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Commentary

Teaching health care workers to adopt a systems perspective for improved control and prevention of health care–associated infections

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An estimated 4% of inpatients in U.S. acute care hospitals are diagnosed with preventable health care–associated infections (HAIs).[1] Although concerted infection control efforts have achieved reductions in some HAIs,[2] the prevalence of HAIs as a whole is growing. This rise in prevalence is occurring despite increasing efforts to improve infection control protocols and implement prevention measures.[3]

Research[4,5] has shown that improvements in infection control and prevention are dependent not only on training health care workers (HCWs) to perform clinical techniques and apply administrative protocols but also on (1) the extent to which such practices are accepted by HCWs as useful or necessary and (2) the identification and removal of barriers to implementation. We argue that procedural approaches alone, even with high levels of adherence, are often insufficient to solve the growing problem of HAIs; it is equally important that interventions address the more complex cognitive aspects of HAI control and prevention. HCWs face many patient care situations for which standard procedures have not been and cannot be developed. In these cases, HCWs must make decisions with incomplete information and a high degree of uncertainty; understand and balance risk versus reward; account for numerous demands, including those of patients, hospital administrators, and insurance providers; coordinate care across multiple contexts and caregivers; and exercise clinical judgment. To implement a reduction in HAIs therefore requires that HCWs follow infection control procedures but also make clinical decisions related to HAI prevention, and the former must be situated within the latter. This suggests that improvements in infection control education and training for HCWs are critical for reducing HAIs.

In this commentary, our aim is to characterize and discuss the affordances of a novel approach to this problem based on cognitive simulation[6-8]: a practice-based intervention in which participants learn to solve multidimensional problems characterized by incomplete information, multiple stakeholders, and incommensurate demands. This approach, though as yet untried in the context of the complex arena of HAI prevention, has the potential to improve implementation of and adherence to infection control procedures and, more importantly, help HCWs learn to make clinical decisions that promote HAI control and prevention.

There are, of course, many types of cognitive simulation in medical education,[6,9-12] and they are used for a wide range of training purposes. According to a recent review by Satish et al,[13] however, most cognitive simulations seek to replicate the challenges and demands of clinical practice, providing a safe setting for HCWs to rehearse skills, gain confidence, and develop their abilities in case management, critical thinking, decision-making, and other important aspects of professional practice. However, simulating day-to-day practice does not help HCWs understand the systemic aspects of the problem and the bigger picture of HAI prevention.

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IMPORTANCE OF NONPROCEDURAL AND SYSTEMIC FACTORS IN INFECTION PREVENTION

In addition to ensuring that HCWs have mastered and routinely apply basic infection control protocols, HAI reduction is critically dependent on a number of nonprocedural factors, including for example (1) reducing unnecessary and inappropriate use of antibiotics; (2) assessing and managing infection risk at both the individual and institutional levels; (3) managing patient care across clinical microsystems (eg, coordinating care across different clinical teams as a patient is transitioned from surgery to postoperative recovery to rehabilitative support or to another institution); (4) clarifying roles and responsibilities on clinical care teams and therefore reducing role ambiguity; (5) ensuring that a wide range of HCWs fully understand and appropriately implement infection control and prevention measures, both procedural and not; and (6) optimizing infection control processes and prevention measures for different contexts and circumstances.[14-18] Furthermore, HCWs must understand the clinical and economic trade-offs among various HAI control measures, such as environmental disinfection, antibiotic stewardship, patient isolation and transport precautions, use of personal protective equipment, hand hygiene, and optimal laboratory testing. For these reasons, clinicians must be able to adopt a systems perspective for patient care, and because trainees are a major part of the frontline clinical workforce, this recommendation is especially applicable to them.

In 2001, the Accreditation Council for Graduate Medical Education began requiring graduate training programs in the United States to incorporate systems-based practice into their curricula, but most have struggled to implement and assess such training.[19-21] Although medical and public health education have begun to converge in recent years, reflecting the extent to which clinical practice is increasingly situated within prevention frameworks,[22,23] graduate education remains focused on specialization and patient-centered practice.[20] This makes it challenging for medical trainees to understand the boundaries, stakeholders, and complex interactions that characterize health care systems, and they view patient care more holistically.

SIMULATION-BASED APPROACH TO TRAINING IN HAI PREVENTION

Educational interventions, particularly graduate and in-service training, comprise a key component of infection control efforts,[5,15,16,24-26] but they most involve only training in basic procedures. In a recent review[24] of educational interventions to prevent HAIs, the most commonly used tools were "lectures or classes, video presentations, posters, questionnaires and fact sheets, and practical demonstrations." Online interventions are also based in basic dissemination of information.[26] Such approaches effectively convey basic facts and approaches, but they do not help HCWs learn to think broadly about HAI control and prevention.

More involved interventions have been developed in other contexts to encourage systems-based thinking. Englander et al,[27] for example, engaged residents in an institutional cost-reduction exercise in which the goal was to lower laboratory testing costs without diminishing the quality of patient care. Because residents request laboratory services extensively, they were able to identify key barriers to the use of point-of-care testing and develop strategies to overcome those barriers, which ultimately saved the institution >$500,000 per year. A key observation is that the residents approached the problem incorporating the view of a health care administrator—that is, someone concerned with management and cost of health care services—rather than through solely the lens of a clinician. In other words, through this exercise, residents learned how diagnostic decision-making can influence hospital economics and that both can be optimized to improve patient care. This is at the core of understanding a health care system.

Although trainees should be included in such exercises whenever feasible, it is difficult to integrate these live programs into already demanding training. Furthermore, such interventions offer little opportunity for supervisors to evaluate trainees, and data cannot be easily collected for assessment of learning and performance.

An online simulation focused on the systems-based approach has numerous advantages over participation in live scenarios such as the one previously described. Among other things, a simulation can (1) be scaffolded to support specific learning objectives and performance outcomes; (2) enable HCWs to consider a complex problem from a different perspective, such as that of a hospital administrator, helping them better understand the systemic aspects of the problem; (3) incorporate large numbers of HCWs who can collaborate even across institutional or geographic barriers; and (4) collect rich data on participant performance, making detailed assessment of learning, attitudes, and practices possible. In addition, research[28] suggests that an online simulation may help to overcome barriers to learning such as those related to differences in experience, health care role, or sex.

We propose a simulation-based approach to training in HAI control and prevention based on a particular theory about how people learn and develop mastery in a particular context. According to epistemic frame theory,[29-31] expertise in a domain is characterized not by the accumulation of knowledge and skills in isolation but by the particular set and configuration of knowledge, skills, values, habits of mind, and ways of making and justifying decisions, the epistemic frame of that domain. Understanding comes from making connections among different elements of practice, such as the connection that residents made between health care economics and diagnostic decision-making in the exercise previously described. Cognitive simulations are a particularly powerful training tool because they help learners make meaningful and situated connections among skills and knowledge and the decision-making processes that guide action. A broad range of research[28,32-36] has shown that cognitive simulations help learners integrate these elements, making them meaningful, actionable, and persistent.

Importantly, a cognitive simulation developed from this theoretical perspective needs to do more than simply recreate a patient care scenario. HCWs develop expertise in HAI control not only understanding basic patient-specific skills, but also through cognitive processes that take into account how patient care decisions have effects beyond the patient in a complex health care system. To develop these cognitive processes, HCWs need to be able to analyze and solve patient care problems by taking into account multiple perspectives, not only theirs, but also the perspectives of patients, other providers, administrators, and those charged with infection control at the institutional or community level.

An online cognitive simulation in which HCWs approach HAI control and prevention from the perspective of a hospital's director of infection control, for example, would help them learn to understand the intricacies of that position outside of patient care. A key element of this approach is to assume a role that is fundamentally different from their own. Health care providers and administrators are interested in the same problem—HAI control and prevention—but they approach that problem from different perspectives: individual patient protection versus protection of patients throughout the health care system. Learning science research[6,7,31,37,38] on how professionals are trained suggests that significant learning gains can be achieved when learners are able to assume a role different from their own in a realistic but scaffolded environment

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