HSR&D
Health Services Research & Development Service

FORUM
Translating research into quality health care for Veterans

May 2010

Commentary

Research and Prevention of Health Care-Associated Infections

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A publication of the VA Office of Research & Development, Health Services Research & Development Service, Center for Information Dissemination and Education Resources, in conjunction with AcademyHealth.

Health care-associated infections (HAIs) cause significant illness in the United States, with an estimated 1.7 million cases and 99,000 deaths in 2002.[1] Traditionally, clinicians have assumed that some HAIs are inevitable. In recent years, two important factors have driven a change in attitude from "HAIs are inevitable" to "HAI prevention is imperative:" (1) the increasing incidence of these infections; and (2) the accumulation of data showing that certain HAIs could be prevented. The concept of inevitability of HAIs has become less convincing. And, as health care organizations became more involved in the outcome measurement of care, including public reporting of HAIs, it has become more difficult to accept that any specific HAI rate, even if low, is satisfactory.

A New Focus on HAI Prevention

Thus, there has been a new focus on prevention of HAIs, with influential entities like the Government Accountability Office and the Institute of Medicine weighing in on the issue.[2,3] Evaluation of the literature is the first step in defining specific activities that could be taken to prevent HAIs with the goal of implementation on a broad scale. Interestingly, data are available for several specific areas, such as perioperative antibiotics and positioning for the prevention of ventilator-associated pneumonia. Many other areas in need of HAI prevention are not well studied. It is notable, however, that implementation clearly lags behind even the convincing data provided in the literature. The general inertia of medical care to change has prevented forward motion despite good intentions. The articles in this edition of FORUM highlight areas where change has been made in a variety of settings based on best evidence available.

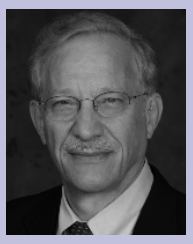
"This sickness doth infect the very lifeblood of our enterprise."

— William Shakespeare
Source: King Henry IV, Part 1

Inevitably, as program implementation moves forward, research gaps are identified. For instance, are we certain that active surveillance is necessary in a MRSA program? That we know the optimum degree of bed elevation necessary for prevention of ventilator-associated pneumonia? Or that we know the value of each individual hand hygiene episode as indicated in current guidance? Is there good evidence to support methodology for implementation of these programs at the local and national levels? Gaps such as these at both the scientific and implementation stages are critical for future interventions that will have measurable, positive outcomes.

Challenges for Research Arena

The challenges for the research arena are many and varied. For the basic science component, interest and funding are always issues. While traditional mechanisms are



Director's Letter

HSR&D is uniquely positioned to facilitate the implementation of evidence-based research into policy and clinical practice. This is the core of HSR&D's mission. Engagement of stakeholders (i.e., field and VA Central Office (VACO), operations and managers, patient care staff, and Veterans), as appropriate, early in the research process is key to the success of this mission.

Input from stakeholders can be invaluable, initially when conceiving a research project, and subsequently to facilitate its eventual implementation and systematization. A first step is to determine, given the nature and scope of the project, who at a particular medical center, Veterans Integrated Service Network (VISN), or in VACO may be interested in providing input. As an example, in the article by Jain and Evans in the current issue of FORUM, a research project related to MRSA infections must acknowledge VHA's current MRSA Prevention Program, and possibly incorporate developing programmatic policies and procedures into the project's research goals. For other articles in this issue, the project that involved hand washing (Lukas and Petzel) and the project addressing prevention of catheter-associated urinary tract infections (Render, Hasselbeck, and Almenoff) would likely involve different sets of stakeholders.

As the research project progresses, to maintain engagement, researchers should periodically update VHA stakeholders. Finally, as the project nears completion, researchers should consider next steps. For example, how likely is a successful research intervention to be sustained following the research project's conclusion? What additional research may be required? Are the project's research results sufficiently significant to warrant a subsequent broad implementation project? Who is responsible for the next steps? Even if the particular research team will not pursue a related project, a responsibility remains to support follow-up efforts. Because VHA is an integrated health care system, peer reviewed publications are required but not sufficient.

There are many stages of a research endeavor. Each stage can benefit from stakeholder counsel and expertise. While it may take considerable effort to identify the most relevant stakeholders and maintain contact, benefits can be immeasurable. The VA research community provides a wealth of collaborative opportunities, which I strongly urge all researchers to consider when planning their research projects.

Seth A. Eisen, M.D., M.Sc.
Director, HSR&D

available for the molecular epidemiology components of antibiotic resistance and infection prevention, funding for the large studies necessary with regard to implementation may be more difficult. Since most HAIs are low-incidence events, most studies need to be large enough to have sufficient power to show a difference based on standard study protocols. Such studies do not generally have a natural home in granting agencies. Also, since the studies would involve large numbers of patients, often at many hospitals, the problem of consent becomes critical. For instance, if a VA study divided the country into two regions – calling for active MRSA surveillance in one region and no active surveillance in the other (a control group) – would each patient making up the nearly 600,000 annual admissions to VA facilities need to sign an individual consent form?

Another challenge is defined in attempts to translate research data into implementation strategies. For instance, is it better to initiate change through direct orders, appeal to the intellectual and analytical strengths of the caregivers, or just deal with top management concerning the hazards of not preventing HAIs? Is there a need for input from human factors researchers, anthropologists, and psychologists in addition to the traditional health care groups in order to effect change? How do we deal with conflicting or incomplete data since clear best practice evidence may not exist for all things that may need to be tested or implemented? Can modeling be used to complement fuzzy data?

There are many challenges to improving the care of patients with particular emphasis on prevention of HAIs. We should, however, be optimistic that advances are being made through numerous efforts such as those highlighted in this newsletter – patient care is improving, and many individual patients are not suffering morbidity and mortality related to HAIs. With the emphasis in the Secretary's transition initiatives on Veteran-centric care that incorporates preventing health care-associated complications, this is the perfect opportunity for VA to stay in the forefront of the scientific knowledge base underlying guidance and implementation for prevention of health care-associated infections.

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Response to Commentary

Crucial Opportunities for Addressing HAIs

Bradley N. Doebbeling, M.D., M.Sc., Senior Investigator, VA HSR&D Center on Implementing Evidence-Based Practice, Indianapolis, Indiana

I appreciate Dr. Roselle highlighting the pervasiveness of HAIs, thus demonstrating their critical importance and the need for both implementation and further research. I share his conviction that HAIs have finally gained the national attention of the public, policymakers, Congress, and funding agencies. This is a promising time when funding is finally being targeted to address questions of comparative effectiveness, including the broader definition favored by VA and AHRQ, which includes issues related to delivery systems, implementation, and reengineering.

As Dr. Roselle points out, HAIs are not unavoidable. HAIs are due to the practices and behaviors of everyone in health care settings. A complex adaptive systems framework suggests the concept of emergence. We find that success at one level precipitates new challenges at the next level. As effective programs develop and become systematized, just as in ecocycles, there is a creative destruction or reorganization phase.[1]

Hospitals that have tackled HAIs as an organizational change challenge – rather than continuing to delegate HAIs to the infection control program – are those that have seen dramatic reductions in MRSA and other HAIs and dramatic improvements in quality in other domains.[2] Partnering with facility and VISN leadership, and engaging teams of committed health care staff volunteers in owning, driving, and measuring change is effective, creative, and sustainable.

If anything, now is the time for even greater efforts to bring together operations leaders, clinicians, staff and researchers for more regular conversation, perhaps at regional and national meetings, in order for operations to help focus us on the important clinical and management issues that need further research because they are not easily solvable. VA should find opportunities to bring operations and researchers together, to apply their conceptual frameworks, develop new quick methods and evaluation methodology, and solve key problems for Veterans.

Dr. Roselle points out correctly that many of the specific questions regarding details of policy and how to implement them are not studied and remain open questions. However, the lack of evidence for many interventions should not delay action in improving health care processes and quality. Model health care systems like VA and Intermountain Healthcare have shown the value of focusing on identifying high prevalence conditions, describing variation in processes and eliminating that variation through quality improvement and information solutions. Effective managers do not wait for evidence. There is too much work to be done in transforming our health care systems and much of it needs to be done now.

"Strength is derived from unity. The range of our collective vision is far greater when individual insights become one."

— Andrew Carnegie

I remain impressed that my colleagues in HSR&D have been tackling these difficult problems for a number of years, as the articles here show. In fact, one of the challenges in conducting such research in implementation science and system redesign is that our funding and publishing mechanisms remain too slow to fund thoughtful evaluations of important natural experiments and changes in systems that happen quickly. I agree that there is a keen need for further research in implementation science, effective organizational change strategies, and how to effectively integrate information and communication technology into workflow and practice. Some of the many recent VA innovations in operations – with formation of the VA Systems Redesign Office and Steering Committee, and forming and funding the VA Engineering Resource Centers – are important steps.

Dr. Roselle also highlights that the engagement of other specialties is needed to truly make a difference. The Pittsburgh VAMC showed the value of bringing expertise in engineering and social sciences to bear in driving organizational change to redesign their processes and engage staff hospital wide. I fully agree and have found that bringing informaticists, engineers, cognitive scientists, communications specialists, sociologists, and many other disciplines together to tackle important implementation science problems is not only fulfilling, but brings cutting edge methods to bear and creative solutions to previously "unsolvable" problems.

Further, there is a call for immediate new strategic directions in rethinking how computational technology can best support cognitive processes and decisions in a fundamentally different information system that will make effective, patient-centered care possible.[3] The VA Consortium for Healthcare Informatics Research (CHIR) and Veterans' Informatics, Information and Computing Infrastructure (VINCI) are two important, multicenter VA initiatives designed to make electronic health information readily available for quality improvement and research, and fostering collaboration in new ground-breaking approaches not possible outside VA. Our VA informatics colleagues are actively planning the next generation of a new information system for VA.

These new directions for research, operations, care coordination, Office of Health Information (OHI), and all of VA are truly crucial innovations that bring together clinicians, managers, staff, researchers, and trainees to tackle tough problems together. I hope that VA leadership, Office of Research and Development (ORD), and all of us seek crucial opportunities for conversations together, find common ground, and work together collaboratively to design the new VA.

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Research Highlight

Reducing MRSA Health Care-Associated Infections

Rajiv Jain, M.D., Director, VHA MRSA Prevention Program, and Acting Chief Consultant for Medical-Surgical Services in the Office of Patient Care Services, and Martin E. Evans, M.D., Associate Director, VHA MRSA Prevention Program

A 2005 survey conducted by the Centers for Disease Control and Prevention (CDC) found that more than 94,000 patients in the United States developed serious infections from Methicillin-resistant *Staphylococcus aureus* (MRSA) resulting in an estimated 18,650 deaths. This figure was more than the deaths from HIV/AIDS that year. Nationwide, MRSA is the most common cause of ventilator-associated pneumonias and surgical site infections, the fourth most common cause of central line-associated bloodstream infections, and the eighth most common cause of catheter-associated urinary tract infections. MRSA infections have been a growing problem in private and VA medical facilities. Because there are few antibiotics that are effective against MRSA, effective infection prevention and control strategies to prevent the spread of MRSA within health care systems are essential.[1]

Toyota Production System Principles

In 2002, the VA Pittsburgh Healthcare System (VAPHS) began collaboration with the Pittsburgh Regional Healthcare Initiative and the CDC to adopt the principles of the Toyota Production System (TPS) to reduce transmission of MRSA and MRSA health care-associated infections (HAIs). The approach was piloted on a surgical ward at VAPHS. The key strategies implemented included: (1) surveillance cultures for MRSA on all admissions and discharges; (2) prompt isolation (in contact precautions) of patients found to be colonized or infected with MRSA; and (3) an aggressive hand hygiene training program. Using TPS, MRSA infections on the surgical ward decreased 60 percent over four years. The strategy was expanded to the Surgical Intensive Care Unit (ICU), where a 75 percent reduction in MRSA HAIs was realized over three years.[2] In 2005, the program was expanded to include all acute care units at VAPHS and reductions of similar magnitude were noted on all acute care units.

The VAPHS experience with TPS showed that health care systems and processes could change with positive outcomes. The model was successful in decreasing MRSA HAI rates; however, application of TPS was resource intensive. In order to expand the program in a cost effective manner, VAPHS explored a process called Positive Deviance (PD), described at www.positivedeviance.org. With PD, "culture change" where infection control becomes everyone's responsibility, was added to the original three strategies to decrease MRSA infections. Active surveillance, contact precautions, hand hygiene, and culture change became known as the "VA MRSA Bundle." Recognizing the success of VAPHS in controlling MRSA HAIs and seeking to validate the process, VA Central Office provided VAPHS with funding to support trials of the MRSA Bundle at other VAs. Thirty-nine VA facilities applied to be b-test sites, and 17 were selected. Six elected to undergo formal PD training. All b-sites agreed to collect MRSA process and compliance data and report through the CDC's National Healthcare Safety Network (NHSN) beginning in October 2006.

The VHA MRSA Program Office, in collaboration with researchers at the Center for Health Equity Research and Promotion (CHERP) based at VAPHS, conducted a qualitative evaluation using in-depth interviews to describe the key strategies and potential pitfalls involved with implementation of the Directive. A majority of the participants believed that using a cultural transformation approach was necessary for the program to succeed because it allowed staff to buy-in and get involved.[3]

VHA-Wide Implementation

The original plan for VHA-wide implementation was projected to occur in a staged process over two to three years. However, the Secretary of Veterans Affairs visited VAPHS in December 2006, and saw first-hand the success the institution was having in controlling MRSA. Recognizing the importance of MRSA prevention in Veterans' lives, the Secretary released Directive 2007-002 in January 2007, authorizing implementation of the MRSA Prevention Initiative and all components of the "MRSA Bundle" in one ICU or other high-risk area in all VHA acute care facilities by March 2007. It directed all acute care units to implement the Initiative by December 31, 2007.

Implementation of the MRSA Prevention Initiative in Community Living Centers began in December 2008, with guidelines developed specifically for the homelike setting. Guidelines have also been developed for spinal cord injury units, polytrauma units, inpatient mental health units, and ambulatory care/outpatient settings. By the end of April 2010, the MRSA Prevention Initiative will have been deployed VHA-wide.

Data from the VHA MRSA Prevention Initiative from inception of the program to the present are currently being analyzed. Preliminary results suggest significant changes in MRSA HAI rates in the ICU and non-ICU setting as well as significant decreases in MRSA transmission among patients during their hospital stay.

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Research Highlight

Tackling Hand-Hygiene Compliance: An Organizational Approach

Carol VanDeusen Lukas, Ed.D., Center for Organization, Leadership and Management Research, VA Boston Healthcare System, Boston, Massachusetts, and Robert A. Petzel, M.D., VA Under Secretary for Health

Hand hygiene is one of the simplest yet most effective processes for reducing infections in patient care. Hand-hygiene compliance has been the subject of directives in VA and a visible priority in recent surveys of The Joint Commission, national standards by the CDC, and an extensive campaign by the World Health Organization. But despite this high priority and strong evidence that has been available for years, compliance is at best variable. This seemingly simple practice has proven very difficult to bring to reliably high levels of compliance across an organization.

In an effort to improve hand-hygiene compliance, the Center for Organization, Leadership and Management Research (COLMR) worked closely with VISN 23 on a recently completed, three-year intervention based on the premise that although hand hygiene is an individual act, achieving high rates of compliance requires interdependent organizational action.

Organizational Components to Facilitate Improvement

Consistent with our hypotheses, we found that hand-hygiene compliance was strengthened by the presence of three interacting organizational components that medical center managers and clinicians can affect: (1) robust clinical process redesign to engage staff and incorporate evidence-based practices in routine operations; (2) active top leadership commitment to the redesign effort; and (3) links to management structures and processes to support, align, and integrate redesign. Among the seven participating medical centers in VISN 23, four facilities showed high presence of, or fidelity to, these components (fidelity scores of 3.17 to 3.95 on a 4-point scale) while three facilities had lower scores (1.42 to 2.15) showing only partial presence. The four high-fidelity facilities demonstrated statistically significant hand-hygiene improvement over the course of the project while the lower-fidelity facilities did not. The high-fidelity facilities also had consistently higher hand-hygiene scores at the end of the project. These fidelity scores reflect real differences between the high- and lower-fidelity groups in their patterns of behavior and activities across the three model components.

Clinical process redesign. All facilities in the study used a variety of education and awareness strategies to improve hand-hygiene compliance. However, the *high-fidelity facilities* went beyond education and awareness to also undertake process engineering and culture change. Clinical redesign was characterized by energetic, multidisciplinary improvement teams. Teams had strong leaders with excellent project management skills who often paired with clinical leaders and often included experienced improvement experts. All teams went beyond basic process redesign methods to explore higher reliability interventions as compliance plateaued. In the *lower-fidelity group*, clinical process redesign was often more ad hoc. Teams, if appointed, never got off the ground or fell away due to time constraints. Teams collected data but did not use them to help understand possible sources of non-compliance or the impact of their intervention activities. Often, lower-fidelity facilities felt their teams lacked the leadership, authority, or infrastructure to accomplish their goals.

Active top leadership commitment. In the *high-fidelity group*, senior facility leaders were supportive of and involved in hand-hygiene improvement efforts. Perhaps most important, senior leadership involvement and support was consistent over time. Senior leaders set clear expectations about target levels of compliance and sent the message that current practices were deficient. In the *lower-fidelity group*, senior leaders either did not see hand hygiene as a high priority or expressed support but were not consistent in their involvement. In some cases, they modeled good hand hygiene and, for example, addressed it if it came up on patient safety and environment-of-care rounds, but they generated little sense of urgency for improvement.

Links to senior management structures and processes. In the *high-fidelity group*, there were explicit strategies to link improvement efforts to senior management. All facilities identified a member of the leadership team as a champion to work actively with the hand-hygiene redesign team. There were clear lines of accountability for performance that did not meet its targets. Facility managers provided resources, such as staff time, for the hand-hygiene improvement efforts. Attention to hand hygiene was regularly rewarded and hand-hygiene success celebrated. In the *lower-fidelity group*, senior leadership champions were less consistently identified and involved. Hand-hygiene data tended to be reviewed by standing performance improvement or patient safety committees buried several layers below leadership. The result of such disconnection was that project teams felt they did not get consistent direction, cross-department issues went unresolved, and hard-won successes were not recognized.

Implications

Although the three components associated with significant hand-hygiene improvement are within managers' control, implementing them is not always easy. In this project, the presence of the three components varied despite an intervention that was consistent across facilities. Facilities with the highest fidelity to the three components – and through those components to improved hand-hygiene performance – were those that (1) shared the urgency to improve compliance with hand hygiene and (2) had a positive improvement climate including staff experience with quality improvement and organizational values for improvement. These factors suggest dimensions that a medical center might assess to determine the features on which it needs to build in order to implement the three components successfully.

While improved hand-hygiene compliance was the short-term project objective, the broader aim was to test whether focused organizational support of improvement initiatives and alignment of the initiatives with broader organizational goals strengthens the ability of VA medical centers to implement evidence-based clinical practices.

Research Highlight

Preventing Catheter-Associated Urinary Tract Infection in U.S. Hospitals: From Ideas to Action

Sarah L. Krein, Ph.D., R.N., and Sanjay Saint, M.D., M.P.H., HSR&D Center for Clinical Management Research, Ann Arbor, Michigan

Urinary catheters are frequently used in hospitalized patients and result in substantial morbidity and costs due to catheter-associated urinary tract infection (CAUTI). Urinary catheters may also cause non-infectious complications resulting from reduced mobility or urethral trauma from improper placement or removal. Despite the clinical and economic consequences of CAUTI, a 2005 national survey of both VHA and non-VHA hospitals revealed that preventing CAUTI was a low priority for most U.S. hospitals, with little attention given to either CAUTI or urinary catheters as a patient safety problem.[1]

Several recent initiatives may lead to increased attention on preventing CAUTI, including: (1) changes in the Centers for Medicare and Medicaid Services (CMS) reimbursement policy to not pay hospitals for the costs incurred for hospital-acquired CAUTI; (2) publication of CAUTI prevention recommendations by the Centers for Disease Control and Prevention (CDC)/Healthcare Infection Control Practices Advisory Committee (HICPAC) and others (www.cdc.gov/hicpac/cauti/001_cauti.html); and (3) a statewide collaborative in Michigan that focuses specifically on the prevention of CAUTI,[2] using an approach that successfully reduced rates of central line-associated bloodstream infection (CLABSI).[3]

Have these initiatives been effective? While complete results are not yet available, preliminary data collected in 2009 through another national survey suggest there is still much to be done to prevent CAUTI in U.S. hospitals. For example, the CMS payment change does not affect VHA hospitals and so has not increased CAUTI as a hospital priority within VHA. However, even for non-VHA hospitals, of which the majority report that payment changes have led to a moderate to large increase in the prevention of CAUTI as a hospital priority, the reported use of most prevention practices remains low. Specifically, both timely removal of urinary catheters and using them only when indicated are perhaps the most effective methods for preventing CAUTI or other catheter-associated complications. Yet, many hospitals – both VHA and non-VHA – do not have a routine system for monitoring catheter placement or discontinuation, and the implementation of effective strategies to promote appropriate use remains elusive. Even in Michigan, where most hospitals have been involved in a program that focuses on the timely removal of urinary catheters, efforts to reduce inappropriate catheter use have been variable.

What can be done? Besides identifying potential gaps in the prevention of health care-associated infection, and specifically CAUTI, the focus of our research is to develop, test, and evaluate strategies to address these gaps. Currently we are working with the Michigan Hospital Association Keystone Center for Patient Safety and Quality and hospitals in Michigan to assess and, building on current efforts, to develop effective CAUTI prevention strategies across hospitals.[2] In addition, we look forward to collaborating with the VA's Inpatient Evaluation Center (IPEC) and others as part of a VHA focused CAUTI prevention initiative. While our approach to CAUTI prevention will likely include many of the same general strategies used in prior infection prevention efforts (e.g., the model used by Pronovost and colleagues to reduce CLABSI),[3] preventing CAUTI presents several unique challenges: (1) the lack of highly effective products or approaches for preventing CAUTI; (2) the ubiquity of urinary catheter use throughout the hospital and not primarily in a specialized setting like the intensive care unit; and, (3) the limited importance placed on CAUTI prevention by hospital personnel. Challenges notwithstanding, some of the fundamental components for preventing CAUTI include:

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Goldstein Receives 2010 Under Secretary's Award for Outstanding Achievement

Mary K. Goldstein, M.D., M.S., has received this year's prestigious Under Secretary's Award for Outstanding Achievement in Health Services Research. The award recognizes a VA researcher whose work has met three key criteria: improved our understanding of factors that affect the health of Veterans and improved the quality of their care, contributed to the future of VA health services research by inspiring and training the next generation of investigators, and enhanced the visibility of VA research through national recognition within the research community.

For more than 18 years as a VA health services researcher, Dr. Goldstein has brought scientific distinction to the VA Palo Alto Healthcare System through her contributions to health services research, and has clearly exemplified the three major criteria for this award. Dr. Goldstein serves as Director of the Geriatrics Research Education and Clinical Center (GRECC) at the VA Palo Alto Health Care System.

Dr. Goldstein's research focuses on functional status in geriatrics, hypertension management, application of clinical guidelines and guidelines compliance, and automated clinical decision support systems. Her work in health informatics is known nationally and internationally. Throughout her career, Dr. Goldstein has shared her expertise and experience by actively mentoring VA researchers and clinicians. Over the years, she has generated more than 100 publications, including journal articles and book chapters, in the areas of hypertension, geriatrics, decision-making, and decision support.

Robert A. Petzel, M.D., Under Secretary for Health, presented the award to Dr. Goldstein at the VA Research Week Forum in Washington, D.C. in April.

Research Highlight

Creating Systems to Improve ICU Outcomes: Reducing Central Line-Associated Bloodstream Infections and Ventilator Pneumonia in VA ICUs

Marta L. Render, M.D., Chief, VA Inpatient Evaluation Center, Cincinnati, Ohio, Rachael Hasselbeck, M.S.N., Director, Implementation, VA Inpatient Evaluation Center, Cincinnati, Ohio, and Peter Almenoff, M.D., Assistant Deputy Under Secretary for Quality and Safety, VA Office of Quality and Safety, Kansas City, Missouri

Infections acquired as a consequence of hospitalization are costly and common. In a 2001 review, which ranked safety practices based on the evidence and potential for impact and effectiveness, practices to reduce hospital-acquired infections ranked highly.[1] The *Saving 100,000 Lives* campaign of the Institute for Healthcare Improvement and the elimination of payment for infectious complications of hospitalization by Medicare and other insurers represent external efforts that have targeted hospital-acquired infections.[2]

The VA Inpatient Evaluation Center (IPEC) provides infrastructure to improve outcomes in hospitalized Veterans. IPEC uses information technology to measure variation in outcomes and evidence-based practices, provides benchmarked feedback to both senior and middle-level managers, and creates learning tools for implementation. Organizationally, VA leadership plays a central role in establishing IPEC targets for improvement through an executive board composed of senior regional, national, and local leaders, and a clinical advisory board composed of an ICU director and nurse manager from each of the 21 VA regions.

Reducing Central Line-Associated Bloodstream Infection and Ventilator Pneumonia in the ICU

In the fall of 2005, VA Operations asked IPEC to support the implementation of evidence-based practices (EBP) in the intensive care unit (ICU) to reduce central line-associated bloodstream infections (handwashing, sterile gown and gloves, bed-sized drape, cap and mask, avoidance of the femoral site, early removal) and ventilator-associated pneumonia (elevation of head of the bed, coordinated daily sedation vacation and spontaneous weaning trial, daily weaning assessment, venous thromboembolism prevention, and stress ulcer prophylaxis). The agreement by regional leadership to support these projects as part of VA's commitment to *Saving 100,000 Lives*, and inclusion of reduction in infection rates in leadership's performance contract created a strong mandate.

To create momentum for this initiative, three hospitals in the field presented their experience in implementing the central line-associated bloodstream infections (CLAB) and ventilator-associated pneumonia (VAP) bundle and reducing infections during a kick-off web-based call. IPEC contacted every nurse manager and infection control practitioner in VA to learn existing use of measures and practices to reduce hospital-acquired infections. To make implementation easy, a website provided tools such as (1) learning modules that offered CEUs, (2) examples of forcing functions (line cart, checklist for line insertion, and daily goal sheet), (3) adaptable policies and procedures, (4) an annotated bibliography, and (5) guidance for moving practice change. Lacking a system to track hospital-acquired infections nationally, we developed a data management website where hospitals manually entered infection rates using CDC definitions and adherence to evidence-based practices. Rates benchmarked internally and externally were reported quarterly to multiple levels of leadership. IPEC program managers mentored struggling sites (infections > 75th percentile) who volunteered.

Results

This implementation experience created a template for future initiatives. Facilitators for successful implementation included availability of pilot sites, feedback benchmarked to similar ICUs, leadership commitment, accessible tools to adapt to local circumstances, learning strategies that keep new staff up to date on expected practices and shared expertise across VA hospitals, and a help desk (via the program managers at IPEC) to troubleshoot barriers and mentor. Barriers included use of older frameworks for change (conference room planning rather than rapid tests of change), time constraints, and tapping interest of a physician champion. Given a goal likely to improve patient outcomes based on strong evidence, 260/273 ICUs dropped their infection rates without coaching or participation in a collaborative process. External drivers from regulators and quality organizations and internal drivers such as comparative rates of infections in VA and prioritizing the initiative through inclusion in the leadership performance contract facilitated the interest of VA leadership.

Adherence to both the CLAB bundle and VAP bundle increased. Adherence to composite EBP for CLAB increased from 85 percent in the second quarter of 2006 to 97 percent in 2009. Adherence to composite EBP for VAP increased from 51.6 percent in the second quarter of 2006 to 90.6 percent in 2009, and ventilator days fell by 8,800 from 2007 to 2009. CLAB rates fell (3.8 to 1.8 /1000 line days; $p < 0.01$) overall as did the rate of ventilator pneumonia (6.8 to 2.8/ 1000 vent days; $p < 0.01$). Struggling sites lacked a functional team, forcing functions, and system to provide feedback to frontline staff.

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1) A simple summary of key recommendations for preventing CAUTI such as through the mnemonic "ABCDE" (see box).
2) Engaging nurses as key champions for CAUTI prevention and appropriate urinary catheter use.
3) Education about catheter risks with particular emphasis on non-infectious as well as infectious complications.
4) Use of stop-orders or nurse-based removal protocols, either computerized or paper-based.
5) Establishing consistent, rigorously derived (yet practical and user-friendly) indications for catheter placement and discontinuation.

Improving patient safety and quality of care requires moving beyond simply disseminating scientific evidence. Nevertheless, identifying and implementing effective strategies to ensure the use of proven practices in real-world clinical settings remains challenging. Our in-depth study of hospital-based infection prevention – with a focus on CAUTI – is an example of research underway throughout VA to address this challenge. While we hope to reduce CAUTI and improve urinary catheter use in hospitals across the United States, our broader goal is to use infection prevention as a model for developing methods for uncovering and then addressing the many complexities that affect the safety of hospitalized patients.

Catheter-Associated Urinary Tract Prevention: Recommendations[2]

- **A**dherence to general infection control principles (e.g., hand hygiene, surveillance and feedback, aseptic insertion, proper maintenance, education) is important.
- **B**ladder ultrasound may avoid indwelling catheterization.
- **C**ondom catheters or other alternatives to an indwelling catheter such as intermittent catheterization should be considered in appropriate patients.
- **D**o not use the indwelling catheter unless you must!
- **E**arly removal of the catheter using a reminder or nurse-initiated removal protocol appears warranted.

FORUM
Geraldine McGlynn, Editor-in-Chief
Margaret Trinity, Editor

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