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Legislative mandates for use of active surveillance cultures to screen for methicillin-resistant *Staphylococcus aureus* and vancomycin-resistant enterococci: Position statement from the Joint SHEA and APIC Task Force

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Legislation aimed at controlling antimicrobial-resistant pathogens through the use of active surveillance cultures to screen hospitalized patients has been introduced in at least 2 US states. In response to the proposed legislation, the Society for Healthcare Epidemiology of America (SHEA) and the Association for Professionals in Infection Control and Epidemiology, Inc., (APIC) have developed this joint position statement. Both organizations are dedicated to combating health care-associated infections with a wide array of methods, including the use of active surveillance cultures in appropriate circumstances. This position statement reviews the proposed legislation and the rationale for use of active surveillance cultures, examines the scientific evidence supporting the use of this strategy, and discusses a number of unresolved issues surrounding legislation mandating use of active surveillance cultures. The following 5 consensus points are offered. (1) Although reducing the burden of antimicrobial-resistant pathogens, including methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant enterococci (VRE), is of preeminent importance, the APIC and the SHEA do not support legislation to mandate use of active surveillance cultures to screen for MRSA, VRE, or other antimicrobial-resistant pathogens. (2) The SHEA and the APIC support the continued development, validation, and application of efficacious and cost-effective strategies for the prevention of infections caused by MRSA, VRE, and other antimicrobial-resistant and antimicrobial-susceptible pathogens. (3) The APIC and the SHEA welcome efforts by health care consumers, together with private, local, state, and federal policy makers, to focus attention on and formulate solutions for the growing problem of antimicrobial resistance and health care-associated infections. (4) The SHEA and the APIC support ongoing additional research to determine and optimize the appropriateness, utility, feasibility, and cost-effectiveness of using active surveillance cultures to screen both lower-risk and high-risk populations. (5) The APIC and the SHEA support stronger collaboration between state and local public health authorities and institutional infection prevention and control experts. (Am J Infect Control 2007;35:73-85.)

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Over the past 20 years, the incidence of infections caused by antimicrobial-resistant pathogens has increased dramatically, especially in vulnerable high-risk populations, such as patients in the intensive care unit (ICU) and those who are immunocompromised.[1,2] Improving the treatment of these infections and preventing the spread of pathogens such as methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant enterococci (VRE), a focus of clinicians and researchers for many years, is now a source of increasing concern for the general public, the media, and the policy makers.

Recently, legislative measures aimed at controlling antimicrobial-resistant pathogens in health care facilities were introduced in 2 US states. The proposed legislation mandates the use of active surveillance cultures to screen hospitalized patients for carriage of MRSA and, in one state, VRE. This strategy, described in greater detail below, is based on the concept that, if patients who are asymptomatically colonized with antimicrobial-resistant bacteria are detected, they can be isolated from other patients to prevent transmission. As an adjunct to this strategy, colonized patients may be offered treatment to attempt to eradicate the antimicrobial-resistant bacteria.

In response to the proposed legislation mandating use of active surveillance cultures, the Society for Healthcare Epidemiology of America (SHEA) and the Association for Professionals in Infection Control and Epidemiology, Inc., (APIC) have developed this joint position statement. Both organizations are dedicated to developing, validating, and promoting a wide array of methods to combat antimicrobial resistance and all health care-associated infections, including the use of active surveillance cultures in appropriate circumstances, as recommended in previously published guidelines.[3,4] However, the SHEA and the APIC do not support legislation as a means to mandate any specific infection control strategy, including use of active surveillance cultures. As will be discussed in detail, such legislation would effectively exclude local experts in health care epidemiology, infection control, and prevention from the process of risk assessment and resource allocation that is essential to meet the clinical and epidemiologic challenges unique to each health care facility. Moreover, legislation is too inefficient a tool to permit a rapid response to the evolving clinical environment and ever-changing scientific evidence that determine the most effective infection control and prevention strategies. Practical considerations regarding the mandatory implementation of active surveillance cultures, including unanticipated logistical challenges regarding patient and laboratory flow, concerns about patient safety, and a number of methodologic issues, are also yet to be addressed.

In the sections that follow, this position statement (1) reviews the proposed legislative measures as well as the rationale for use of active surveillance cultures, (2) examines the scientific evidence supporting the use of active surveillance cultures and eradication strategies, (3) discusses potential unresolved issues and unintended consequences of legislation mandating use of active surveillance cultures, and (4) provides the consensus points of the APIC and the SHEA regarding US legislation mandating use of active surveillance cultures to screen for MRSA and VRE. (Although the utility of active surveillance cultures to screen for other pathogens has been examined, this statement will exclusively consider the use of active surveillance to reduce transmission of MRSA and VRE, the organisms addressed by the legislation proposed to date.)

OVERVIEW OF PROPOSED US LEGISLATIVE INITIATIVES

At the time this statement is written, legislative proposals for mandatory use of active surveillance cultures have been introduced in 2 US states. In Illinois, 2 bills have been proposed. The first, Illinois SB2771,[5] was introduced in January 2006 as an amendment to the state's Hospital Licensing Act. If passed, the new law would compel every hospital in the state to ''screen all patients for MRSA in accordance with guidelines published by the Centers for Disease Control and Prevention.''[5] If a patient tested positive for MRSA, the law would require the hospital to ''inform the patient and offer treatment.'' Mandatory reporting of all MRSA cases to the state health department would also be required. The second bill, Illinois SB3087,[6] differs from the first in that it additionally specifies that, for patients who test positive for MRSA, ''the hospital must segregate that patient from patients who test negative for MRSA and must provide treatment to that patient.'' The second bill makes no specific provision for reporting cases in which MRSA is detected.[6]

In Maryland, a 2006 legislative subcommittee set aside a proposed mandatory active surveillance bill (Maryland HB966).[7] The proposed legislation had adopted a broad approach, including surveillance for both MRSA and VRE in hospitals and nursing facilities. The bill would have required the ''identification of colonized or infected patients through active surveillance cultures,'' ''isolation of identified patients in an appropriate manner,'' and ''strict adherence to handwashing and hand hygiene guidelines.''[7] The proposed legislation, like Illinois SB2771, included a provision for reporting cases of colonization or infection to the state health department.

RATIONALE FOR USE OF ACTIVE SURVEILLANCE CULTURES

Antimicrobial-resistant pathogens have been recognized as a major global public health threat for more than 30 years. Most recently, pathogens resistant to nearly all available antimicrobials have emerged as an increasingly common problem.[2,8] For pathogens such as MRSA and VRE, estimates of the risk of death independently associated with antimicrobial resistance have been variable.[9,10] However, several recent studies support the conclusion that infections caused by antimicrobial-resistant pathogens are associated with both worsened clinical outcomes[11,12] and an increased cost of care,[13,14] compared with infections caused by antimicrobial-susceptible strains of the same bacteria.

An understanding of the rationale for the use of active surveillance cultures requires an appreciation of the distinction between bacterial colonization and infection. Most antimicrobial-resistant bacteria are opportunistic pathogens, often colonizing the skin and mucosal surfaces of humans without producing signs or symptoms of infection.[15-17] However, when presented with a breakdown in the physical or immunologic defenses of the host, colonizing bacteria are capable of producing infection and even death. Estimates of the incidence of infection following the detection of MRSA colonization range from 10% to 30%, depending on the population studied and the length of follow-up.[18-20] The frequency of infection following newly-detected VRE colonization appears to be lower.[21-23] For both VRE and MRSA, the risk of infection following colonization is higher for more severely ill patients (such as those in the ICU) than for those who are not acutely ill (such as residents of long-term care facilities).[24,25]

Transmission of antimicrobial-resistant pathogens between patients, including those who are either infected or asymptomatically colonized with these bacteria, accounts, in part, for the increase in antimicrobial resistance observed in health care facilities, a fact suggested by numerous epidemiologic and microbiologic studies.[26-32] In addition, an increase in the number of patients colonized or infected with community-associated strains of MRSA has been observed at many health care facilities in the United States in recent years, which has also contributed to the overall prevalence of MRSA colonization and infection at these institutions.[33] The purpose of screening with active surveillance cultures is to prevent patient-to-patient transmission through detection of both colonized and infected patients and implementation of isolation precautions known to reduce the risk of dissemination of antimicrobial-resistant pathogens. Use of active surveillance cultures has been shown to improve detection of antimicrobial-resistant pathogens, compared with reliance on culture of specimens collected for clinical reasons alone.[34-36]

Operationally, use of active surveillance cultures involves the collection of specimens for culture whether or not the patient is exhibiting signs or symptoms of infection. For MRSA, swab samples for culture are generally collected from the anterior nares and sometimes from other sites, including wounds. For VRE, specimens are generally collected from the rectal and/or perirectal area or from stool samples. Along with culture of specimens collected at hospital admission, culture may be performed periodically throughout the hospital stay for patients not already identified as carriers to detect those who have acquired the organism during hospitalization. Molecular typing may be helpful in assessing whether patient-to-patient transmission has actually occurred.[37]

Once a patient is identified as being colonized or infected, isolation precautions are generally used to prevent the spread of antimicrobial-resistant pathogens to other patients. Contact precautions, which have been shown to be effective in reducing transmission of VRE[38] and MRSA,[39] include physical separation (typically in private rooms) of infected and colonized patients from other patients, use of appropriate hand hygiene, and use of clean gowns and gloves by health care workers during all contact with the patient or the patient's environment. In specific circumstances, patients carrying antimicrobial-resistant pathogens may also undergo treatment to eradicate colonization, which, if successful, could interrupt the potential for spread. The required elements of a hospital-wide active surveillance cultures program are summarized in Table 1.

Active surveillance cultures have been identified as an important tool for the control of MRSA and VRE in many settings. The most recent SHEA guideline on prevention of nosocomial transmission of these organisms advocates the use of active surveillance cultures for controlling their spread.[3] This guideline also emphasizes the importance of integrating use of active surveillance cultures with other basic infection control practices, including hand hygiene, compliance with the use of gown and gloves when needed, health care worker education, antimicrobial stewardship, environmental cleaning, and appropriate tracking and monitoring of infection control and prevention initiatives. Similarly, the Healthcare Infection Control Practices Advisory Committee (HICPAC) guideline for the control of multidrug-resistant bacteria also promotes the use of active surveillance cultures for high-risk patients when other measures have failed to control the spread of antimicrobial-resistant bacteria.[4]

Table 1. Required elements of an effective active surveillance program

Screening test
Must be timely, affordable, and reliable
Clinical efficacy
Should reduce transmission rate to patients and health care workers
Should reduce infection rate by preventing acquisition
Implementation
Hospital and administrative financial support
Systems and staff to screen patients
Systems and staff to monitor effectiveness and compliance
Education of patients, staff, and families
Adequate physical plant and supplies (eg, private rooms, gloves, gowns, and antimicrobial agents)
Plan to manage social isolation and safety of patients under contact precautions

Assessment of the evidence supporting use of active surveillance cultures and decolonization

The effectiveness of using active surveillance cultures to prevent the spread of VRE and MRSA has been examined in a number of studies conducted across a range of clinical contexts, particularly in hospital units and patient populations at high risk and during outbreaks. Other recent publications have comprehensively reviewed the full spectrum of available evidence for active surveillance.[3,4,40] This document provides a more focused summary of the literature relevant to the question of whether legislation is an appropriate and effective tool to reduce transmission of MRSA and VRE in health care facilities.

Clinical effectiveness of active surveillance cultures and isolation

Much of the original evidence supporting use of active surveillance cultures as an effective means to prevent infections caused by antimicrobial-resistant bacteria emerged from experience with hospital outbreaks. When used during an outbreak, active surveillance cultures have been convincingly demonstrated to interrupt the spread of both VRE[37,41-49] and MRSA.[50-55] The evidence supporting the use of active surveillance cultures for the control of antimicrobial-resistant bacteria in circumstances other than during an outbreak is more limited.[36,56-67] Most of the available reports describe surveillance programs applied to high-risk units (such as ICUs and dedicated wards for immunocompromised patients) or specific populations of high-risk hospital patients (such as long-term care facility residents or hemodialysis patients). As a result, the findings of these studies are not easily extrapolated to patients, and circumstances in which the risk of transmission of antimicrobial-resistant bacteria might be lower.

Fewer published reports have examined application of active surveillance cultures to all hospitalized patients, the strategy mandated by the proposed legislation. Furthermore, many of the available studies were not designed to assess the effectiveness of an active surveillance culture program in reducing transmission or infection but rather were undertaken to determine how colonized or infected patients could be most efficiently and affordably detected.[68-70] In each case, the investigators concluded that targeted surveillance of high-risk patients, such as is advocated by the previous SHEA and HICPAC guidelines, offers the optimum strategy to detect colonized and infected patients.

One especially important study that examined the performance of active surveillance cultures to control endemic infection is that of Ostrowsky et al.[71] Testing a strategy to reduce VRE transmission in more than 30 long-term and acute care facilities in Iowa, Nebraska, and South Dakota, the investigators demonstrated that the proportion of patients identified as VRE carriers fell from 2.2% to 0.5% in the participating facilities during the 3 years of the study.[71] Although based on periodic screening rather than a continuous active surveillance culture program, the study demonstrates that health system-wide reduction in VRE colonization is possible.

Well-designed comparator trials represent the ''gold standard'' for reliably quantifying the performance of active surveillance cultures for the control of antimicrobial-resistant pathogens in circumstances other than during an outbreak. However, such investigations have been, thus far, only infrequently undertaken. In one nonrandomized study, Price et al[72] found that the rate of VRE bacteremia was 2.1 times higher in a hospital that did not screen patients, compared with a second hospital in which high-risk patients were routinely screened by means of surveillance cultures at admission and periodically during the hospital stay.

A large, multicenter, randomized study incorporating use of active surveillance cultures to screen for both VRE and MRSA is currently underway under the auspices of the Bacteriology and Mycology Study Group and supported by the National Institute for Allergy and Infectious Diseases.[73] In this study, 19 ICUs have been randomly assigned to implementation of either routine infection control practices or a more intensive infection prevention strategy, including use of active surveillance cultures to screen for both MRSA and VRE. The primary outcome is the incidence of new colonization or infection events with MRSA and VRE during the ICU stay. The results of this study should be available within the next 12 months and are likely to add considerably to the discussion of use of active surveillance cultures for high-risk populations.

While awaiting the results of rigorous, prospective, and well-controlled studies, mathematical models have been employed to help predict the potential effect of using active surveillance cultures to reduce transmission of antimicrobial-resistant bacteria in lower-risk patients. Cooper et al[74] found that ''a policy of screening newly admitted patients for MRSA coupled with rapid and effective isolation and treatment could make a major contribution to controlling its spread.''[74(p10228)] Bootsma et al[75] modeled the potential effectiveness of a strategy of rapid diagnostic testing, compared with use of surveillance cultures and isolation, to reduce dramatically the prevalence of MRSA colonization and infection over time. Similar mathematical models are available for VRE transmission.[76] Although the potential value and importance of theoretic mathematical models are recognized, epidemiologic assumptions incorporated in models require validation in a wide variety of settings and circumstances. Careful interpretation of models, recognizing all the limitations and assumptions, is essential.

Any overview of the clinical performance of active surveillance culture programs must acknowledge the ongoing experience with related strategies in Denmark, The Netherlands, and several other European countries because these efforts have not only informed the studies previously discussed but have likely influenced the current US legislative initiatives. In most of these countries, ''search and destroy'' methods have been employed to reduce MRSA to the status of an uncommon nonendemic pathogen in recent years. This long-standing, intensive, coordinated campaign relies on targeted screening of high-risk patients. If multiple cases of MRSA colonization or infection are detected, entire units may be closed for comprehensive screening and cleaning.[77-80] In addition, health care workers may be screened for MRSA carriage and, if colonized, not allowed to work until successfully decolonized.

Extrapolating these experiences to the United States may be difficult. First, there appear to be differences between Europe and North America in the epidemiology of antimicrobial-resistant bacteria. The high prevalence of MRSA colonization and infection already seen in various regions of the United States represents a particular challenge because this was not the case in nearly any of the European nations when ''search and destroy'' programs were initially implemented. Moreover, the impact of community-associated MRSA colonization and infection on the effectiveness and feasibility of using active surveillance cultures in the United States and other affected nations is unknown.[81,82] Given the rapid spread of community-associated MRSA strains, it may be particularly challenging to control MRSA with any strategy that focuses exclusively on the hospital. Second, it should be noted that the proposed US legislation describes a universal screening program that differs in scope from the targeted ''search and destroy'' method employed successfully in Europe. Finally, use of active surveillance cultures may be more difficult to implement and sustain because of the size and the heterogeneity of the health care environment found in the United States.

Cost-effectiveness of using active surveillance cultures and isolation

Use of active surveillance cultures has been shown to be cost-effective during outbreaks in ICUs. Karchmer et al[83] demonstrated that weekly surveillance cultures and isolation of infants colonized or infected with MRSA interrupted an epidemic of MRSA infection at one neonatal ICU and that the cost was 19- to 27-fold less than the attributable cost of excess MRSA bloodstream infections in a comparison hospital in which samples for surveillance cultures were not collected. Similarly, Muto et al[84] found that use of surveillance cultures for high-risk patients to control an outbreak of VRE infection at a university hospital significantly reduced the incidence of VRE bacteremia and the total costs, compared with those at another hospital in which the strategy was not employed.

Use of active surveillance cultures has also been suggested to be cost-effective in high-risk settings in the absence of an outbreak. Chaix et al[85] evaluated the costs and benefits of an active surveillance program to control endemic MRSA in the medical ICU of a French university hospital. Assuming a high risk of infection (greater than 25%) among colonized patients, the authors found that the active surveillance strategy was cost-effective when the rate of MRSA carriage on admission to the unit was 1% to 7%, even if only a small proportion of MRSA infections was prevented.

Comparable experience with the cost-effectiveness of using active surveillance cultures for the control of endemic VRE has also been reported. Montecalvo et al[86] described a multipronged effort to control endemic VRE in an adult oncology unit. They demonstrated that the overall savings attributable to the number of VRE infections prevented by use of active surveillance cultures more than outweighed the added expense of the program itself.

Although these and other studies provide evidence to support the economic benefit of using surveillance cultures to screen for MRSA and VRE among high-risk patients or during outbreaks, examination of the cost-effectiveness of screening all patients across all health care settings has not yet been performed. Future analyses, especially those that incorporate the results of

Table 2. Potential unresolved issues and unintended consequences of legislation mandating active surveillance to screen hospitalized patients for antimicrobial-resistant pathogens

Infection control and prevention programs and priorities
Loss of autonomy in risk assessment and resource allocation
Insufficient flexibility to respond to changes in local epidemiology or new scientific evidence
Insufficient infrastructure and resources
Data management
Lack of adequate standardization
Lack of adequate validation
Shortcomings in proposed enforcement and compliance plans
Safety
Potential concerns for safety and satisfaction of patients in isolation
Logistics
Need for cohorting of patients in institutions without sufficient single-patient rooms
Barrier to discharge for colonized or infected patients
Insufficient laboratory infrastructure and resources
Added risk for laboratory delays and errors because of marked increase in volume

rigorous epidemiologic studies to provide an accurate range of model parameters, are needed.

Effectiveness of eradication and suppression of colonization

Carriers of MRSA or VRE are often colonized for long periods of time.[87,88] During the period that they remain colonized, these patients are at added cumulative risk for infection and can serve as a potential source for transmission to others. To preempt these phenomena, a number of approaches to decolonizing patients have been evaluated for both MRSA[89-91] and VRE.[92]

Strategies to eradicate MRSA colonization have included the use of a range of agents applied either topically (generally to the anterior nares) or systemically.[93-95] The overall utility of decolonization strategies for patients colonized or infected with MRSA was the subject of a recent systematic review.[96] On the basis of the results of 6 trials that included 384 participants, the authors of the study concluded that the available evidence is inadequate to recommend the use of topical or systemic agents to eliminate MRSA colonization. Unfortunately, aggressive attempts to institute programs to eradicate MRSA have been accompanied by the emergence of MRSA strains that are resistant to mupirocin, the topical antimicrobial agent most commonly used for nasal decolonization.[91,97,98]

Attempts to eradicate VRE colonization have primarily focused on eliminating intestinal carriage of the organism, often with nonabsorbable enteral antimicrobial agents. The results of these studies have been variable and somewhat disappointing.[99,100] Limited success has been demonstrated with the nonabsorbable agent ramoplanin.[92] In one recent study, the rate of VRE acquisition among ICU patients was reduced through the use of chlorhexidine baths to eliminate VRE on the skin.[101]

UNRESOLVED ISSUES AND UNINTENDED CONSEQUENCES

Even if the available evidence supporting the use of active surveillance cultures for lower-risk populations were already as strong as that for high-risk patients, a number of unresolved issues and potential unintended consequences would still argue against legislation mandating the implementation of this strategy. In the following sections, issues that are unresolved and several aspects of patient management that could be unexpectedly and negatively affected by legislation mandating use of active surveillance cultures are discussed. These issues are summarized in Table 2.

Potential impact on infection control programs and priorities

In the United States and other countries with established infection prevention and control infrastructure, infection control professionals, managers, and health care epidemiologists are responsible for planning and executing a wide array of activities to protect the health of patients, staff, and hospital visitors. Included in this broad scope of work are routine surveillance for health care-associated infections, detection and investigation of outbreaks, and ensuring institutional compliance with regulatory mandates from federal agencies and state and local health departments. Increasingly, emphasis has also been placed on the measurement and improvement of performance standards for the prevention of health care-associated infections caused by both antimicrobial-resistant and antimicrobial-susceptible bacteria.

In addition to local and institutional efforts, infection prevention and control activities have increasingly been promoted and coordinated on a broader scale, emphasizing interinstitutional collaboration for the transfer of knowledge and the sharing of best practices. Such initiatives have included national and regional collaborations aimed at reducing central line-associated bloodstream infections and ventilator-associated pneumonia, pay-for-performance programs to enhance the appropriate delivery of perioperative antimicrobial prophylaxis, and public health interventions to promote more uniform infection control approaches.[102] These efforts have resulted in substantial numbers of infections prevented and, ultimately, lives saved.

The allocation of infection control resources for these manifold tasks has traditionally been the responsibility of health care epidemiologists and infection

control and prevention professionals, with the support of hospital administrators. Through careful risk assessment based on the available local data, and with sensitivity to the clinical priorities of the institution, these experts must allocate an increasingly limited pool of personnel and resources. Priority is typically given to the most critical needs of patients, while the flexibility is retained to respond swiftly to both unexpected changes in local epidemiologic trends, as well as the most up-to-date scientific evidence.

Legislation mandating use of active surveillance cultures or any other infection control strategy neither recognizes the need for flexible allocation of resources to the most critical hospital-specific challenges nor allows for a timely response when significant new information becomes available. In addition, legislation mandating any single infection control and prevention strategy that exclusively targets specific antimicrobial-resistant pathogens may be counterproductive, compared with integrated infection prevention and control strategies that result in a greater *overall* reduction in the number of health care-associated infections caused not only by MRSA and VRE but by all antimicrobial-resistant and antimicrobial-susceptible pathogens. For example, improvement in hand hygiene compliance and prevention of surgical site infections, ventilator-associated pneumonia, and central venous access device-associated infection are clinically efficacious against nearly all pathogens responsible for health care-associated infections. The relative emphasis placed on these initiatives, as well as use of active surveillance cultures, is best determined by risk assessment at the level of the individual institution.

The dilemmas posed by legislation mandating use of active surveillance cultures will be especially problematic if no additional resources are made available for implementation. Without additional support, health care epidemiologists and infection control and prevention professionals will be necessarily compelled to dedicate themselves to performance of active surveillance cultures at the expense of established and effective strategies that may be more appropriate to the local situation. In this manner, mandating use of active surveillance cultures could lead to worsening rates of other potentially devastating health care-associated infections, including *Clostridium difficile*-associated disease,[103] health care-associated infections caused by antimicrobial-susceptible and other antimicrobial-resistant bacteria, and even pandemic influenza or other as-yet-unrecognized emerging pathogens. Legislation mandating use of one particular infection control strategy is no different than legislation insisting on use of one specific operative approach by cardiovascular surgeons, one pain regimen by palliative care specialists, or one particular chemotherapy agent by oncologists.

Requirements for data management and validation, monitoring compliance, and enforcement

The success of any active surveillance program depends on the quality, timeliness, and reliability of the data generated. The results must be presented in a manner that is familiar and easy to understand. Simultaneously, to allow meaningful benchmarking and comparisons across institutions, an active surveillance culture program must conform to standards recognized by accreditation bodies, professional societies, and public health authorities. Nevertheless, numerous questions remain about the epidemiologic, biologic, clinical, and logistical implications of active surveillance. How are rates of MRSA and VRE colonization and infection most appropriately quantified? How should patients who acquire colonization with MRSA or VRE during one hospitalization but return with infection at a subsequent admission be counted and managed? What is the optimal body site from which to obtain specimens for surveillance, and is this site the same for all patient populations and situations? Does the same hold true for novel or emerging strains of MRSA or VRE? What is the most appropriate microbiologic assay to use for surveillance? Is there a role for more sensitive molecular assays? Resolution of the questions and controversies regarding these standards must be established as a prerequisite for the application of active surveillance cultures to lower-risk and high-risk patients. Rational and evidence-based standards must be developed with input from experts in health care epidemiology and in infection control and prevention to ensure that the design, conduct, analysis, and interpretation of surveillance programs are appropriate.

The legislation as proposed in both Illinois and Maryland does not specify how the implementation of mandatory active surveillance culture programs would be ensured and monitored nor is it clear who would bear the costs (hospitals, patients, and/or insurers). Currently, Medicare and most other insurers will not reimburse providers for performance of screening cultures. In addition, the role of the Joint Commission on Accreditation of Healthcare Organizations, the Centers for Disease Control and Prevention, and other agencies with whom health care epidemiologists and infection control and prevention professionals have historically collaborated to develop and ensure practice standards also remains to be defined. It would be imprudent to assume that local or state health departments are equipped with the infrastructure, resources, or expertise to oversee mandatory active surveillance culture programs at every health care facility in their jurisdiction. In fact, many state

health departments do not have staff with infection control expertise. Adding oversight of active surveillance programs to public health departments could unnecessarily strain the capacity of these agencies. The amount and complexity of information to be reported to health departments would be substantial, and management of such information would divert public health personnel away from other important duties, such as oversight of tuberculosis programs; communicable disease surveillance, prevention, and control activities; and investigation of community outbreaks. The result would be not only inconsistent supervision and coordination of institutional active surveillance programs but also a necessary shift of state resources from other important public health efforts.

Safety and isolation precautions

Despite the benefit of preventing transmission of bacterial pathogens from patient to patient and the clear negative effects of MRSA and VRE infection, several recent studies have raised concern regarding potential negative aspects of patient isolation. Stelfox et al[104] found that isolated patients were twice as likely as control patients to experience adverse events, more likely to file a formal complaint with the hospital, more likely not to have vital signs appropriately recorded, and more likely to have more days without a physician progress note. Similar observations have been reported in a number of other studies.[105-107] Accurately determining the safety of isolation and optimizing practice to ensure the best outcome for patients should be addressed prior to the widespread implementation of active surveillance culture programs.

Logistical barriers to the mandatory implementation of active surveillance culture programs

In addition to the broader concerns already described, a number of more practical challenges would accompany the widespread implementation of active surveillance culture programs as mandated by the proposed legislation, particularly if additional resources are not made available to support these initiatives. Although each such logistical challenge may individually not be insurmountable, in the context of the greater concerns regarding legislation mandating use of active surveillance cultures, the examples described below and other obstacles must be anticipated and addressed before, not after, any widespread program is implemented.

At least initially, identification of MRSA or VRE carriers by means of active surveillance cultures will be associated with an increase in the number of patients who must be cared for using contact precautions, which ideally includes use of a private room. Estimates based on the experience at hospitals that have performed limited prevalence surveillance at hospital admission indicate that up to 7.9% of all admitted patients would require initial isolation after the adoption of a mandatory active surveillance culture program.[68,69,108,109] The limited number of single-patient rooms in many health care facilities represents a very real issue that would need to be addressed in the face of legislation mandating use of active surveillance cultures.

Although cohorting of colonized or infected patients together under the care of dedicated providers has been advocated and shown to be practical under special circumstances,[56] this can be quite difficult on a large scale and could potentially lead to delays in the admission of patients, patient transfers within the hospital, and hospital discharge of colonized or infected patients who require skilled nursing care or rehabilitation. In addition, if use of active surveillance cultures is also mandated in long-term care facilities, the resultant need for isolation may further limit the availability of beds in such facilities for patients being discharged from the hospital, creating an additional bottleneck in patient flow.[110] Although, in the long term, many of these patient-flow issues will improve if the spread of antimicrobial-resistant bacteria diminishes and there are fewer patients colonized or infected with MRSA and VRE, the short-term detriment could be significant were legislation mandating use of active surveillance cultures to be enacted.

A second practical issue that would accompany legislation mandating use of active surveillance cultures relates to the change in workload that would be faced by clinical microbiology laboratories. At most health care facilities, including some large acute care hospitals, the clinical microbiology laboratory is not presently equipped or staffed to manage the collection, processing, analysis, and interpretation of the increased number of specimens and results that would be generated by more widespread use of active surveillance cultures to screen for antimicrobial-resistant pathogens. Even at centralized laboratories, unless there is advance planning, the addition of the thousands, if not tens of thousands, of cultures generated by active surveillance could overwhelm staff, equipment, and resources. Delays in processing and reporting isolates obtained as part of routine clinical care may occur, with possible risk to patients.

CONCLUSIONS AND CONSENSUS POINTS

There is considerable evidence to support the use of active surveillance cultures for high-risk patients and

during outbreaks of infection and colonization with antimicrobial-resistant pathogens, as has been previously recommended by the SHEA and the HICPAC.[3,4] However, at present, there is insufficient evidence to justify the mandatory application of this strategy to all hospitalized patients. Even if consensus existed regarding the clinical efficacy and cost-effectiveness of using active surveillance culture and eradication of colonization for both lower-risk and high-risk patients, a number of issues regarding the uncertainties and potential unintended consequences of legislation mandating application of this strategy to any population would remain. Although logistical constraints are ultimately likely to be addressed, legislation mandating any one strategy to prevent and control the spread of antimicrobial-resistant pathogens remains of concern because local experts would be excluded from their crucial role of conducting timely and flexible risk assessment and resource allocation.

However, it must be acknowledged that the discussion generated by the proposed legislation represents a critical opportunity to further raise and sustain the profile of antimicrobial resistance as a public health crisis and to better inform the public about this threat. The position of the SHEA and the APIC is that it is essential to promote the highest standards to prevent the consequences of antimicrobial resistance and health care-associated infection, while acknowledging the considerable effort that is still required to identify, refine, and promote the most effective strategies to interrupt the spread of antimicrobial-resistant pathogens. The following consensus points are intended as a set of principles to help guide health care epidemiologists and infection control and prevention professionals participating in this process (Table 3).

1. Although reducing the burden of antimicrobial-resistant pathogens, including MRSA and VRE, is of preeminent importance, the APIC and the SHEA do not support legislation to mandate use of active surveillance cultures to screen for MRSA, VRE, or other antimicrobial-resistant pathogens. Although there is considerable evidence supporting the use of active surveillance cultures as a clinically effective and cost-effective method for combating the spread of antimicrobial resistant microorganisms in specific circumstances, to mandate this strategy as the single infection control intervention to be applied in all circumstances would preclude local risk assessment and implementation of a broad range of interventions needed to control infections caused by antimicrobial-resistant and antimicrobial-susceptible pathogens. Moreover, legislation in general is not sufficiently flexible to permit rapid response to local epidemiologic trends or changes in the understanding of the spread and consequences of antimicrobial resistance. Local experts should be permitted the latitude to assess the risks of, needs for, and priorities in the application of guidelines and recommendations to prevent and control health care-associated infections, including the use of active surveillance cultures.
2. The SHEA and the APIC support the continued development, validation and application of efficacious and cost-effective strategies for the prevention of infections caused by MRSA, VRE, and other antimicrobial-resistant and antimicrobial-susceptible pathogens. Health care epidemiologists and infection control and prevention professionals must continue to take the lead in ensuring that an integrated program to prevent infections caused by both antimicrobial-resistant and antimicrobial-susceptible bacteria is implemented at all sites where health care is provided. The optimal program at any institution should be determined through local risk assessment and collaboration among clinicians, laboratorians, and health care administrators.
3. The APIC and the SHEA welcome efforts by health care consumers, together with private, local, state, and federal policy makers, to focus attention on and formulate solutions for the growing problem of antimicrobial resistance and health care-associated infections. Antimicrobial-resistant pathogens

Table 3. Consensus points offered by the Society for Healthcare Epidemiology of America and the Association for Professionals in Infection Control and Epidemiology, Inc., regarding legislation mandating active surveillance cultures to screen hospitalized patients for antimicrobial-resistant pathogens

1. Although reducing the burden of antimicrobial-resistant pathogens, including MRSA and VRE, is of preeminent importance, the APIC and the SHEA do not support legislation to mandate use of active surveillance cultures to screen for MRSA, VRE, or other antimicrobial-resistant pathogens.
2. The SHEA and the APIC support the continued development, validation, and application of efficacious and cost-effective strategies for the prevention of infections caused by MRSA, VRE, and other antimicrobial-resistant and antimicrobial-susceptible pathogens.
3. The APIC and the SHEA welcome efforts by health care consumers, together with private, local, state, and federal policy makers, to focus attention on and formulate solutions for the growing problem of antimicrobial resistance and health care-associated infections.
4. The SHEA and the APIC support ongoing additional research to determine and optimize the appropriateness, utility, feasibility, and cost-effectiveness of using active surveillance cultures to screen both lower-risk and high-risk populations.
5. The APIC and the SHEA support stronger collaboration between state and local public health authorities and institutional infection prevention and control experts.

APIC, Association for Professionals in Infection Control and Epidemiology, Inc.; *SHEA*, Society for Healthcare Epidemiology of America; *MRSA*, methicillin-resistant *Staphylococcus aureus*; *VRE*, vancomycin-resistant enterococci.

pose an ongoing threat comparable with that of all other emerging communicable diseases. For individual patients, the suffering associated with infections caused by antimicrobial-resistant pathogens cannot be overstated; survivors experience sequelae that may persist long after the infection is treated. To serve best our patients, it is incumbent on members of the SHEA and the APIC to provide timely, informed, knowledgeable, and practical guidance to policy makers, as well as the public and the media, so that the issues surrounding antimicrobial resistance can be framed and addressed in the most appropriate and scientifically sound manner possible.

4. The SHEA and the APIC support ongoing additional research to determine and optimize the appropriateness, utility, feasibility, and cost-effectiveness of using active surveillance cultures to screen both lower-risk and high-risk populations. The appropriateness of mandatory performance of active surveillance cultures for both lower-risk as well as high-risk patients can best be ascertained through additional research that not only employs the most appropriate methodology but also specifically anticipates and addresses the many uncertainties and potential unintended consequences of this strategy. Additional funding is required at the federal level to support research so that these critical issues can be addressed.
5. The APIC and the SHEA support stronger collaboration between state and local public health authorities and institutional infection prevention and control experts. This collaboration is needed to ensure that the most appropriate approach to prevent and control antimicrobial resistance is undertaken. This collaboration should be based on transparency and flexibility in adapting to both local needs and the state-of-the-art evidence base. Collaborative programs that engage multiple institutions together with public health experts may supplement these efforts. These relationships, together with existing regulatory bodies, and not legislative mandates, offer the greatest opportunity to ensure that any new prevention and control measure is applied in the most appropriate, consistent, and timely fashion.

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