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## Institutional quality and patient safety programs: An overview for the healthcare epidemiologist

**Pranavi V. Sreeramoju, MD, MPH, MBA<sup>1,a</sup>, Tara N. Palmore, MD<sup>2,a</sup>, Grace M. Lee, MD<sup>3,4</sup>, Michael B. Edmond, MD, MPH, MPA, MBA<sup>5,6</sup>, Jan E. Patterson, MD, MS<sup>7</sup>, Kent A. Sepkowitz, MD<sup>8</sup>, Donald A. Goldmann, MD<sup>9,10,11</sup>, David K. Henderson, MD<sup>2</sup>, Keith S. Kaye, MD, MPH<sup>12</sup>**

<sup>1</sup>Division of Infectious Diseases and Geographic Medicine, University of Texas Southwestern Medical Center, Dallas, Texas,

<sup>2</sup>Clinical Center, National Institutes of Health, Bethesda, Maryland,

<sup>3</sup>Division of Infectious Diseases, Lucile Salter Packard Children's Hospital, Stanford University,

<sup>4</sup>Stanford Children's Health, Stanford, California,

<sup>5</sup>Carver College of Medicine, University of Iowa, Iowa City, Iowa,

<sup>6</sup>University of Iowa Health Care, Iowa City, Iowa,

<sup>7</sup>Division of Infectious Diseases, University of Texas Health Science Center, San Antonio, Texas,

<sup>8</sup>Memorial Sloan Kettering Cancer Center, New York, New York,

<sup>9</sup>Department of Immunology and Infectious Diseases and Epidemiology, Harvard School of Public Health, Boston, Massachusetts,

<sup>10</sup>Harvard Medical School, Boston, Massachusetts,

<sup>11</sup>Institute for Healthcare Improvement, Boston, Massachusetts

<sup>12</sup>Division of Infectious Diseases, Department of Medicine, University of Michigan Medical School, Ann Arbor, Michigan

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Quality improvement has been integral to infection prevention since the days of Ignaz Semmelweis<sup>1–3</sup> and Florence Nightingale.<sup>4</sup> In the 21st century, healthcare epidemiology and the healthcare quality movement have blossomed and become indispensable disciplines in every hospital and healthcare system. The 2 fields have become increasingly intertwined over the past several years, such that the job of healthcare epidemiologists requires a close working relationship with quality and safety leadership.

In many hospitals and health systems, infection prevention is integrated with the quality department. The healthcare epidemiologist often works closely with, and reports to, the executive in the corporate suite who oversees quality and safety, frequently the chief quality officer (CQO) or the chief medical officer (CMO). Many of the metrics used in hospital

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**Author for correspondence:** Pranavi V. Sreeramoju, Pranavi.Sreeramoju@UTSouthwestern.edu.

<sup>a</sup>First authors of equal contribution.

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quality are based on surveillance data and are provided to quality leadership directly by the healthcare epidemiologist. In addition, infection prevention and quality share many of the same goals (eg, optimizing patient safety and outcomes), approaches (eg, improving structures and monitoring and refining care processes<sup>5</sup> and mind-sets (eg, embracing a culture of safety and quality improvement). In addition to these practical reasons why healthcare epidemiologists should have a basic understanding and knowledge of healthcare quality and patient safety, they can utilize quality processes and skills to optimize infection prevention. Infection prevention can be a practical pathway toward quality and patient safety leadership.

In this paper, we outline important concepts in quality and patient safety with which a healthcare epidemiologist should be familiar. We describe notable similarities and differences among the skills needed in healthcare epidemiology and quality, compare and contrast the types of processes utilized in interventions and programs by each discipline, and describe ways in which healthcare epidemiology can lead to a career in healthcare quality and patient safety.

For the purposes of this paper, ‘healthcare epidemiology’ and ‘infection prevention’ are used interchangeably, as are ‘infection control’ and ‘infection prevention.’ In addition, the healthcare epidemiologist is considered to be the medical director of infection prevention. In recent times, medical directors of antimicrobial stewardship programs are considered healthcare epidemiologists and they lead efforts to promote quality and safety of patient care related to antimicrobial usage and resistance. While the importance of antimicrobial stewardship in improving quality of patient care is increasingly being recognized and will likely be more closely aligned with quality in the future, in the current quality landscape, infection prevention outcomes are more closely aligned with quality. The overview of concepts and career guidance presented in this paper is applicable to medical directors of both infection prevention and antimicrobial stewardship. When the quality department is discussed, for the purposes of this manuscript, the assumption is that it encompasses patient safety.

## Overview of the Quality and Patient Safety Movement

The roots of healthcare quality can be traced to the early 1900s, when Ernest Codman, a Boston surgeon, became a pioneer in applying quality improvement principles to the care of his patients. He sought to measure a comprehensive panoply of clinical outcomes that went far beyond anything tracked by physicians or hospitals of his time.<sup>6,7</sup> Like Semmelweis and others whose ideas threatened the complacent establishments of their times, he was ostracized by his colleagues. In the middle of the 20th century, W. Edwards Deming and Walter Shewhart developed foundational principles of quality improvement through their work in the automotive and communications industries, respectively, bringing the concepts and language of quality improvement into the healthcare realm.<sup>8,9</sup> Their basic principles (ie, plan-do-study-act) echo an epidemiological approach to problem solving. Additionally, Joseph Juran<sup>10</sup> emphasized that quality planning, quality control, and quality improvement (frequently referred to as the Juran trilogy) go together, and that management needs to commit to continual improvement.

In the 1980s, the SENIC study by the Centers for Disease Control and Prevention (CDC) demonstrated that hospitals that had infection control programs had better infection-specific patient outcomes than those that did not.<sup>11,12</sup> The study, the results of which were rapidly embraced by The Joint Commission (then the Joint Commission on Accreditation of Healthcare Organizations), helped fuel the establishment of healthcare epidemiology programs in every US hospital. The landmark 2001 publication by the National Academy of Medicine, “Crossing the Quality Chasm,” highlighted deficiencies in healthcare quality and patient safety and emphasized the need for improved delivery of healthcare.<sup>13</sup> The publication defined quality as “the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge,” and outlined 6 components of quality known by the acronym STEEEP: safety, timeliness, efficiency, equity, effectiveness and patient centeredness. Healthcare-associated infections were framed as a patient safety issue, in service of a basic tenet of medicine, “first, do no harm.” Quality and safety programs in hospitals were subsequently established to apply quality improvement principles and standardize care. In 2000, the National Academy of Medicine published, “To Err Is Human: Building a Safer Health System,”<sup>14</sup> a report that called for healthcare organizations to develop a “culture of safety,” with personnel and processes focused on safe and reliable care.

Whereas the NAM reports raised awareness, the 2006 Keystone Michigan ICU project demonstrated concretely that quality improvement methods could lead to dramatic reductions in the rate of central line-associated bloodstream infections, underscoring the preventability of such infections.<sup>15</sup> The Keystone publications likely accelerated the integration of hospital epidemiology programs into healthcare quality and safety programs.<sup>15,16</sup> Funding, training, and leadership in quality improvement pre-dated the NAM reports. The Agency for Healthcare Research and Quality (AHRQ) has been funding research and training in quality improvement and patient safety and sponsoring multi-institutional quality improvement studies related to healthcare-associated infections for 30 years. The Institute for Healthcare Improvement has also worked aggressively to improve the quality of care as well as to raise awareness about quality in healthcare since 1991 and has provided opportunities for training in quality and patient safety since 2003.<sup>17</sup>

Since 2008, other frameworks that have been promoted in addition to STEEEP are the “Triple Aim,” comprising care, health, and cost,<sup>18</sup> and the “Quadruple Aim,” including improved staff work–life balance and “Joy at Work.”<sup>19</sup> The framework is intended to guide healthcare improvement initiatives to pursue healthcare quality and experience of care, improve population health, and reduce per capita cost of care for populations.<sup>20</sup> Because of rising costs of healthcare in the United States, “value” is considered one of the most important characteristics of healthcare delivery in modern times. Value in modern healthcare is defined as (quality + service experience + access to care)/cost. Innovation as well as adoption of known best practices are recognized as means to help achieve high-value healthcare.

Quality and patient safety are now critical and inextricable components of healthcare infrastructure. Regulatory forces including mandatory public reporting of quality measures, efforts to align quality and safety programs with payments (eg, value-based and bundled

payments), and national ratings based on quality metrics, have transformed healthcare quality and patient care in general, and the transformation is ongoing.<sup>21,22</sup>

## **Important concepts, approaches, and metrics in quality and patient safety**

Similar to healthcare epidemiology, healthcare quality and patient safety are comprised of several concepts, processes and vocabularies that are commonly used. Healthcare epidemiologists should be familiar with these processes and terms to facilitate communications with healthcare quality personnel. In addition, several of these processes and concepts can be used successfully in infection prevention and antimicrobial stewardship.

### **Culture**

A focus on changing the culture of healthcare has led to many insights about improving the quality of care for patients. Since the National Academy of Medicine issued its call for a “culture of safety,” the healthcare industry has drawn lessons from other high-risk sectors (eg, the aviation industry) on key concepts like just culture, high reliability, and systems safety. The culture of safety concept has become a cornerstone of healthcare quality and patient safety.

The concept of ‘just culture’ provides leaders with a framework for evaluating behavior choices of healthcare personnel who fail to use safe patient care practices.<sup>23–25</sup> The hallmarks of a culture of safety are acknowledgment of risk, blame-free response to events or near misses, and institutional support for reporting of errors or problems.<sup>26</sup> Within a culture of safety, departments do not function within siloes and are not firewalled from one another. Cross-disciplinary collaborations are encouraged to address problems and challenges and to seek solutions. Leadership in a culture of safety is committed to fostering the psychological safety to raise safety concerns<sup>27</sup> and to providing the resources necessary to address them.<sup>28</sup>

### **High-reliability organizations**

Many acute-care hospitals now strive to be high-reliability organizations.<sup>29</sup> Such organizations endeavor, like the airline and nuclear power industries, to function smoothly and efficiently in complex, high-risk settings while avoiding serious mishaps. The 5 principles of high-reliability organizations are preoccupation with failure, reluctance to simplify (embracing complexity), commitment to resilience, sensitivity to operations, and deference to expertise. Potential problems are anticipated, and when they do occur, they are detected early and addressed quickly in an effort to avoid catastrophic consequences. High-reliability organizations focus on improving safety, reducing variability, and error-proofing systems in an effort to provide consistent, evidence-based care. Systems thinking in which the goal is the synthesis of an entire product solution that will address longstanding problems<sup>30</sup> and a hierarchy of risk controls approach<sup>31</sup> are used to evaluate and to design safety processes.

## Root-cause analysis

A root-cause analysis (RCA) is a structured method used to analyze serious adverse events and near misses to identify system errors and preventive measures.<sup>32,33</sup> Although it was initially developed to analyze industrial accidents, RCA has become a cornerstone process used as an error analysis tool in healthcare to detect safety hazards. The focus of an RCA includes identifying how and why an event occurred, while avoiding a focus on individual fault or blame. Goals include focusing on the systems of care, identifying fundamental problems or vulnerabilities that increase the likelihood of errors, and, ultimately, preventing future harm through the correction of flaws underlying an adverse event or near miss.

RCAs are conducted with prespecified protocols. A multidisciplinary and interprofessional team collects data and reconstructs events via review of medical records and interview of participants. The team uses a systems approach to analyze the sequence of events leading to an error or near miss, then develops an action plan to correct systems issues that are identified in the course of the RCA.<sup>34</sup> RCA<sup>2</sup> (RCA-squared) is a method developed by the National Patient Safety Foundation that builds on the RCA using improvement science to implement actions such as engineering controls, standardization of processes, and physical plant changes whenever feasible. These approaches are favored over interventions (eg, in-service trainings and/or policy memoranda), which have been shown to have weaker or shorter-acting effects.<sup>35</sup>

## Failure mode and effects analysis

A failure mode and effects analysis (FMEA) is a structured process analysis that is conducted by a multidisciplinary team in advance of a planned procedure or event in an effort to identify all possible “modes” of failure, or ways in which failure might occur.<sup>36</sup> For example, an FMEA may be conducted before introducing a new type of surgical procedure to identify in advance any vulnerabilities in staffing, nursing expertise, operating room or surgical equipment, air handling, postoperative support, etc.

## The human factors analysis and classification system

The human factors analysis and classification system (HFACS) is an alternative or complementary method to the RCA used to evaluate causes of adverse events or near misses and to identify opportunities for improving systems and processes.<sup>37</sup> The HFACS was developed in part to provide a methodology to facilitate investigation of an adverse event caused by or involving humans. It seeks to overcome some of the limitations of RCAs, including lack of standardization and reliability and identifying causes that are too nonspecific to be actionable. The HFACS places the focus on “why” and assesses the role of individual human error.

## Model for improvement

The model for improvement has been used by many healthcare organizations to guide improvement work, and aims to accelerate improvement.<sup>38</sup> The model includes 2 parts. The first part involves addressing 3 questions: (1) What are we trying to accomplish? (2) How will we know that a change is an improvement? (3) What change can we make that will

result in an improvement? Addressing these questions helps determine the aims (pertaining to desired changes) and improvement metrics.

The second part begins with the formation of a team that includes those who are engaged in the work at hand as well as major stakeholders in the process. To be successful, the team should be interprofessional (multiple professions) and multidisciplinary (multiple disciplines in medicine). Once team membership has been established, aims have been set, and improvement metrics have been developed, the next step is to test change in the real-world setting using the second component of the model, the plan-do-study-act (PDSA) cycle. The PDSA cycle involves planning and trying a change, observing the results, and acting upon what is learned.<sup>39</sup> The steps include (1) planning the test or observation (including a plan to collect and analyze the data); (2) doing, that is, implementing the test, often on a small scale initially; (3) studying, that is, setting aside time to analyze data and evaluate the results; and (4) acting on what was learned in the test by modifying the change that was tested. At this point, the PDSA cycle might begin once again with planning for the refined test.

### **Metrics used in quality and patient safety**

Generally, 4 types of metrics are used in healthcare quality and patient safety to assess and compare performance: structural, process, outcomes, and patient engagement measures.<sup>40</sup>

**Structural measures**—These measures provide an assessment of an organization's capacity and capability with regard to systems and processes to provide high-quality care. Examples include engaged and supportive administrative leadership, robust institutional policies and procedures that focus on patient safety, support for surveillance systems, availability of healthcare epidemiology expertise, provider-to-patient ratios, use of an electronic medical record (EMR) system, and proportion of board-certified physicians on staff.

**Process measures**—These measures assess what a provider does to maintain or improve a patient's health, and they are often based upon or reflect guidelines or recommendations for clinical care and practice. Examples include adherence to device bundles, the proportion of patients who receive preventive cancer screening services (eg, mammograms and colonoscopy) or the proportion of patients who receive indicated vaccinations.

**Outcomes measures**—These measures assess the impact of the healthcare service or intervention on the health status of the patient. These metrics are heavily incentivized in reputational and payment programs and receive much attention and focus from hospital leadership.<sup>41</sup> Examples include 30-day mortality for pneumonia patients, the rate of central-line-associated bloodstream infections, and influenza immunizations.

**Patient experience and engagement measures**—These measures are used to assess patient satisfaction and experience in the hospital as well as participation in their care. For example, the Centers for Medicare and Medicaid Services (CMS) assesses patient experience via the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey, which is an instrument and data collection methodology for measuring patients' perceptions of their hospital experiences.<sup>42</sup> It is administered after discharge and

includes questions about communications with and responsiveness of hospital staff and hospital cleanliness.<sup>43</sup> An example of patient engagement is participation in patient portal tools in electronic medical records.

## The Role of the Healthcare Quality Leader

Leaders in healthcare quality and patient safety must fill several roles and must possess certain skills. These have many similarities with the roles and skills that make healthcare epidemiologists effective. Leadership is important in both infection prevention and healthcare quality, and key leadership skills are similar between the 2 disciplines. In this section, we summarize the roles and skills necessary for a leader in quality and patient safety to be effective (Table 1).

### Clinical and technical skills

A leader in healthcare quality and safety must have a clinical background to have a good understanding of clinical issues and challenges that arise, as well as the insight to address the issues effectively. Although a leader does not need to be an expert in information technology (IT), having basic knowledge and familiarity with healthcare IT topics (eg, electronic medical records) can help to facilitate communication with IT and data analytics experts and to provide insight and perspective for IT-related healthcare issues as partnership in these areas is critical. Business expertise is valuable in planning budgets and return on investment (ROI) proposals, and administrative experience and knowledge are helpful for department management and oversight.

### Leadership

The importance of effective leadership cannot be overstated. A person occupying a leadership position in quality and patient safety may have many skills and strengths, but is much less likely to be effective if he or she is not a good leader. The leader should be a team-builder who can facilitate the establishment of productive committees and task forces, as well as a coach who can help direct and improve the quality of the work and effectiveness of team members. The leader must be able to address and manage complex, multifaceted situations that involve a variety of diverse personnel. These situations call for adaptive leadership skills that include self-awareness, mindfulness, being an attentive and effective listener, observational skills, and the ability to anticipate beliefs and behaviors that must be changed to achieve a safer environment. The effective leader must be able to manage emotionally charged situations with calm and fortitude. A quality and safety leader should have a strong and dynamic presence and should be a willing and active participant on frontline activities, such as going to the place where the activities take place and seeing directly how the work occurs.<sup>44</sup> They should also provide vision and direction for an organization, and they should inspire healthcare personnel to strive for the safest possible hospital environment for their patients. The leader must promote equity and inclusion and must leverage the benefits of a diverse healthcare workforce to provide optimal care to a diverse patient population.<sup>45</sup>

### **Communication skills**

Leaders in healthcare quality must communicate effectively both verbally and in writing. They also need to be able to communicate effectively with all types of healthcare personnel and hospital employees, including clinicians, nonclinical hospital staff, and administrators. Although leaders do not necessarily need to be well liked, they do need to be approachable, trusted, and respected.

### **Intangibles**

Prior experience in quality and patient safety, or quality or performance improvement in healthcare, can be extremely useful in a healthcare quality leadership role. In fact, a background in infection prevention leadership is excellent preparation for broader work in quality and patient safety, since this background includes not only metrics and data analysis, understanding epidemiologic methods but also interprofessional and multidisciplinary team building and patient safety interventions. Having the intellect to appreciate the complexities of the hospital and health system and the challenges that healthcare personnel face on the clinical front lines is essential for providing effective leadership. In addition to prior experience and intellect, a leader in healthcare quality should have a genuine passion for patient safety. Ideally, by combining these characteristics, an effective leader can possess and demonstrate intellect and experience complemented by passion for improving patient care.

## **Comparing and Contrasting Healthcare Epidemiology and Quality: Similarities**

The characteristics and roles of a healthcare epidemiologist are described in detail elsewhere.<sup>46</sup> Although no single model of a healthcare epidemiologist or quality leader is completely applicable, the disciplines have some general similarities and differences in style, methods, and content (Table 1). Notable similarities include effective communication, clinical background and knowledge, administrative skills, leadership, being a coach and a team builder, and having intellect and passion for patient safety.

### **Culture of safety**

Healthcare epidemiologists are mindful of the culture of safety, which is a cornerstone of quality and patient safety in healthcare. A culture of safety encourages reporting of errors and adverse occurrences and uses them to identify system problems rather than to assign blame and punish individuals. For example, infection prevention specialists do not single out personnel who fail to isolate a patient for influenza; rather, they use systems analysis and improvement and psychological safety methods to make isolation a more automatic process when such a diagnosis is suspected or confirmed. A wrong-site surgery triggers an RCA and other reviews to identify, enforce, and reinforce systems-based solutions, rather than censuring the involved surgical team. This type of culture is key to implementing improvements in the infection prevention processes as well as other aspects of patient safety and quality.



## Collaboration

Direction of both healthcare epidemiology and quality efforts involve leading change, often through influence rather than through actual authority. Healthcare epidemiologists are team builders who are accustomed to work that is collaborative rather than reliant solely on siloed individual efforts, resulting in shared achievements in which many people are invested. The culture of teamwork is likewise integral to quality work. In both disciplines, leaders promote teamwork and collaboration, and they work to break down siloes and develop partnerships across disciplines to improve care. For example, in infection prevention, an effort to reduce surgical site infections might typically involve, at a minimum, surgeons, anesthesiologists, nurses, wound-care specialists, informatics experts, and pharmacists. Encompassing stakeholders from all disciplines in patient safety and quality improvement helps maintain broad staff investment in both infection prevention and quality improvement efforts. An initiative to reduce falls would typically involve nursing, psychiatry, patient safety staff, and representatives of medical or surgical teams.<sup>47,48</sup>

## Leverage data to inform actions

Quality and healthcare epidemiology leaders routinely define performance measures and make certain that they are collected in a reliable and consistent manner. They report numerous types of patient safety and clinical quality data to hospital leadership and boards, and to major stakeholders within the hospital. Some of these metrics are used in pay-for-performance algorithms, thus giving the data significant financial implications. The financial penalties of deficient quality measures are substantial. For example, in fiscal year 2019, more than half of US hospitals received reduced Medicare reimbursement as a result of excessive rates of readmission.<sup>49</sup> Pay-for-performance is often tied to clinical quality and patient safety measures. Among those metrics, much of the key patient safety data are collected and contributed by healthcare epidemiologists, who oversee the surveillance and assembly of data related to healthcare-associated infections (Table 2). Such metrics may include hand hygiene compliance, rates of device-related infections, surgical site infections, sepsis, *Clostridioides difficile* infection, staff and patient influenza immunization, and adherence with screening for multidrug-resistant organisms.

## Communication skills

Strong communication skills are crucial for both infection prevention and quality leaders. The healthcare epidemiologist has the experience in managing challenging situations, such as outbreaks, high-profile exposures, or public health investigations, as well as the subject matter expertise and communication skills to lead the hospital and health system response to those situations. Healthcare epidemiologists are accustomed to navigating ambiguous and novel situations and to using honest and open feedback to engage colleagues. These abilities translate well to quality leadership in the era of value-based care, in which reporting and communication of patient outcomes (including both HAI and non-HAI data) to the public and to government and regulatory agencies are integral to the success of the health system.

## Comparing and Contrasting Healthcare Epidemiology and Quality: Differences

### Finance

Both quality and healthcare epidemiology have administrative roles, and leaders in healthcare quality are usually tied more closely to the corporate suite and are more directly enmeshed in fiscal and pay-for-performance issues than are healthcare epidemiologists. With a shift from volume-based to value-based care, quality and safety performance measures, including performance related to infection prevention processes and outcomes, have greater financial implications for the hospital and health system. Quality is inextricably linked with reimbursement and revenue, making the chief quality officer (or their equivalent) an integral member of the corporate suite and a key player in the financial health of the institution. As a result, the scope of the quality leader's portfolio often includes a knowledge of, or familiarity with, healthcare finances. Although healthcare epidemiologists are constantly reminded about nonreimbursement and penalties related to HAIs when conducting surveillance and reporting infection rates, issues of finance are generally outside the direct scope and responsibility of the healthcare epidemiologist, with the exception of being responsible for making a business case for infection prevention and antimicrobial stewardship programs.

### Methodology

Infection prevention has decades of history with improvement science and several well-defined outcomes and process metrics. Healthcare epidemiologists have an understanding of association compared to causality. They appreciate and try to mitigate bias in epidemiologic studies, and they utilize methods to identify, investigate, and control outbreaks and epidemics.

Healthcare quality is a relative newcomer to healthcare. As such, quality leaders may rely less on an evidence base and more on innovation to approach problems. Both healthcare epidemiologists and quality leaders utilize quality improvement methodology, but some other types of methodologies and analytics are used more commonly in the quality and patient safety fields. Quality leaders often display and analyze time-ordered data; they appreciate and often try to mitigate variation, focus on improving systems, and embrace causal and change theory and rapid cycle testing of predictions. Patient safety specialists use RCA to study retrospectively or FMEA to study prospectively the systems errors that lead to patient safety lapses. Quality leaders focus more broadly on outcome and process measures, using electronic health record analytics to measure identified weaknesses in processes. Thus, quality leaders must have in-depth knowledge of national trends and performance improvement methodologies to translate evidence-based practices into clinical use. Examples of such process metrics include administration of aspirin and door-to-balloon time for patients who present with acute myocardial infarction or wait time for radiology procedures.

## Sources of influence

Another contrast lies in the respective sources of influence and reference for healthcare epidemiology and quality. The CDC collects and publishes reams of data and information about healthcare-associated infections, as well as numerous evidence-based infection prevention guidelines for healthcare facilities and practitioners. The CDC serves as the authority on healthcare epidemiology practices and metrics, but quality and patient safety are informed and refereed by multiple sources. Examples of these leaders in healthcare quality are as follows:

- The Institute for Healthcare Improvement<sup>50</sup> is a well-established, influential nonprofit thought leader that has been promoting healthcare quality since its inception in 1991.
- The Agency for Healthcare Research and Quality<sup>51</sup> funds research aimed at developing tools to improve quality of care.
- The National Quality Forum<sup>52</sup> is a nonprofit, membership-based organization that builds broad collaborations to develop consensus standards for quality metrics.
- The Centers for Medicare and Medicaid Services (CMS)<sup>53</sup> have used reduced reimbursement to encourage hospitals and health systems to improve quality in targeted areas, including reduction of healthcare-associated infections, other preventable complications of inpatient care, and readmissions. As the largest third-party payor, CMS is, by design, a major determinant of healthcare quality priorities.
- The Joint Commission<sup>54</sup> is a nonprofit organization that accredits hospitals that meet its annual National Patient Safety Goals and other Conditions and Standards of clinical quality and patient safety.
- The nonprofit Leapfrog Group,<sup>55</sup> founded in 2000, uses quality and patient safety metrics from voluntary surveys to rate hospitals and ambulatory surgery centers.

## Breadth versus depth

Although the roles of healthcare epidemiologist and quality leader overlap substantially, they are distinguished from one another by important aspects of content and style. A healthcare epidemiologist is a content expert with regard to infection prevention issues, whereas a leader in healthcare quality is not always assumed to be a content expert (but is expected to identify and appropriately utilize content experts). Healthcare epidemiologists are expected to lead outbreak investigation and control efforts. They are also expected to advise or lead efforts to prepare an organization for emerging pathogens (eg, *Candida auris*), infection-related disasters such as bioterrorism, pandemic respiratory infectious diseases (eg, SARS-CoV-2) and outbreaks of global health importance (eg, Ebola). Quality leaders, on the other hand, may be called upon to prevent and mitigate disasters that are not related to infections (eg, cybersecurity threats, hospital floods, or the opioid crisis).

Quality and patient safety leaders must be conversant in and comfortable with a broad array of material that might not have an extensive depth of scientific evidence-based research. A transition from healthcare epidemiology to quality may require acclimation to espousing goals and processes that have other merits in addition to a science base. The broader portfolio of quality also requires developing a high level of comfort with a generalist's breadth of knowledge, which might reflect knowledge in a wider variety of specialties, and less in-depth knowledge of any specific specialty (ie, quality encompasses a wide variety of healthcare specialties) rather than that of a subject matter expert (ie, infection prevention is based in epidemiologic infectious diseases principles with which the healthcare epidemiologist has in-depth knowledge and expertise). Table 3 offers a general comparison of infection prevention, quality and safety concepts, actions and knowledge base.

### **Convergence among infection prevention, quality and patient safety**

The disciplines of infection prevention and quality and safety have much to learn from one another. Infection prevention utilizes shoe-leather epidemiology reliably and effectively, while increasingly utilizing more efficient methodologies to scale activities. Experts in infection prevention conduct outbreak investigations and have expertise in designing and implementing multimodal interventions, some of which may be packaged as 'bundles of care' and checklists.<sup>46,56</sup> These concepts have been embraced by infection prevention, quality and patient safety. Infection preventionists and healthcare epidemiologists often successfully implement proactive prevention programs such as hand hygiene, isolation practices, healthcare personnel vaccination programs and emerging infections preparedness. In fact, patient safety can be envisaged as having 2 components: infection-related patient safety (ie, freedom from healthcare-associated infections) and non-infection-related patient safety (ie, freedom from adverse events such as falls, pressure ulcers, medication errors, etc). Implementation science, which studies methods to optimize appropriate implementation and uptake of evidence-based interventions to improve healthcare, has become a rapidly growing discipline not only in infection prevention but also in healthcare quality and patient safety. An often underemphasized discipline is that of improvement science, which focuses on innovative approaches to improving the quality and safety of care.

Quality improvement methods fundamentally focus on achieving system change, often through testing interventions using PDSA cycles to reduce variation in care leading to process improvement and also to learn which interventions were effective and which interventions were not. Lean, six-sigma, and quality improvement methods are often implemented together. They focus on systems, people, error proofing, reliability, repeated testing and experimentation to recognize problems and identify solutions, providing feedback and measuring outcomes. Lean methods help reduce waste, resulting in greater stewardship of resources.<sup>57</sup> Lean is sometimes referred to as Toyota Production System. Six-sigma methods focus on improving efficiency and reducing variability of processes. Quality improvement methods additionally allow changes to workflow for adoption, scale-up, and adaptation of support processes and to improve the patient experience.

Quality improvement per Deming emphasizes 'profound knowledge' among healthcare personnel. According to Deming, predictably successful improvement requires skills and

knowledge across 4 domains: systems thinking, practical knowledge of what works, social factors in the work environment, and understanding variation.<sup>58</sup> Healthcare personnel at the bedside, ie, clinicians who come in contact with patients, should be in charge of inspecting processes and outcomes while they work, and they should continuously find ways to improve their work and mitigate problems (often referred to as *kaizen*, a Japanese term for continuous improvement<sup>59,60</sup>). For example, healthcare personnel at the patient bedside might monitor adherence to hand hygiene and find ways to improve hand hygiene practices. Another example is healthcare personnel auditing care processes for central-line and urinary catheter care and creating action plans to prevent central-line-associated bloodstream infections or catheter-associated urinary tract infections. Safety experts employ methods such as RCAs and FMEAs to identify system issues and opportunities.

Several quality and safety methods and skills can be used effectively to reduce healthcare-associated infections and to reduce risk of transmission of pathogens, particularly when employed in conjunction with sound principles of infectious diseases, microbiology, and epidemiology. Furthermore, principles of culture of safety, human factors analysis, teamwork, and implementation science have been used in the development of socioadaptive approaches that augment the effectiveness of technical approaches to prevent healthcare-associated infections.<sup>24,61</sup> Many of these concepts have been included in a guide for sustaining and spreading successful prevention efforts published by the AHRQ.<sup>62</sup>

## Determining whether quality is a “right” career path for you

Whether or not you are actively looking for a career transition, the possibility of expanding your healthcare epidemiology skills and expertise into a quality role might be worth considering. If you are curious about a career in quality and patient safety, here are a few questions that you should consider.

### Would you like to shift your focus and perspective from vertical to horizontal?

Healthcare quality encompasses components of healthcare epidemiology, patient safety, and key aspects of healthcare processes and outcomes. Chief quality officers, and other quality leadership roles, track a significant portfolio of quality performance indicators and quality improvement undertakings across disciplines. If you relish the challenge of mastering a broad portfolio of topics rather than preserving and cultivating the depth of focused expertise rooted in infectious diseases and epidemiology that is required for healthcare epidemiology, then quality may be an appealing career choice. A shift from depth to breadth would require comfort with a more superficial level of knowledge on many topics than healthcare epidemiologists typically possess regarding issues that they address. Although healthcare epidemiologists need to learn details that are well outside of their training to be effective in infection prevention (eg, robotic surgery, plumbing, and air handling), the scope of this type of peripheral knowledge is much greater in quality and patient safety. Quality leaders must have knowledge of how the entire health system works and how high-value care is delivered on all levels, with special focus on high-risk areas and processes with vulnerabilities that might impact the safety, quality, and service experience for both patients and healthcare personnel, as well as access to care and costs of care. The quality leader may need to make

tough decisions while facing limited resources. A leader in quality and patient safety is not only charged with HAI prevention, but also with improving quality and safety across all healthcare disciplines. Quality leaders are more often drawn into crisis handling, dealing with regulators and accreditors, and dealing with disruptive personnel than are healthcare epidemiologists.

### **Do you like to think big?**

Healthcare epidemiologists often do think big, and the results of their quality improvement efforts (eg, hand hygiene, antimicrobial stewardship, and influenza immunization campaigns) can have enormous impacts on patient safety and clinical quality. However, quality leaders may routinely take on expansive, multidisciplinary projects that carry the multitasking aspects of healthcare epidemiology a step further. Those who embrace the opportunity to steer large projects that aim toward a broad vision of improving healthcare quality may thrive in the role of quality leader. Big projects may start with high-stakes organizational needs, such as poor sepsis outcomes, high rates of readmission, or long emergency department wait times, but addressing these needs can have a major impact on patient outcomes and satisfaction.

### **What kind of health system leader would you like to be?**

Those who use communication skills effectively to develop inter-disciplinary teams and achieve consensus on infection prevention improvement projects may enjoy using those leadership skills in a broader context. The comprehensive outlook that is involved with quality and patient safety enables the quality leader to have a broad impact on the healthcare system outside of infection prevention, to occupy a leadership role, and to interface with the corporate suite of the hospital or health system, where policies and financial decisions are made. Leadership structures vary, but quality leaders often report to chief medical officers, chief operating officers or chief executive officers, who support and guide the activities of the quality and patient safety department. Quality leaders may also present patient safety and performance metrics to the corporate suite as well as the board of trustees and report on progress in quality improvement initiatives.

If becoming a healthcare leader who interacts with other leaders both within and outside of the healthcare facility or system, and assumes a broad role in healthcare processes and outcomes piques your interest, then a career in quality and patient safety might be appropriate for you.

## **Beyond Healthcare Epidemiology: Pursuing a Career in Quality and Patient Safety**

### **Gaining clarity**

If you are motivated to pursue broader roles in quality and patient safety or other areas of healthcare delivery improvement, the first step may be to gain clarity on your intent and goals, your own strengths, and the aspects of quality and patient safety that are of most interest to you. Remembering that, within the field of quality and patient safety, a wide variation exists in job titles, roles, and responsibilities, as well as in reporting structures

across healthcare organizations. Healthy discussions with trusted advisors and those who have made similar transitions are good starting points, with a goal of learning as much as possible about the prospective positions and different organizational settings.

The landscape of healthcare delivery improvement, like the genetic makeup of influenza virus, is constantly shifting and drifting. The very shifts and drifts that have influenced the evolution of healthcare epidemiology in recent decades have also influenced quality and safety. Because of the wide variation in job titles and responsibilities and organizational structures, as well the ever-changing landscape of healthcare delivery improvement, being flexible and open-minded regarding potential career transition opportunities pertaining to quality and safety is highly advantageous. One needs to acknowledge that measures of success are a combination of objective and subjective measures and that the audiences one responds to becomes much broader. In certain scenarios and environments, considering and exploring jobs that might be technically outside of quality and patient safety, such as positions in clinical innovations, healthcare policy, and high-value care, might be appropriate transitions toward a career in quality and patient safety. These types of positions are related to improving quality and safety of patient care and would provide valuable experience.

### **Developing a mental framework and gaining additional skills**

Once clarity on intent is developed, paying attention to the mind-set, skill set, and tool set of successful leaders in quality and safety is worthwhile.<sup>63</sup> The leadership platform in quality is a bigger stage than that in healthcare epidemiology, and transition toward quality requires a broader mental framework and investment in gaining additional skills. Understanding the concepts involved in healthcare delivery improvement (eg, metrics, financial and reputational incentives, and change management), the different parts of the healthcare organization that fall within the quality department (eg, performance improvement, data analytics, regulatory, and patient safety), and the different clinical services (eg, surgery and medicine) and programs (eg, stroke, transplant) and departments (eg, operations and finance) that are affected by quality is a critical success factor. Table 4 provides a sample of quality metrics that one should learn to lead a quality program.

Expertise in healthcare epidemiology is often helpful while breaking down components of any quality metric to explore key drivers for improvement. Leaders in quality must engage and communicate regularly with the corporate suite, board members, medical staff, public relations, community leaders, and policy makers. Leaders in quality often have several dozen direct reports, which requires them to develop skills in human resources and budget management. They are often required to lead the charge to improve hospital and health system rankings, reputation, and reimbursement. They are often held accountable for performance on regulatory and accreditation surveys. Knowledge and familiarity regarding patient experience and provider wellness are also increasingly important areas in quality.

### **Resources**

The following resources are available for training in healthcare quality and patient safety.

**Formal courses in quality and safety**—Many courses concerning healthcare delivery improvement, quality, safety and effectiveness are offered by organizations such as IHI, Intermountain Healthcare, the American Society for Quality,<sup>64</sup> and various universities, such as the Clinical Safety & Effectiveness course available at University of Texas System health campuses.<sup>65</sup> The American College of Medical Quality offers a certification program as well.<sup>66</sup> These programs teach a broad array of concepts, skills, and tools necessary for a successful career in quality and safety. In addition, certification programs in lean and six-sigma methods may be useful.

**Books and journals**—Several books and journals in this space may be useful. Books on foundational concepts and review articles are helpful at the beginning of a career transition.<sup>67–72</sup> Journals that publish notable work on quality and safety include the *New England Journal of Medicine* (and spinoff *NEJM Catalyst*), the *Journal of American Medical Association*, *Harvard Business Review*, *Milbank Quarterly Journal*, *BMJ Quality and Safety*, *The Lancet*, *Implementation Science* (and spinoff *Implementation Science Communications*), *Joint Commission Journal on Quality and Patient Safety*, and *American Journal of Medical Quality*, among others. Once the foundation is laid for a career in quality and patient safety, a plethora of literature is available pertaining to various topics in the field.

**Leadership training programs**—Formal leadership training programs address a variety of skills and topics, including appropriate personality traits and behaviors, conflict management styles, leadership styles, motivation profiles, coaching skills, and negotiation skills, and they provide safe settings in which to practice these skills. The IHI offers several leadership training programs, and a number of academic institutions offer advanced leadership training for healthcare executives.

**Advanced degrees**—An MBA, MHA, Masters in Health Care Management or a similar degree offered by many universities might be useful, although it may not be necessary. These degrees often involve courses pertaining to the business of medicine such as financial accounting, healthcare economics, financial management, and healthcare policy, as well as soft skills such as organizational behavior, leadership, strategy, and negotiation. The American Society for Quality offers a fellowship program. Several online resources on improvement science may be useful. They are particularly helpful for adding greater structure to problem-solving in healthcare quality.

The importance of getting involved in quality and safety activities at one's own institution and gaining additional skills through experiential learning cannot be understated. Participation in the health system quality and safety committee, collaboration with quality and safety leaders on specific quality improvement initiatives, studying noninfection outcomes alongside infection outcomes in patients, and volunteering to lead initiatives broader than traditional infection prevention initiatives are some ways to get involved. When preparing a manuscript on quality improvement work related to infection prevention or antimicrobial stewardship, using the Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0) guidelines is recommended.<sup>73</sup> Attending meetings hosted by the IHI and Academy Health and presenting quality improvement and safety work at their annual meetings are important ways to become visible in the field. Pursuing these activities



with the help and support of a mentor and coach may facilitate a successful transition to a leadership role in quality and patient safety.

**Building a network**—The importance of establishing a network of mentors, coaches, advisors, and sponsors cannot be emphasized enough.<sup>74</sup> Developing collaborations with peers in other departments, learning about other departments and services outside one's own field, and learning how other departments approach quality are essential. Building high-quality relationships on which one can rely is integral to building an effective network. Networks are of at least 3 types (operational, personal and strategic) based on operational relationships in the workplace, personal relationships independent of the workplace, or strategic relationships that one seeks out and builds over time.<sup>75–77</sup> Networks create an advantage for leaders by helping to identify and increase chances of being selected for leadership roles, as well as helping to maximize effectiveness in a leadership role.

### **Making the transition**

Once on the path toward quality and patient safety, you will move from a role requiring deep expertise on specific topics (in infection prevention) to a role requiring breadth and not necessarily depth of expertise on a variety of diverse topics. Quality and patient safety leaders rely more on other healthcare professionals for input and expert advice. Following organizations (eg, AHRQ, Kaiser Family Foundation, Commonwealth Fund, IHI) and successful leaders in quality and safety on social media such as Twitter, LinkedIn, and Facebook, to name a few, is particularly helpful. Having clarity on job roles and responsibilities and developing a learning plan to become familiar with organizational structure, departmental budgets, and corporate culture, as well as the culture of patient safety at your institution, can provide important knowledge and infrastructure within quality and patient safety. Building a knowledgeable, loyal team to support you as you guide your organization's quality and safety journey is also very important.

### **Conclusions**

Healthcare epidemiology and quality leadership have many interfaces and commonalities. Skills and characteristics that healthcare epidemiologists foster to be effective, including communication and team building, serve both positions well. Both track a multitude of metrics, and have the aim of improving patient care outcomes. Healthcare epidemiologists and quality leaders are in positions of influence within a hospital or healthcare system, and both have important roles in leading change, advancing the culture of safety, and improving patient outcomes.

Healthcare epidemiologists who cultivate an interest in quality can further develop their skills and knowledge base in quality improvement and implementation science by promoting improvements in healthcare safety, quality, and delivery within their hospitals. For those who are interested in expanding their skills, additional training in methodologies used in patient safety and quality is available. Learning and adopting these approaches can be steps in career progression, both within healthcare epidemiology and quality.

In many facilities and systems, healthcare epidemiology has joined patient safety and quality as part of a vital continuum that has significant impact on achieving high-value care and outcomes for patients. Healthcare epidemiologists can broaden their perspectives and, potentially, advance their careers by learning and embracing quality as an allied and overlapping discipline. Quality leadership not only represents a natural direction for healthcare epidemiologists but may be an inevitable one in some organizations where, through the lens of value-based care, healthcare epidemiology is viewed as integral to quality.

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## References

1. Kadar N Rediscovering Ignaz Philipp Semmelweis (1818–1865). *Am J Obstet Gynecol* 2019;220:26–39. [PubMed: 30444981]
2. Larson E A retrospective on infection control. Part 2: Twentieth century—the flame burns. *Am J Infect Control* 1997;25:340–349. [PubMed: 9276547]
3. Smith PW, Watkins K, Hewlett A. Infection control through the ages. *Am J Infect Control* 2012;40:35–42. [PubMed: 21783278]
4. McDonald L Florence Nightingale, statistics and the Crimean War. *J Roy Statist Soc A* 2014;177:569–586.
5. Donabedian A Evaluating the quality of medical care. *Milbank Mem Fund Q* 1966;44 suppl 3:166–206.
6. Codman EA. The classic: a study in hospital efficiency: as demonstrated by the case report of first five years of private hospital. *Clin Orthop Relat Res* 2013;471:1778–1783. [PubMed: 23381621]
7. Neuhauser D Ernest Amory Codman MD. *Qual Saf Health Care* 2002;11:104–105. [PubMed: 12078360]
8. Berwick DM. Controlling variation in health care: a consultation from Walter Shewhart. *Med Care* 1991;29:1212–1225. [PubMed: 1745079]
9. Best M, Neuhauser D. W Edwards Deming: father of quality management, patient and composer. *Qual Saf Health Care* 2005;14:310–312. [PubMed: 16076798]
10. Best M, Neuhauser D. Joseph Juran: overcoming resistance to organisational change. *Qual Saf Health Care* 2006;15:380–382. [PubMed: 17074878]
11. Haley RW, Culver DH, White JW, et al. The efficacy of infection surveillance and control programs in preventing nosocomial infections in US hospitals. *Am J Epidemiol* 1985;121:182–205. [PubMed: 4014115]
12. Haley RW, Culver DH, Emori TG, Hooton TM, White JW. Progress report on the evaluation of the efficacy of infection surveillance and control programs. *Am J Med* 1981;70:971–975. [PubMed: 7211933]
13. Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: National Academies Press 2001.
14. Institute of Medicine. *To Err is Human: Building a Safer Health System*. Washington, DC: The National Academies Press; 2000.
15. Pronovost P, Needham D, Berenholtz S, et al. An intervention to decrease catheter-related bloodstream infections in the ICU. *N Engl J Med* 2006;355:2725–2732. [PubMed: 17192537]

16. Pronovost PJ, Watson SR, Goeschel CA, Hyzy RC, Berenholtz SM. Sustaining reductions in central-line-associated bloodstream infections in Michigan intensive care units: a 10-year analysis. *Am J Med Qual* 2016;31:197–202. [PubMed: 25609646]
17. Institute for Healthcare Improvement website. [http://www.ihl.org/about/Documents/IHI\\_Timeline\\_2018.pdf](http://www.ihl.org/about/Documents/IHI_Timeline_2018.pdf). Published May 4, 2018. Accessed February 25, 2019.
18. Berwick DM, Nolan TW, Whittington J. The triple aim: care, health, and cost. *Health Aff (Millwood)* 2008;27:759–769. [PubMed: 18474969]
19. Bodenheimer T, Sinsky C. From triple to quadruple aim: care of the patient requires care of the provider. *Ann Fam Med* 2014;12:573–576. [PubMed: 25384822]
20. Mery G, Majumder S, Brown A, Dobrow MJ. What do we mean when we talk about the Triple Aim? A systematic review of evolving definitions and adaptations of the framework at the health system level. *Health Policy* 2017;121:629–636. [PubMed: 28420540]
21. Centers for Medicare & Medicaid Services website. <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/Value-Based-Programs.html>. Updated January 2020. Accessed August 7, 2020.
22. Centers for Medicare & Medicaid Services website. <https://innovation.cms.gov/initiatives/bundled-payments/>. Accessed September 5, 2019.
23. Marx D Patient Safety and the “Just Culture”: A Primer for Health Care Executives. New York, NY: Trustees of Columbia University; 2001.
24. Sreeramoju P Reducing infections “together”: a review of socioadaptive approaches. *Open Forum Infect Dis* 2019;6(2):ofy348. [PubMed: 30740469]
25. Hollnagel E, Wears R, Braithwaite J. From Safety-I to Safety-II: A White Paper. Middelfart, Denmark; University of Denmark; 2015.
26. Gandhi T. Leadership and vision for a culture of safety. *NEJM Catalyst* 2018.
27. Knobloch MJ, Chewning B, Musuza J, et al. Leadership rounds to reduce healthcare-associated infections. *Am J Infect Control* 2018;46:303–310. [PubMed: 29102425]
28. Chassin MR, Loeb JM. High-reliability health care: getting there from here. *Milbank Q* 2013;91:459–490. [PubMed: 24028696]
29. Chassin MR, Loeb JM. The ongoing quality improvement journey: next stop, high reliability. *Health Aff (Millwood)* 2011;30:559–568. [PubMed: 21471473]
30. Stalter AM, Phillips JM, Ruggiero JS, et al. A concept analysis of systems thinking. *Nurs Forum* 2017;52:323–330. [PubMed: 28000925]
31. National Institute for Occupational Safety and Health (NIOSH) website. <https://www.cdc.gov/niosh/topics/hierarchy/default.html>. Published 2015. Accessed February 25, 2019.
32. Reason J Understanding adverse events: human factors. *Qual Health Care* 1995;4:80–89. [PubMed: 10151618]
33. Reason J Human error: models and management. *West J Med* 2000;172:393–396. [PubMed: 10854390]
34. Charles R, Hood B, Derosier JM, et al. How to perform a root cause analysis for workup and future prevention of medical errors: a review. *Patient Saf Surg* 2016;10:20. [PubMed: 27688807]
35. RCA2: Improving Root Cause Analyses and Actions to Prevent Harm. Boston, MA: National Patient Safety Foundation; 2016.
36. Ashley L, Armitage G, Neary M, Hollingsworth G. A practical guide to failure mode and effects analysis in health care: making the most of the team and its meetings. *Jt Comm J Qual Patient Saf* 2010;36:351–358. [PubMed: 20860241]
37. Diller T, Helmrich G, Dunning S, Cox S, Buchanan A, Shappell S. The Human Factors Analysis Classification System (HFACS) applied to health care. *Am J Med Qual* 2014;29:181–190. [PubMed: 23814026]
38. Langley G, Moen R, Nolan K, Nolan T, Norman C, Provost L. *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance*, 2nd ed. San Francisco: Jossey-Bass; 2009.
39. Agency for Healthcare Research and Quality website. <https://innovations.ahrq.gov/qualitytools/plan-do-study-act-pdsa-cycle>. Accessed February 25, 2019.

40. Agency for Healthcare Research and Quality website. <https://www.ahrq.gov/talkingquality/measures/types.html>. Accessed February 25, 2019.
41. Centers for Medicare & Medicaid Services website. <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/Hospital-Value-Based-Purchasing-.html/>. Published 2017. Accessed February 25, 2019.
42. Hospital value-based purchasing. Centers for Medicare & Medicaid Services website. [https://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/downloads/Hospital\\_VBPurchasing\\_Fact\\_Sheet\\_ICN907664.pdfIn](https://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/downloads/Hospital_VBPurchasing_Fact_Sheet_ICN907664.pdfIn): Published 2017. Accessed August 7, 2020.
43. Healthcare Consumer Assessment of Healthcare Providers and Systems website. <https://www.hcahpsonline.org/>. Accessed February 28, 2019.
44. Mannon M Lean healthcare and quality management: the experience of ThedaCare. *Qual Manage J* 2014;21:7–10.
45. Swensen S, Pugh M, McMullan C, Kabcenell A. High-Impact Leadership: Improve Care, Improve the Health of Populations, and Reduce Costs. Cambridge, MA: Institute for Healthcare Improvement; 2013.
46. Kaye KS, Anderson DJ, Cook E, et al. Guidance for infection prevention and healthcare epidemiology programs: healthcare epidemiologist skills and competencies. *Infect Control Hosp Epidemiol* 2015;36:369–380. [PubMed: 25998192]
47. Gittel JH, Beswick J, Goldmann D, Wallack SS. Teamwork methods for accountable care: relational coordination and team STEPPS. *Health Care Manage Rev* 2015;40:116–125. [PubMed: 24828004]
48. Valentine MA, Nembhard IM, Edmondson AC. Measuring teamwork in health care settings: a review of survey instruments. *Med Care* 2015;53: e16–e30. [PubMed: 24189550]
49. Rau J Medicare eases readmission penalties against safety-net hospitals. *Kaiser Health News*, September 26, 2018.
50. Institute for Healthcare Improvement website. <http://www.ihl.org/>. Accessed January 2, 2019.
51. Agency for Healthcare Research and Quality website. <https://www.ahrq.gov/>. Accessed January 2, 2019.
52. National Quality Forum website. <http://www.qualityforum.org/Home.aspx>. Accessed January 2, 2019.
53. Centers for Medicare & Medicaid Services website. [https://www.cms.gov/medicare/medicare-fee-for-service-payment/hospitalacqcond/hospital-acquired\\_conditions.html](https://www.cms.gov/medicare/medicare-fee-for-service-payment/hospitalacqcond/hospital-acquired_conditions.html). Accessed January 2, 2019.
54. The Joint Commission website. [https://www.jointcommission.org/about\\_us/about\\_the\\_joint\\_commission\\_main.aspx](https://www.jointcommission.org/about_us/about_the_joint_commission_main.aspx). Published 2019. Accessed August 7, 2020.
55. The Leapfrog Group website. <http://www.leapfroggroup.org/>. Accessed January 2, 2019.
56. Association for Professionals in Infection Control and Epidemiology website. [https://apic.org/Professional-Practice/Infection\\_preventionist\\_IP\\_competency\\_model](https://apic.org/Professional-Practice/Infection_preventionist_IP_competency_model). Accessed February 25, 2019.
57. Scoville R, Little K. Comparing Lean and Quality Improvement. IHI White Paper. Cambridge, MA: Institute for Healthcare Improvement; 2014.
58. Perla RJ, Provost LP, Parry GJ. Seven propositions of the science of improvement: exploring foundations. *Qual Manag Health Care* 2013;22:170–186. [PubMed: 23807130]
59. Goyal S, Law E. An introduction to Kaizen in health care. *Br J Hosp Med (Lond)* 2019;80:168–169. [PubMed: 30860922]
60. Varkey P, Reller MK, Resar RK. Basics of quality improvement in health care. *Mayo Clin Proc* 2007;82:735–739. [PubMed: 17550754]
61. Saint S, Greene MT, Krein SL, et al. A program to prevent catheter-associated urinary tract infection in acute care. *N Engl J Med* 2016;374:2111–2119. [PubMed: 27248619]

62. Agency for Healthcare Research and Quality website. <https://www.ahrq.gov/professionals/quality-patient-safety/hais/cauti-tools/guides/sustainability-guide.html>. Published 2015. Accessed February 25, 2019.
63. Healthcare Leadership Alliance website. <http://www.healthcareleadershipalliance.org/>. Published 2017. Accessed September 26, 2019.
64. American Society for Quality website. <https://asq.org/programs/emerging-quality-leaders/schedule>. Accessed September 26, 2019.
65. Agency for Healthcare Research and Quality website. <https://psnet.ahrq.gov/perspectives/perspective/98/The-University-of-Texas-System-Clinical-Safety-and-Effectiveness-Course>. Published 2011. Accessed February 25, 2019.
66. American College of Medical Quality website. <https://acmq.org/page/Certification>. Published 2019. Accessed February 25, 2019.
67. Nash DB, Joshi M, Ransom ER, Ransom SB. The Healthcare Quality Book: Vision, Strategy, and Tools, fourth edition. Washington, DC: Health Administration Press; 2019.
68. Ogrinc GS, Headrick LA, Barton AJ, Dolansky MA, Madigosky WS, Miltner RS. Fundamentals of Health Care Improvement: A Guide to Improving Your Patients' Care. 3rd edition. Oakbrook, IL: Joint Commission Resources; 2018.
69. Langley GJ, Moen RD, Nolan KM, Nolan TW, Norman CL, Provost LP. The Improvement Guide: A Practical Approach to Enhancing Organizational Performance. 2nd edition. San Francisco, CA: Jossey-Bass; 2009.
70. Wachter RM. The Digital Doctor: Hope, Hype, and Harm at the Dawn of Medicine's Computer Age. New York: McGraw-Hill Education; 2017.
71. Vincent C Patient Safety. Edinburgh; New York: Churchill Livingstone; 2006.
72. Reason JT. A Life in Error: From Little Slips to Big Disasters. Surrey, England: Ashgate; 2013.
73. Ogrinc G, Davies L, Goodman D, Batalden P, Davidoff F, Stevens D. SQUIRE 2.0 (Standards for QUality Improvement Reporting Excellence): revised publication guidelines from a detailed consensus process. *BMJ Qual Saf* 2016;25:986–992.
74. Gottlieb AS, Travis EL. Rationale and models for career advancement sponsorship in academic medicine: the time is here; the time is now. *Acad Med* 2018;93:1620–1623. [PubMed: 29979207]
75. Krackhardt D, Hanson JR. Informal networks: the company behind the chart. *Harv Bus Rev* 1993;71:104–411. [PubMed: 10127036]
76. Ibarra H, Hunter M. How leaders create and use networks. *Harv Bus Rev* 2007;85:40–47, 124. [PubMed: 17286073]
77. Cross R, Thomas R. A smarter way to network. *Harv Bus Rev* 2011;89:149–153, 167. [PubMed: 21800476]

Table 1.

## Skills Needed to be an Effective Leader in Healthcare Quality and Patient Safety

Category	Specific Skills	Comments	Similarities with Skills for the Healthcare Epidemiologist
Communication	Good interpersonal skills		
	Excellent verbal and written communication skills	Ability to communicate effectively with all types of hospital employees, healthcare personnel	Effectively communicates with various populations, including both internal and external stakeholders
Technical	Clinical background in any specialty and/or subspecialty	Helps to command respect from clinicians	A healthcare epidemiologist's clinical background is in infectious diseases, pathogen transmission, microbiology laboratory diagnostics, and/or special populations
	Information technology (IT) and electronic medical record (EMR)	Knowledge, familiarity and/or ability to effectively work with IT/technical staff	Can leverage data management resources to obtain necessary information
	Business and administrative skills	Knowledge of financial structure and complexities in healthcare; ability to effectively manage and run a hospital department	Can develop and present business plans, return on investments (ROIs) proposals and recruit physician and administrator champions for proposed plans
			Understands financial impacts, cost-effectiveness of proposed plans
Leadership	Team builder; coach		Ability to include multidisciplinary and interprofessional stakeholders in decision-making processes
	Ability to solve complex and/or emotionally charged problems		Ability to manage and conduct investigations in emotionally charged scenarios
	Presence on "front lines" of clinical care, boots-on-the-ground mentality	Participates in routine quality/safety rounds	On-site visits, walk-throughs and rounding important component of healthcare epidemiology
	Commitment to diversity, equity, and inclusion	Leverages the benefits of a diverse workforce to strengthen the organization and promotes a culture of equity and inclusion	Collaborate with a diverse workforce and provide optimal care for a diverse patient population
Intangibles	Passion, intellect and experience	Passion, intellect, and experience for improving patient care in multiple diverse ways	Passion, intellect and experience for minimizing patient risk for infections

Examples of Key Quality and Safety Performance Measures Related to Infection Prevention Reported to External Agencies in the United States

**Table 2.**

<b>Metric</b>	<b>Reporting Authority</b>
Central-line-associated bloodstream infection in ICU and select wards	CMS, TJC, state health departments
Surgical site infection rates for select procedures	CMS, TJC, state health departments
Severe sepsis and septic shock management bundle	CMS
<i>Clostridioides difficile</i> infection rate	CMS, TJC, state health departments
Perioperative antibiotic administration	CMS
30-day readmission rate following total hip or total knee arthroplasty	CMS

Note. ICU, intensive care unit; CMS, Centers for Medicare and Medicaid Services; TJC, The Joint Commission.

**Table 3.** Concepts, Actions and Knowledge Base for Infection Prevention, Quality, and Safety

Variable	Infection Prevention	Quality	Safety
Surveillance and analysis	X	X	X
Benchmarking	X	X	X
Microbiology and infectious diseases	X		
Use of molecular epidemiology tools	X		
Hand hygiene, environmental hygiene, vaccination programs	X		
Outbreak investigation and control	X		
Contact tracing and postexposure management	X		
Emerging infections and liaison with public health	X		
Noninfection safety issues such as pressure ulcers, diagnostic errors, etc.			X
Root-cause analyses and failure modes and effects analyses			X
Culture of safety measurement and interventions			X
Plan-do-study-act, rapid cycle improvement and lean methods		X	
CMS core measure reporting		X	
Value based payment programs		X	
Quality incentive payment programs and interface with finance		X	
Culture of high reliability		X	X
Interface with corporate suite and the health system board		X	

Note. CMS, Centers for Medicare and Medicaid Services.



Table 4.

## Examples of Metrics in Quality in Acute Care Hospitals and Hospital-Based Clinics

Quality Domain	Metrics
Safety	Patient safety indicators (eg, pressure ulcer, iatrogenic pneumothorax, postoperative sepsis)
	Total hip and knee arthroplasty-associated complications
	NHSN SIR for CAUTI, CLABSI, CDI, SSI after colon surgery and hysterectomy
	Hypoglycemia and insulin use
	Warfarin elevated INR
Timeliness	Care in ED: median time from ED admit to departure to inpatient area for admitted patients, median time from ED arrival to discharge for discharged patients
Effectiveness	Readmissions
	Transfusion for hemoglobin level of 9 g/dl or greater prior to first transfusion
	Revisits to ED or hospital after outpatient procedures such as colonoscopy, biliary procedures, urological procedures and arthroscopy
	Mortality
Efficiency	Direct cost index for different services
	Hospital length of stay
Equity	The following variables evaluated by gender, race, and SES (non-low SES vs low SES):
	-Sepsis lactate timing, sepsis mortality O/E
	-NSTEMI troponin testing, NSTEMI mortality O/E
	-Maternal hemoglobin change, maternal transfusion rate
	-Mortality in patients with heart failure
Patient centeredness	Cleanliness and quietness
	Responsiveness of doctor and nurse
	Pain assessment

Note. NHSN, National Healthcare Safety Network; SIR, standardized infection ratio; CAUTI, catheter-associated urinary tract infection; CLABSI, central-line-associated bloodstream infection; CDI, *Clostridioides difficile* infection; SSI, surgical site infection; INR, international normalized ratio; ED, emergency department; SES, socioeconomic status; O/E, observed to expected ratio; NSTEMI, non-ST segment elevation myocardial infarction.