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Practice Forum

Integrating antibiotic stewardship and infection prevention and control programs using a team science approach

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Reduction of health care-associated infections is trending in the right direction after decades of work by those involved in infection prevention and control and antibiotic stewardship. With institutional priorities currently pivoting to meet the needs of COVID-19 patients, this may be an advantageous time to promote integration of facility-level antibiotic stewardship and infection prevention and control programs. We propose a team science framework as a tool to leverage the complementary expertise of stewardship and infection prevention and control professionals. This framework considers stages of team development and fluidity needed when working with shifting priorities and can be used by leaders and team members throughout all phases of team building—from developing and launching the team, through evaluating and modifying team activities to best suit local needs.

We cannot afford to take our "foot off the gas" when it comes to reducing health care-associated infections (HAIs), particularly those caused by antibiotic-resistant bacteria and *Clostridioides (Clostridium) difficile***.** We have gained ground regarding the reduction of *C. difficile* infection (CDI), according to a recent Centers for Disease Control and Prevention report published in the *New England Journal of Medicine*—indicating a 24% decrease in CDI and associated hospitalizations during 2011-2017.[1] According to the HAI progress report for 2018 published by the Centers for Disease Control and Prevention, we have also made strides with other HAIs such as central line-associated bloodstream infections and catheter-associated urinary tract infections and antibiotic-resistant HAIs such as methicillin-resistant *Staphylococcus aureus* bacteremia.[2]

To build upon this progress, we portend that facility-level integration of stakeholders (with complementary subject matter expertise) is needed more than ever to accelerate progress amid rapidly shifting priorities. Evidence suggests that while antibiotic stewardship programs (ASPs) and infection prevention and control programs (IPCs) work well independently,[3] there is much to gain when these programs are integrated; stewardship strategies and infection prevention measures appear to be more effective. In fact, similar approaches (CDI prevention bundles) that include both IPC and stewardship strategies have been consistently associated with reductions in CDI.[4,5] There are other examples where IPC and ASP logically intersect such as monitoring antibiotic use to prevent infections caused by antibiotic-resistant organisms, refining testing practices for infections (urinary tract infections) to prevent unnecessary antibiotic use, and reporting process and outcome measures (surveillance for antibiotic use and resistant organisms). Recognizing the potential for quality improvement outcomes by integrating these 2 disciplines, national infection control organizations have been calling for increased interaction between ASPs and IPC programs.[6]

What does it mean to integrate these two programs? Using a framework based on team science to explore this question may aid in building, launching and sustaining a successful combined effort.[7] Team science is defined as a strategy to leverage experience and expertise of research professionals from varying disciplines for the purpose of scientific discovery.[8] Although the science of team science (SciTS) focuses on how integrated research teams operate, much of what has been learned can be applied to integrating the frontline clinical work of AS and IPC programs.[9] The SciTS explores how

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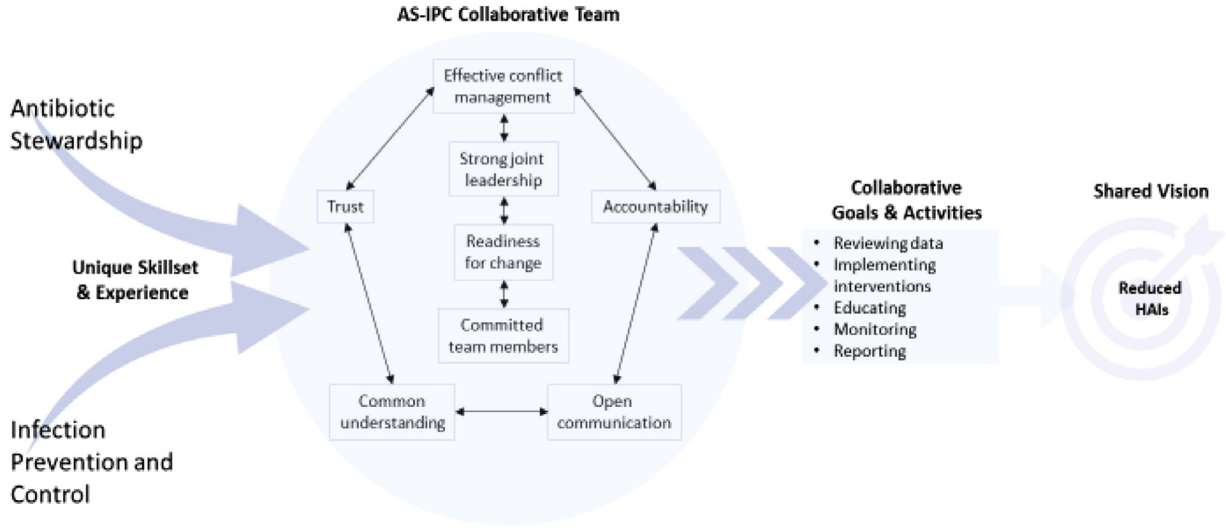

Fig 1. ASP and IPC collaborative framework.

integrated teams work together to produce discoveries that may not be possible when only one type of expertise or one discipline is involved in a project.[10,11] Evidence suggests that teams are influenced by contextual factors such as funding trends, organizational communication, organizational policies and dynamics related to collaboration.[8,9,12-14]

Team science underscores elements that make up an effective team such as effective leadership, *trust* between leaders and team members, *open communication*, shared expectations, well-defined roles, understanding others' professional language, and promoting disagreement while minimizing conflict.[15] Teams are fluid, with new priorities, new members, and new leadership coming and going. Therefore, teams operate on a continuum with stages of interaction and integration. This was described decades ago as regularly occurring stages of team development—forming (members are excited to be part of team), storming (team members learn conflict management), norming (members feel acceptance as part of team) and performing (members develop confidence in team perform at a higher level).[16] These stages can be directly applied to the integration of AS and IPC professional stakeholders to reduce HAIs.

Using team science principles, we propose a framework that can be used to launch integration of AS and IPC professionals. This framework considers stages of team development and fluidity needed when working with rapidly shifting priorities (Fig 1). We apply our framework to an example—reduction of CDI.

Our framework emphasizes skills, expertise and discipline-specific goals. Although members' priorities may vary due to facility-level priorities for the 2 disciplines, there may be many areas of overlap. The primary goals of AS and IPC programs, as defined by their respective professional societies[17,18] are complementary and can be effectively integrated for the purpose of achieving a shared vision—reducing HAIs.

The cornerstone elements of high-functioning teams are depicted in the center of our framework, which considers contextual elements also illuminated in literature related to effective teams. Overall, *readiness for change* is critical to success—those participating must be prepared to engage with each other and respect the roles each will play in preventing HAIs.[12,19] An example of this could be the incorporation of stewardship as part of the facility infection control risk assessment for preventing HAIs). Both *leadership* and *team members* must demonstrate this readiness in resources, personnel or time. As shown in our framework, leadership should be a shared role between one IPC and one stewardship professional. Joint or co-leadership is challenging but can work with the right combination of leader communication behaviors and structural characteristics of the collaborative effort. A recent case study of HAI leadership rounds led by 2 hospital executive leaders found that open communication skills (listening, asking questions, modeling fallibility, allowing time for reflection) and structural characteristics (consistency of meetings, rapid follow-up, reiterating goals, timeliness of data) are important factors related to success when co-leading an initiative.[20]

This case study also highlighted the necessity of building *trust* among team members as key to psychological safety—another key team science element.[20-22] Sustaining best practices require that all members of the ASP-IPC integrated team feel safe to disclose problems and discuss solutions.[23] Building trust among members as the groundwork for respectful disagreement is a cornerstone of team science principles. As such, it is essential that co-leaders pay attention to perceived power differentials between team members and facilitate *conflict management* without blaming.[24] One approach that is gaining momentum in infection control is to perform root cause analyses on HAIs to identify system failures; these same techniques can be applied to ASP interventions.

Overall, members of the ASP-IPC team must build *a* common understanding of how individual skills, expertise and goals fit with the teams' activities to reach a *shared vision*. This understanding should underscore all communication, strategic planning, and decision-making on the ASP-IPC integrated team. These factors will create a supportive environment for maintaining *accountability* and ensuring responsibilities are identified, shared and delegated, acted upon, reported, and evaluated.

EXAMPLE—CDI PREVENTION THROUGH AN INTEGRATED ASP-IP TEAM

CDI is a significant health care-associated pathogen, and the most significant cause of health care-associated diarrhea in the United States[25]; CDI also poses a challenging infection control problem for health care facilities: it is difficult to eliminate from the environment, pathogenesis is not fully understood, it can cause asymptomatic colonization, and it is associated with antibiotic use.[26,27] Given the complex and multidisciplinary nature of CDI prevention, an integrated ASP-IP team may be especially effective in reducing CDI.

Stewardship professionals possess expertise in antibiotic stewardship activities such as preauthorization and postprescription audit and feedback interventions, communication related to consultation, and antibiotic use and resistance monitoring methodology. IPC

professionals possess expertise in identifying and implementing evidence-based practices to prevent transmission of CDI, such as hand hygiene, early identification and isolation, transmission-based precautions, environmental and equipment cleaning and disinfection and HAI surveillance.[28] Many IPC programs have already participated in national team-building collaboratives to reduce HAIs[29] and believe team science is an advantageous approach to facilitate HAI reduction efforts. Both disciplines are skilled at gathering and analyzing data to provide a comprehensive picture of CDI prevention. Both disciplines are also skilled with influencing and shepherding change within organizations.

Health care facilities also have regulatory requirements to conduct annual facility-level infection control risk assessments prioritizing risk based on impact and likelihood of occurring. The ASP-IPC team should define overarching goals by performing an annual risk assessment of HAIs and antibiotic use factors that can affect CDI rates. Facility IPC process measures such as compliance with hand hygiene, isolation, and environmental cleaning should also be reviewed. Once the data review has been completed, intervention planning should begin. The ASP-IPC team can tailor existing CDI prevention practices to local needs. The team can also evaluate methods for collecting data, evaluate diagnostic and testing methods and practices, and identify strategies to streamline feedback to providers and monitoring agencies.

BUILDING INTEGRATED ASP-IPC TEAMS

We understand that prior to integration, it will be necessary to consider local contextual factors. For example, not all institutions have separate IPC and stewardship programs and some institutions house IPC within nursing. Stewardship programs may be housed in infectious disease or pharmacy. One must also consider where the two programs overlap and where they do not overlap. Historically, the ASP role is to assist providers on how best to provide for patients by guiding antimicrobial prescribing decision-making, and the IPC role may focus more on systems-level approaches instead of individual clinical recommendations.

Our framework is a preliminary tool that can be used by ASP-IPC leaders and team members throughout all phases of team development. Future research should examine the structural and process outcomes of using a team science approach for prevention of HAIs.

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