A Consensus Development Conference Model for Establishing Health Policy for Surveillance and Screening of Antimicrobial-Resistant Organisms

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The Canadian Consensus Development Conference on Surveillance and Screening for Antimicrobial-Resistant Organisms (AROs) was sponsored by the Alberta Ministry of Health to provide evidence to update policies for ARO screening in acute care settings. A rigorous evidence-based literature review completed before the conference concluded that neither universal nor targeted screening of patients was associated with a reduction in hospital-acquired ARO colonization, infection, morbidity, or mortality. Leading international clinicians, scientists, academics, policy makers, and administrators presented current evidence and clinical experience, focusing on whether and how hospitals should screen patients for AROs as part of broader ARO control strategies. An unbiased and independent “jury” with a broad base of expertise from complementary disciplines considered the evidence and released a consensus statement of 22 recommendations. Policy highlights included developing an integrated “One Health” strategy, fully resourcing basic infection control practices, not performing universal screening, and focusing original research to determine what works.

Keywords. surveillance; screening; hospital-acquired infection; antibiotic-resistant organism; health policy.

Antibiotic resistance has increased dramatically over the last 2 decades, and is considered to be one of the most serious global threats to the treatment of infectious diseases [1–6]. In May 2005, the 58th World Health Assembly referred to antimicrobial resistance as a threat to global health security and passed a resolution urging member states “to ensure the development of a coherent, comprehensive and integrated national approach to implementing the strategy for containment of antimicrobial resistance and to monitor regularly the use of antimicrobial agents and the level of antimicrobial resistance in all relevant sectors” [7]. Since then, the escalation in antibiotic resistance has been relentless and unforgiving; in April 2014, the World Health Organization (WHO) released a sobering perspective indicating that a “post-antibiotic era, far from being an apocalyptic fantasy, is instead a very real possibility for the 21st century” [8].

Numerous microorganisms have exhibited increasing rates of resistance to commonly used antimicrobials, including penicillin-resistant Streptococcus pneumoniae (PRSP), methicillin-resistant Staphylococcus aureus (MRSA), vancomycin-resistant enterococci (VRE), multidrug-resistant (MDR) Neisseria gonorrhoeae, MDR Shigella and Salmonella species, extended-spectrum β-lactamase (ESBL)–producing MDR enteric gram-negative bacilli, and carbapenemase-producing Enterobacteriaceae (CRE). Recent reports document their global dissemination [8, 9]. Some of these organisms, such as PRSP, MDR Shigella and Salmonella, and certain ESBL–producing gram-negative organisms, are more common in the community setting, whereas MRSA and VRE have traditionally been associated with patients in healthcare facilities. However, community-
livestock-associated MRSA strains emerging from within the community setting are now becoming more prevalent globally [10–17].

Most recently, virtually untreatable extensively drug-resistant microbes including New Delhi metallo-β-lactamase (NDM)-containing Enterobacteriaceae [18–20] and extensively drug-resistant N. gonorrhoeae have emerged [21, 22]. Since the original description and designation of NDM-1 in Sweden in 2009 [23] and the description of intercontinental spread between the Indian subcontinent and the United Kingdom in 2010 [24], isolates containing the NDM-1 gene have been described in multiple countries from virtually all continents, and 8 NDM variants (NDM-1 through -8) have now been described [20].

The nosocomial transmission of AROs such as MRSA, VRE, and MDR gram-negative bacilli within the hospital setting has been a concern for decades but assumes new urgency with the arrival of CRE. The province of Alberta is no exception and has experienced outbreaks of MRSA, VRE, and recently, CRE. Controlling nosocomial transmission of AROs is hampered by both the absence of evidence and conflicting evidence within the published literature to guide clinical and policy choices, resulting in wide variation of approaches to ARO control within the acute care setting [25]. Unfortunately, controlling the transmission of AROs in the acute care hospital setting, especially in the hyperendemic or outbreak setting, is often not evidence-based and is a recognized weakness within the discipline of healthcare epidemiology [26, 27]. One author described outbreak control as the “kitchen sink” approach [28] in which multiple interventions covering every possible risk are used and, although successful, never allow the isolation of the relative contributions of each intervention.

Policies for ARO control in healthcare settings in Alberta, Canada, including screening, are established by the provincial Ministry of Health (MoH) and implemented by the province’s publicly funded health service delivery system, a process that is likely replicated in many healthcare jurisdictions globally. The MoH, in consultation with infection prevention and control (IPC) professionals, determined that existing policies for ARO screening in acute care required updating, and a process was sought to determine how to best address health policy in this regard.

THE CONSENSUS DEVELOPMENT CONFERENCE APPROACH TO ESTABLISHING HEALTH POLICY

The MoH engaged stakeholders, including clinicians and infection control practitioners, to help inform a new approach to ARO screening and control policies. For purposes of these policies, AROs were defined as microorganisms that are no longer susceptible to the drugs or drug combinations normally used against the infections they cause. A detailed literature analysis, including a systematic review, and a benchmarking survey of current practices in different jurisdictions were deemed important but not adequate to guide new policy development, due to a lack of studies focused specifically on the contribution of screening to existing ARO control strategies. To enable a sampling of a broad range of relevant experience, direct consultation with leading IPC experts and clinicians from within Canada and other countries was thought to be beneficial in guiding policy development.

The MoH had prior experience with a conference format used by the Institute of Health Economics (IHE) based in Edmonton, Alberta, which had been adapted from the US National Institutes of Health (NIH) Consensus Development Program [29]. This program was developed in 1977 by the Office of Disease Prevention with an objective to “produce unbiased, evidence-based assessments of controversial medical issues important to researchers, healthcare providers, policymakers, patients, and the general public” [29]. More than 160 consensus statements have been produced, and the process has served as a model for similar programs in other countries. The Program was retired in 2013 by the Office of Disease Prevention, given that many other organizations and agencies have taken on the role to provide evidence-based reviews.

The IHE had adapted the NIH Consensus Development Conference model as part of its Knowledge Transfer Program, which is considered unique in the healthcare field in Canada [30]. The key elements of the adapted model, outlined in detail in Table 1, include the “jury” trial format, an evidence-based synthesis of the literature, the program of speakers addressing key issues, and the final consensus statement of the jury. The Canadian format uses a flexible organizational structure with a focus on broad policy issues, as well as clinical and scientific questions. The format is deliberative, bringing together experts and policy makers to make recommendations that integrate scientific evidence into policy and practice. Consensus statements and other materials from previous conferences are available from the IHE website (http://www.ihe.ca/research/knowledge-transfer-initiatives/-consensus-development-conference-program/).

ESTABLISHING HEALTH POLICY FOR SURVEILLANCE AND SCREENING OF ANTIMICROBIAL-RESISTANT ORGANISMS

An evidence-based review of the literature pertaining to the effectiveness of screening for preventing or reducing the transmission of AROs was conducted as an initial step. The review of the literature was performed by a team of experienced information specialists and reviewers within the IHE and included searches in Medline, Embase, Cumulative Index to Nursing
and Allied Health Literature, Cochrane Database of Systematic Reviews, Centre for Reviews and Dissemination Databases, and Web of Science for primary studies published between 2003 and February 2014 and for systematic reviews and guidelines published to February 2014 [31]. Multiple “gray literature” searches were conducted, and reference lists of published reports were also checked. Titles and abstracts were screened and relevant articles retrieved to determine eligibility for inclusion based on explicit criteria. The primary studies that were not included in the published systematic reviews (either due to publication timing or the absence of a specific organism within the systematic review) included comparative study designs (randomized or nonrandomized controlled trials), cohort or case-control designs, single-group before-and-after designs, and a review of any evidence-based guidelines [31]. The following research questions were posed using the PICOS (population, intervention, comparator, outcome, setting) format: (1) What are the clinical effects of a universal screening strategy for ARO carriage compared with no screening; (2) what are the clinical effects of a universal screening strategy for ARO carriage compared with targeted screening (screening of selected patient populations); and (3) what are the clinical effects of targeted screening for intensive care unit patients, surgical patients, and other high-risk patients (eg, patients on hemodialysis, transferred patients) compared with no screening?

The literature review was current to February 2014 and used rigorous quality assessment tools. The review concluded that ARO infections can have a serious impact on patients and hospital staffing resources and that the costs and resources required for effective prevention and control of endemic AROs are significant. Despite much research having been conducted on hospital-acquired ARO IPC, there was little high-quality evidence that screening of patients, whether universal or targeted, or related to any specific organism, was associated with reduction in hospital-acquired ARO incidence, infection, mortality, or morbidity in endemic settings. Results of a primary study from a single, large randomized controlled trial published subsequent to the dates of any of the systematic reviews suggested that universal approaches to endemic infection control may be more effective than approaches that aim to target MRSA alone [32]. Despite the levels of evidence available, many current clinical practice guidelines recommend that admission screening of high-risk patients be conducted for MRSA, VRE, and CRE. No guidelines currently recommend screening for ESBL-producing organisms. Given the current lack of reliable research evidence to guide decisions regarding screening, the review recommended that future research should focus on conducting well-designed, prospective studies that can disentangle the relative contributions of the various measures and approaches used in hospital-acquired ARO IPC.

The program, which consisted of a series of questions on key issues (Table 2) to be examined by expert presenters, was created by a Scientific Committee, chaired by senior Alberta IPC leaders (A. M. J., G. T., J. C.), and included MoH leadership and senior clinical leaders from the Public Health Agency of Canada, the Centers for Disease Control and Prevention, the Pan American Health Organization, and WHO. To underscore the national and international scope of the conference, the Scientific Committee sought and received the support of relevant national agencies as nonfinancial scientific sponsors including the following: Public Health Agency of Canada, Canadian Institutes of Health Research, Canadian Patient Safety Institute, and Accreditation Canada. Other than the initial mandate to IHE to organize the conference and the input of the Deputy Chief Medical Officer of Health as a member of the Scientific Committee, the MoH was not involved in setting the agenda for the conference, the choice of speakers, or the content to be presented.

The Scientific Committee invited senior clinical and public health leaders, academics, and scientists from across North

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**Table 1. Key Elements of the Institute of Health Economics Consensus Development Conference Model**

1. **“Jury trial” format**
   - The content of the conference is a series of presentations by leading experts, to a jury or panel of approximately 1 dozen members, in front of an audience of conference delegates. All presentations are “plenary” sessions in a single main hall with no concurrent sessions, posters, or abstract presentations.

2. **Evidence synthesis**
   - A systematic review or other synthesis is completed prior to the conference and provided to jury members in advance.

3. **Program (questions)**
   - The program is a series of questions setting out the key issues to be examined at the conference. There are typically 5–8 main questions, divided into 20–25 subquestions, which are the topics addressed by the expert presenters. The program affords jury members and delegates opportunities to seek clarifications and pose questions of the expert speakers.
   - The program duration is 2.5 d. Day 1 is a full day of expert presentations. Day 2 can be the same, or divided between presentations and a “town hall” session, where delegates and jury members can have an open discussion with all the experts who are present. Day 3 is a half-day, beginning with the reading aloud of the draft Consensus Statement by the jury chair, followed by comments and discussion, and then the release of the final statement.

4. **Consensus statement**
   - The main output of the conference is the jury’s summary of the evidence and their recommendations, in the form of answers to the conference questions. The statement is intended to guide policy; it is not a clinical practice guideline and has no legal force. The jury writes the statement in the evenings following the 2 days of presentations. The chair reads the draft statement aloud to the conference on day 3, and it is then finalized and released/published. Maximum length is 30 min reading time, typically about 3000 words.

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Source: Adapted from the Office of Disease Prevention, National Institutes of Health [29, 30].

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HEALTHCARE EPIDEMIOLOGY
As articulated by the Chief Medical Officer of Health of Alberta in his opening remarks, the goals of the province in sponsoring this consensus conference were 2-fold: to fund a high-quality review of the evidence while seeking the advice of leading experts and to support a provincial approach to ARO screening, standardized to the extent possible across all hospitals in the province according to the best available evidence. A centerpiece of the program (http://www.ihe.ca/research/knowledge-transfer-initiatives/consensus-development-conference-program/surveillance-and-screening-for-aros-2014/presentations-10/) was a debate titled “Should We Screen for AROs? Pro vs Con.” The debate, taken together with the evidence-based review of the literature pertaining to the effectiveness of screening, supported the conclusion that the current evidence cannot favor a single answer to the question.

The state of the evidence reflected in the jury’s recommendations, provided in Table 3, focused on 2 points. First, the jury called on hospitals to “pursue relentlessly and fully resource” basic infection control practices including hand hygiene, environmental cleaning, antimicrobial stewardship, and implementation of routine/standard practices in hospitals as components of an ARO control program and did not make a recommendation for screening other than for high-risk populations based on local concerns. The jury acknowledged that the available evidence does not support a recommendation that hospitals implement “horizontal measures” alone, but strongly endorsed their vigorous implementation. Second, the jury focused on the need for research to create a far more robust evidence base for clinical and policy choices on screening and on ARO control in general, and called on the MoH to allocate research funds to this purpose.

**DISCUSSION**

Recommendations of the jury are currently under review by the MoH. Although final outcomes are not yet known, we are confident that the literature review and consensus process will be incorporated into emerging health policy regarding the need for screening as a component of an ARO control strategy in the acute care setting. Given the attendance by individuals representing multiple other provincial ministries and the Public Health Agency of Canada, we further anticipate that the recommendations will be reviewed and scrutinized by policy makers both provincially and federally and will be used to formulate policy in other jurisdictions. ARO screening is a policy with significant implications from the human resource, patient safety, and fiscal perspectives.

There has been a move over the past 2 decades toward evidence-based health policy decision making [33]. Policy makers within governments and other organizations are placing much greater attention on the peer-reviewed literature, its synthesis

Table 2. Questions Posed to the Presenters and the Jury for Consideration for the Canadian Development Consensus Conference

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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</thead>
<tbody>
<tr>
<td>What is appropriate screening for AROs in various settings?</td>
<td>Should we screen for AROs?</td>
</tr>
<tr>
<td>How should screening link to surveillance?</td>
<td>What is the economic cost/benefit of screening?</td>
</tr>
<tr>
<td>What are the impacts of screening on patients and others?</td>
<td>Can screening do harm?</td>
</tr>
<tr>
<td>What responsibility do patients, the public, and healthcare professionals have to ensure responsible stewardship of antimicrobials and other healthcare resources?</td>
<td>What are the barriers to effective research, and what strategies can address them?</td>
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Abbreviation: ARO, antimicrobial-resistant organism.

America and Europe as expert presenters to ensure that a broad-based perspective was captured. The core program of the conference consisted of 24 presentations of 15–20 minutes each, over 2 days. Presenters were asked to dispense with the usual prefaces and descriptions of research teams and programs and to clearly focus on the evidence from their perspective to help the jury answer a specific question. The result was a series of high-quality, concentrated presentations. The complete listing of presenters and their biographies is available at http://www.ihe.ca/research/knowledge-transfer-initiatives/consensus-development-conference-program/surveillance-and-screening-for-aros-2014/speakers-10/, and complete videos of all presentations are available at http://www.ihe.ca/research/knowledge-transfer-initiatives/consensus-development-conference-program/surveillance-and-screening-for-aros-2014/presentations-10/.

The jury consisted of 11 members with expertise in clinical care, academia, healthcare administration, health policy, media relations, public health, patient safety, epidemiology, health security, and front-line IPC. (A detailed listing of jury members with their backgrounds and expertise is available at http://www.ihe.ca/research/knowledge-transfer-initiatives/consensus-development-conference-program/surveillance-and-screening-for-aros-2014/jury-members-10/.)
and interpretation, and the quality of the levels of evidence. With the advent of the Grading of Recommendations Assessment, Development and Evaluation methodology with its focus on levels of quality of evidence and transparency, taking into account system-level preferences [34–36], there has been a substantial move by policy makers within government to a more explicit process, reflecting a “population-policy rather than individual-clinical level decision-making” [33]. Although the use of evidence-based decision making in infectious and communicable diseases has improved within the past few years, the hospital epidemiology area remains hampered by a lack of high-quality evidence [26, 27]. A report from the Centers for Disease Control and Prevention in 2005 that assessed the evidence for the effectiveness of their population-based interventions pertaining to 31 major causes of disease, injury, and disability found that only 4.4% (31/704) of modifiable risk factors had an evidence base that included a measure of the expected effect of these interventions [37]. With a relative dearth of evidence-based policies in infectious and communicable diseases, the European Centre for Disease Control in 2011 published a document highlighting the deficiencies in this area and provided a new context to provide evidence-based methodology for preventing and controlling infectious diseases [38].

In addition to evidence, policy makers often grapple with very complex environments in which to make decisions, and the environment and setting may play an equally important role as just assessing the evidence [39]. This latter component, the context in which the decisions are made, may reflect differences in what appear to be diametrically opposed approaches, both of which have measures of success. For example, the
Dutch “search and destroy” method for reducing MRSA transmission within the acute care setting [40, 41], an example of a vertical control measure that uses screening and decolonization in conjunction with other measures, has been reported as a successful policy within the context of their low-endemicity hospital MRSA setting and healthcare system with significant hospital capacity, but is an approach that may not be easily transferable to another healthcare system. Similarly, the use of more broad-based horizontal approaches, with specific emphasis on general infection control measures but without the use of screening, has also been reported as successful in reducing MRSA in the United States and Europe [25, 32, 42, 43], but in the context of a different setting and healthcare delivery model. A new approach being taken by some policy makers is the “whole-of-government” approach and has been used in Australia, the United Kingdom, and Canada. Multiple ministries and agencies within government, and sometimes relevant nongovernmental organizations, collaborate toward a common objective; this approach is often referred to as an intersectoral management process [44]. This latter approach is one that may be very beneficial to many of the policies that are relevant for infectious diseases and that are almost always complex with respect to the application of interventions, with the primary exemplars being antimicrobial resistance, surveillance, and screening and immunization.

The adapted Consensus Development Conference model described above has considerable merit as a compact format for development of health policy strategies in environments where robust medical evidence is either lacking or conflicting, exemplified by the consideration of policy for ARO screening in the acute care setting. The process engaged an evidence-based approach with respect to the core question about the effectiveness of screening for AROs in hospital settings and allowed identification of conflicting interpretations of the existing evidence while identifying current research gaps. The use of a broad consultation with open debate between local and international experts allowed for a diverse intersection of perspectives and allowed conference participants and the jury to fully appreciate the complex environment or “context” in which policy makers would find themselves in making decisions in this area. With individual participants from multiple levels of government as well as international jurisdictions, it also allowed for an intersectoral consideration of the pertinent issues. The sequestered “jury” deliberation process is both independent and unbiased, which adds to the merit of the approach.

In summary, the Canadian Consensus Development Conference on Surveillance and Screening for AROs held in Calgary, Alberta, in June 2014, sponsored by the MoH, met the goals of the planning and scientific committee by informing a consensus that is relevant for health policy in this area and that is being incorporated into revised strategies for ARO control in the province. A comprehensive list of general recommendations were made that highlighted the need to implement and evaluate an integrated “One Health” strategy, to minimize the misuse of antibiotics in animals and humans, to establish comprehensive ARO surveillance along the European Antimicrobial Resistance Surveillance Network model, to pursue relentlessly and fully resource hand hygiene, environmental cleaning, antimicrobial stewardship, and routine practices in hospitals, and to focus on original research to assess what components work best to control AROs in acute care.

Notes

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