infection control measures by IPPs. Integration on this front can help abort potential MDRO outbreaks. There is a lot to be gained from integrating diagnostic stewardship efforts (beyond those focused on *Clostridioides difficile*), as well. Promoting diagnostic stewardship in the area of urine culture testing, for example, can reduce unindicated testing, reduce the number of asymptomatic bacteriuria cases reported to NHSN as catheter-associated urinary tract infections (CAUTIs), and reduce the unnecessary use of antibiotic therapy for asymptomatic bacteriuria. In a broader context, diagnostic stewardship allows for quicker identification (or ruling out) of a pathogen, quicker tailoring of antibiotic therapy to improve individual patient outcomes and reduce adverse events, quicker institution or de-escalation of appropriate infection prevention measures to decrease the risk for cross-transmission of MDROs and also a decrease in the overconsumption of isolation equipment.

A holistic integrated model that encompasses antimicrobial stewardship, infection prevention stewardship and diagnostic stewardship is exemplified in the AID stewardship model proposed by Dik et al. [13]. This model outlines a

standardized infection management process throughout the patient care continuum that relies on a foundation of appropriate rapid microbiological diagnostics, ideally molecular assays, the results of which should be quickly available and utilized to develop a personalized antimicrobial treatment plan and to detect MDROs early and implement appropriate infection control measures in a timely fashion. Throughout this process, antimicrobial stewards and pharmacists continue to act on evolving microbiological data as well as pharmacokinetic and pharmacodynamic data to further improve and personalize the antimicrobial treatment plan in real time, ultimately limiting inappropriate antimicrobial use, reducing the emergence of MDROs and reducing adverse events. Simultaneously, infection preventionists maintain close surveillance of MDROs and HAIs using real-time microbiological data and react rapidly to possible MDRO cross-transmission events. Such a streamlined, multidisciplinary process may theoretically provide higher quality and more cost-effective patient care while facilitating optimal infection prevention within a health system, and even across multiple health systems whose electronic systems are integrated.

The COVID-19 Experience

IPPs and ASPs have adopted numerous new activities during the COVID-19 pandemic, many of which are complementary, making the present an opportune time to enhance future program collaborative efforts [9]. The COVID-19 pandemic has had an overwhelming impact on health systems worldwide, with more than 146.8 million confirmed cases and more than 3.1 million deaths reported globally as of April 26, 2021, per the World Health Organization (WHO) [14]. The pandemic has had a disruptive effect on traditional health system operations and has pulled multiple disciplines into COVID-19 management efforts in an unprecedented fashion. IPPs have had a longstanding history of being at the core of outbreak response and pandemic preparedness. The magnitude of this pandemic, however, has caused significant constraints on IPPs and has created the immediate need for a change in infrastructure to reduce duplicate efforts and increase the efficiency of existing systems. IPPs have been stretched thin with core activities such as outbreak investigation and mitigation, case identification and isolation, test stewardship, personal protective equipment (PPE) access management, and communication with hospital leadership, staff and patients. ASPs, while not traditionally included in pandemic preparedness plans and operations, have risen to the occasion and shown their value during the COVID-19 pandemic [9, 15]. ASPs have played a key role in the creation and maintenance of institutional COVID-19 treatment guidelines, implementation of formulary restriction

for potential COVID-19 focused therapeutics to ensure appropriate use, managing access to investigational/repurposed drugs and monitoring drug shortages in response to the rapidly changing literature (e.g. hydroxychloroquine). ASPs have also ensured appropriate use of routine antimicrobials, which is crucial given the concern for widespread broad-spectrum antibiotic use particularly in patients with COVID-19 suspected to have bacterial superinfection [16].

The COVID-19 pandemic has not only created new activities for ASPs, but it has also created new opportunities for close collaboration with IPPs. The COVID-19 pandemic has been associated with a paucity of data to guide both IPPs and ASPs optimally, especially early on, and the importance of centralizing and unifying key messaging rapidly became apparent. ASPs can integrate key IPP messaging for co-dissemination with their COVID-19 treatment guidelines. IPPs and ASPs have also collaborated with each other as well as with practice groups within health systems to create new reports and mechanisms for reporting in the face of real-time data needs that have emerged during the pandemic. Social distancing and the move towards telework and virtual meetings have also facilitated real-time collaboration between ASPs and IPPs. Additionally, the increased reliance on telehealth services has allowed resource-replete ASPs and IPPs to collaborate on providing services to other hospitals. While these are great opportunities, they have highlighted the need for robust IT support, again reinforcing the potential benefit of integrating IT services and platforms for both programs. Finally, the essential role ASPs have played in managing COVID-19 treatment guidelines and investigational therapeutics has reinforced their value to institutional leadership and has increased their presence and visibility at key institutional meetings and forums alongside IPPs.

Collaboration Versus Integration

While ASPs and IPPs overlap significantly, there are certain areas where they do not overlap. As previously outlined, ASPs and IPPs have complimentary but not identical goals. ASPs and IPPs, though built around similar team and leadership models, have different command structures. Infection preventionists within IPPs often report through nursing leadership, while pharmacists within ASPs often report through pharmacy service groups. ASPs and IPPs are also often housed in different departments and different physical locations, posing somewhat of an integration barrier [17]. These differences should be recognized and addressed as issues that may make collaboration and integration challenging.

Although full ASP and IPP integration would require major program restructuring in most institutions, strong consideration should be made to such a “Super-team” model. Potential benefits include synergy in the use of a cadre of

infectious diseases trained physicians (who could ultimately be required to have enhanced training in data analysis and communication), a streamlined organizational structure, enhanced leadership access, synergy with software use and IT specialist access, synergy around data submission, interpretation and reporting and ultimately the great potential for enhanced patient outcomes.

Future Implications

The COVID-19 pandemic may have a lasting impact on how ASPs and IPPs operate, and on their relationship with each other. The pandemic has created major opportunities for collaboration in communication and infrastructure enhancement (Table 1). Many ASPs are now better positioned to routinely access senior leaders. ASPs which did not enjoy this routine access pre-pandemic can consider models via which access can occur via routine infection control meetings in collaboration with IPPs. The major switch from traditional in-person communication to technology-dependent remote communication will likely remain embedded in day-to-day professional work across health systems in the post-pandemic era and will enhance the ability of ASPs and IPPs to collaborate with each other and other stakeholders. The infrastructure that was created for data access, reporting and collaboration during the pandemic, though born out of necessity, can be utilized in post-pandemic operations and can serve as a powerful catalyst for future collaboration.

Many more opportunities for collaboration exist, starting with centralizing access to specialists who are key to the function of both programs (such as IT and microbiology specialists). ASPs can also work with IPPs to refine and enhance data tracking and reporting to the NHSN. ASPs and IPPs can create business plans for collaborative use of common resources such as third-party software platforms and enhanced IT support, thus cutting down on costs for both programs. ASPs and IPPs can also continue to collaborate on patient and staff education materials and processes, including combined curriculum development for things like mandatory staff-wide yearly training modules.

Lastly, the pandemic has highlighted the shortage and demand for trained professionals in infection prevention and antimicrobial stewardship to sustain both IPPs and ASPs. A common personnel need for both program types is access to an infectious diseases trained physician. IPPs and ASPs can work on developing combined models for training, recruitment and retention of infectious diseases trained physicians with specialized training in both infection prevention and antimicrobial stewardship. ASPs and IPPs can also collaborate on providing bundled telehealth services to other hospitals without access to enhanced AS and IP support, especially within health system networks.

Table 1 Opportunities for future collaboration between ASPs and IPPs

Low-hanging fruit	Moderate-hanging fruit	High-hanging fruit
Solidify plans for regular senior leadership access by ASPs in collaboration with IPPs	Refine and enhance data tracking and reporting by ASPs, including NHSN reporting	Consider enhanced models for ID physician recruitment, training and certification in Hospital Epidemiology/Infection Prevention and Antimicrobial Stewardship
Utilize infrastructure for telecommunication that was enhanced during the pandemic for future ASP-IPP collaborations	Create collaborative ASP-IPP business plans (e.g. adoption of third party software platforms, enhancing access to IT support)	Consider new combined ASP-IPP program models incorporating streamlined command and reporting structures
Utilize infrastructure that was created for data access, reporting and collaboration during the pandemic for future ASP-IPP collaborations	Collaborate on enhancing access to IT, microbiology, nursing staff	Collaborate on providing bundled ASP-IPP telehealth services to other hospitals
	Collaborate on patient and staff education	

Conclusion

ASPs and IPPs have similarities in terms of goals, strategies, infrastructure and metrics. The potential for synergy has long been recognized yet underutilized. The COVID-19 pandemic has highlighted multiple opportunities for collaboration between ASPs and IPPs. These opportunities should be explored and infrastructure investment should be made to enhance both program types in the post-pandemic setting.

Compliance with Ethical Standards

Conflict of Interest Mariam Assi, Salma Abbas, Priya Nori, Michelle Doll, Emily Godbout, Gonzalo Bearman, and Michael P. Stevens declare that they have no conflicts of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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- Of major importance

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