Translating infection prevention evidence into practice using quantitative and qualitative research

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Infection control professionals and hospital epidemiologists, using the valid methods of applied epidemiology—surveillance, benchmarking, intervention, evaluation—have largely been responsible for dramatically reducing the incidence of health care-associated infections over the past several decades. However, we believe that the field of infection control can—and should—also be a leader in understanding how research findings can be efficiently and effectively translated into clinical practice. Unfortunately, there is no current reliable information about which preventive practices are being used in US hospitals to prevent common device-related infections. If we are to understand how best to translate research into practice, the reasons hospitals are using some preventive practices—or are not—must be explored more fully. This article provides a framework for one proposed research endeavor to promote the successful translation of proven infection prevention practices and a subsequent decrease in health care-associated infections. In addition, we hope that this article will stimulate increased interest and research in identifying strategies that will successfully move evidence from the peer-reviewed literature to the patient’s bedside. (Am J Infect Control 2006;34:507-12.)

“Knowing is not enough, we must apply. Willing is not enough, we must do.”
Goethe

Infection control and prevention is a modern day success story and a primary example of how principles of epidemiology can be successfully applied to prevent illness. Indeed, infection control has been identified as a model for the emerging patient safety movement.1 Research has also played an active role in this success story, including a number of studies that support or discredit the use of various practices to help prevent health care-associated infections (HAIs).2-8

Despite the many advances in this area, however, HAIs remain a common and costly problem.9-12 The Centers for Disease Control and Prevention (CDC) estimates that, in the United States alone, HAIs affect approximately 2 million patients hospitalized in acute care settings annually and lead to approximately $3.5 billion in direct costs per year.9,13-17 Work by Harbarth et al suggests that at least 20% of all nosocomial infections can be prevented, with approximately 56% of vascular catheter-related infections identified as potentially preventable.18

Coincident with the concept of a preventable proportion is the rise of consumer-driven, patient-centered care.19 Notably, there are signs that consumers, purchasers, and public policy decision makers are increasingly asking for transparency in measures of performance of providers relative to HAIs.20 Thus, although current infection control practices are a step in the right direction, several additional steps are necessary for infection control to match its potential and respond to growing public concern that HAIs are much too frequent. One critical aspect in meeting this goal is to understand why some evidence-based recommendations are followed by hospitals, and others are not. This information, in turn, provides the foundation for identifying and implementing effective strategies to facilitate the use of proven preventive practices and for helping to ensure optimal patient outcomes.

Generating, interpreting, and disseminating sound scientific evidence are fundamental components of promoting high quality care and a safer health care environment.21 It is increasingly apparent, however,
that simply creating and passively disseminating the information on which to practice evidence-based medicine often does not lead directly to clinical or practice change.\textsuperscript{22-25} Even though we have rigorous evidence and national consensus guidelines, only slightly more than half of patients receive recommended care in the United States.\textsuperscript{26,27} Similarly, recent investigations have shown that recommendations for preventing ventilator-associated pneumonia (VAP) were not commonly used in some hospitals, despite evidence suggesting that these practices can significantly reduce the risk of VAP.\textsuperscript{28,29} Also, despite several studies demonstrating that long, natural or artificial nails increase microbial flora on hands of personnel, there remains an underappreciation of the potential associated risks by many direct care providers.\textsuperscript{30} We strongly suspect, given anecdotal evidence, that such findings are also true for other important infection prevention practices. It is clear that we need to understand better the multitude of factors that affect the attitudes and behaviors of care providers, both individuals and organizations, in adopting and implementing evidence-based practices, including HAI prevention practices.

Although determining the best methods for ensuring the effective use of proven practices in real-world clinical settings is critically important, the inherent complexity of most health care organizations makes this a challenging task.\textsuperscript{31} Meeting this challenge requires the use of novel research strategies as well as a robust conceptual framework. One such framework is a conceptual model developed from studies of organizational change and the adoption/diffusion of innovations. Research on the diffusion and adoption of various technologies or innovations has a long history spanning several disciplines, including economics, sociology, and psychology.\textsuperscript{32-34} As such, a variety of models and theories have evolved to describe, characterize, and predict these phenomena.\textsuperscript{35-39} One of the most simple, yet widely used, models in this area of inquiry is the classic diffusion of innovations work by Everett Rogers.\textsuperscript{35}

As defined by Rogers,\textsuperscript{33}"Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system."\textsuperscript{33}p.5 The 4 main elements that compose the diffusion model are the innovation, communication channel, time, and social system. An innovation is an idea, object, or practice that is perceived as new by the potential adopter. Various attributes of the innovation such as credibility and complexity and the perceived costs and benefits influence its adoption. Communication channels are the mechanism for the exchange of information about the innovation. These channels range from the broad distribution of information through television or the Internet to a personal conversation between colleagues. The time component in diffusion is an inherent part of the decision process that can lead to the adoption or rejection of an innovation. Time is also used to characterize both the relative speed at which the innovation is adopted and the different types of adopters, with those who are first to adopt new ideas classified as innovators, and those who are last to adopt classified as laggards. A social system is a set of interrelated units with a common objective. These units can be individuals, families, or even organizations. Diffusion occurs within this system, and the structure of the system influences the diffusion process.\textsuperscript{33}

Although the concepts used to describe the diffusion of innovations are strongly rooted in studies and observations of individual behavior, these concepts also apply to innovation in organizations. The innovation process in an organization, as described by Rogers,\textsuperscript{33} is composed of 2 major activities: initiation and implementation. The initiation phase precedes the adoption decision and consists of information gathering and planning. However, a decision to adopt an innovation is not sufficient to ensure implementation (ie, use), especially the effective implementation of a practice as required to produce the expected benefits.\textsuperscript{40-42} For example, the adoption of semirecumbent positioning for ventilated patients as defined by the presence of a hospital policy does not necessarily ensure that the policy will be appropriately followed by all clinicians or clinical services (medical, surgical) and subsequently reduce the rate of VAP. The implementation phase includes all the events, actions, and decisions related to the use of the innovation.\textsuperscript{43}

Adapting the basic diffusion of innovations model to gain a better understanding of infection prevention (see Fig 1) highlights the importance of the attributes of a specific practice and the context in which these practices are adopted and implemented. Practice characteristics, such as plausibility and practicality,\textsuperscript{43} facility characteristics (eg, size, culture, number of infection control practitioners), and environmental factors all play a role in the decision by a hospital about whether or not to adopt a particular infection prevention practice. For those hospitals that choose to adopt an infection prevention practice, characteristics of the practice and the hospital are also expected to affect or modify practice implementation. Finally, practice implementation as well as characteristics of the facility (eg, patient population) will ultimately influence a hospital’s HAI rates. Because those who adopt new infection prevention practices are often on the frontlines of clinical care, it may not always be apparent as to how organizational factors might constrain or facilitate the seemingly
logical adoption of evidence-based practices. However, many factors including hospital size, degree of specialization, and number and type of intensive care units are all likely to influence practice adoption because they may be determinants of a specific problem or performance gap. Additionally, organizational characteristics such as the degree of task differentiation (e.g., the presence of a dedicated peripheral intravenous catheter team) and intraorganizational communication could play a significant role in implementation. Other important aspects relate to the actual decision maker or level at which the adoption decision and implementation occurs (e.g., administrative level, physician level, nursing level) as well as involvement by organizational leaders including the amount of resources and support provided to the decision maker and for ensuring implementation.

Despite a number of studies of interventions to promote the use of infection prevention practices, there continues to be considerable variability in the use of many practices, and little is known about what factors facilitate or impede either practice adoption or implementation. Moreover, the complexity of implementing infection prevention practices both among and within health care organizations is increasingly evident as demonstrated by studies of adherence to evidence-based recommendations for decreasing VAP. These studies suggest that there are cognitive, behavioral, and administrative factors that all need to be addressed to promote successfully the use of semi-recumbent positioning in ventilated patients. Before identifying and designing and then implementing effective interventional approaches to encourage the use of evidence-based infection prevention practices, however, we need to understand better the complex inter- and intraorganizational processes surrounding these practices. Furthermore, this understanding can only be obtained by using a broader conceptual framework, such as the diffusion of innovation approach described above, as well as a study design that is responsive to the dynamic nature of real-world health care organizations. Because infection control professionals are a key link in understanding how infection prevention research findings are translated into clinical practice, we feel it is important to inform the readers of the AJIC about the study we are currently undertaking as described below. A second intent of this article is to stimulate additional research that identifies strategies that will successfully move evidence from the peer-reviewed literature to the patient’s bedside.

STUDY OVERVIEW

Drawing on the conceptual framework described in detail above, we plan to study the adoption and implementation of important, evidence-based infection prevention practices. More specifically, we are using a sequential mixed methods study design that relates a quantitative survey data analysis phase to a qualitative semistructured interview and observational phase (see Fig 2). In the first phase, we will survey hospital infection control professionals to describe quantitatively and compare the diffusion, adoption, and, to some degree, implementation of several specific infection prevention practices. In the second phase, we will conduct in-depth semistructured telephone and on-site interviews with both clinical and administrative personnel at selected medical centers. These qualitative

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**Fig 1.** Conceptual framework for translating infection prevention evidence into practice.
data will be used to examine how complex organizational and contextual factors may serve as either facilitators or barriers to the adoption and, perhaps more importantly, the effective implementation of these important innovations.

The study will focus primarily on practices to prevent HAIs that are related to the use of urinary catheters, central venous catheters, and mechanical ventilation. We selected these device-related HAIs because they are relatively common and because there is evidence to support a number of practices to prevent these types of infections. Also, because we are not planning to assess infection rates or how the use of certain practices (e.g., maximum sterile barriers) affects infection rates as part of this research, it is important to examine the use of practices that have previously been shown to be effective through prior studies.

In addition to using a research design that we believe is best suited for studies of complex, real-world health care organizations, another important facet of this research is the multidisciplinary nature of the research team. The individuals conducting the study represent a wide range of educational and professional experience, including nurses and physicians, infection control professionals, and researchers with expertise in organizational behavior and both quantitative and qualitative research methods. Only through this type of rigorous, multidisciplinary and in-depth examination will we gain the insight and understanding that are essential for both developing and testing interventions to ensure the correct use of these practices and subsequently reduce infection risk. We also view this study as an opportunity to contribute to the increasingly important field of translation/implementation to ensure timely improvements in patient care and outcomes. We believe that understanding the success and failure of translating infection prevention practices will serve as a model to understanding the best way to translate other patient safety interventions.

CONCLUSION

Infection control and hospital epidemiology is a modern day success story. Infection control professionals and hospital epidemiologists, using the valid methods of applied epidemiology—surveillance, benchmarking, intervention, evaluation—have largely been responsible for dramatically reducing the incidence of HAIs over the past several decades. We believe that the field of infection control can—and should—also be a leader in understanding how research findings can be efficiently and effectively translated into clinical practice. Unfortunately, there is no current reliable information about which preventive practices are being used in US hospitals to prevent common device-related infections. If we are to understand how best to translate research into practice, the reasons hospitals are using some preventive practices—or are not—must be explored more fully. As we work toward our goal of promoting the successful translation of proven infection prevention practices and a subsequent decrease in HAIs, we look forward to sharing our results with the AJIC readers.
References


