State of Childhood Asthma and Future Directions Conference: Overview and Commentary

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ABSTRACT

The Merck Childhood Asthma Network, Inc conference titled “State of Childhood Asthma and Future Directions: Strategies for Implementing Best Practices” was held December 13 to 14, 2006. Here we summarize the presentations and recommendations for systems approaches from that conference and discuss current asthma care.

The articles in this supplement summarize the presentations and recommendations made at the Merck Childhood Asthma Network, Inc conference titled “State of Childhood Asthma and Future Directions: Strategies for Implementing Best Practices,” which was held December 13–14, 2006, in Washington DC. In addition, they explore the multidimensional array of issues related to asthma causes, epidemiological features, and care, as well as highlighting a series of new and missed opportunities to improve the quality of life for children with asthma. As we discuss, our current system for treating childhood asthma can be aptly described by the adage, “the system is perfectly designed to get the results that it does.” We conclude that improving asthma outcomes for children requires taking a more systematic approach that includes implementation of evidence-based, high-quality care. Given the prevalence of childhood asthma and its associated burden, implementing a systems approach to preventing the disease and improving outcomes for children with asthma ought to be a national priority. To start, we need to consider what the system would comprise.

SYSTEMS APPROACH TO DISEASE PREVENTION

Any serious attempt at system change begins with measurement, which suggests that we need a reliable surveillance mechanism that can measure asthma incidence and prevalence and identify geographic and population-level patterns (“outbreaks”) or increases in morbidity in an actionable time frame. Such data need to be collected and evaluated not only on a national scale but also for individual states and communities, because many of the factors that are related to asthma outcomes can be influenced by local action. Although funding from the Centers for Disease Control and Prevention to develop and to implement multiple local surveillance efforts1 is a step in the right direction, significant additional funding is necessary to develop a comprehensive public health approach that can achieve positive effects. Since 2001, the United States has made significant investments in surveillance systems for bioterrorism agents and pandemic influenza. Many of these systems use emergency department and inpatient claims data or school absenteeism data; the fact that these data sources are not also used to monitor asthma morbidity is a missed opportunity for asthma surveillance.

In 1999, the Centers for Disease Control and Prevention undertook an initiative to monitor and to control childhood asthma. The resulting surveillance data came from a combination of survey and hospital discharge data. If expanded and made more timely, these data could be suitable for monitoring progress in asthma prevention and management. As is evident from the recent data releases from the Centers for Disease Control and Prevention,2 the substantial time lag in the release of data makes it difficult for communities that have implemented important policies to know whether their policies are effective and whether changes in the health care environment are having a positive impact. The current measurement system does not enable communities to implement remedial actions that address current problems and population-level outbreaks.

SYSTEMS CHANGES IN ASTHMA MANAGEMENT AND ACCESS TO CARE

Clinical studies suggest that we know how to manage asthma and to improve outcomes for children with this disease, including using antiinflammatory agents in the treatment of persistent asthma. However, preventing acute exacerbations is an important challenge.3 Martinez3 suggests that additional studies and new approaches are needed to address the “heterogeneity of asthma exacerbations” in children. We also know that many of the necessary elements...
of health care are not delivered consistently and that there are significant disparities in health care based on patients’ insurance status, income, and race/ethnicity. By some reports, up to 55% of children with asthma do not receive the recommended elements of care. Even in managed-care organizations, which presumably offer uniform access to care, there are documented disparities in access, asthma outcomes (numbers of hospitalizations and emergency department visits), and quality care indicators (referral to a specialist and use of antiinflammatory agents where indicated). Although the structural aspects of the health care system make only a modest contribution to health outcomes overall, several components of the delivery system, such as having health insurance and a usual source of care, have been associated with better asthma outcomes.

**SYSTEMS CHANGES TO ADDRESS ASTHMA AS A MULTIFACTORIAL DISEASE**

Although most of our efforts have focused on therapeutic approaches and on the delivery of care, we need to understand that what affects childhood asthma goes beyond the health care system. The pathogenesis of asthma is multifactorial, involving a complex interaction of genetic, environmental, and social forces. As Schwartz\(^\text{12}\) notes, “asthma is inherited as a complex trait and results from the interaction of multiple genes.” Although certain gene combinations may predispose a child to asthma, their expression may be modified by external factors. These factors include well-known environmental triggers, such as naturally occurring indoor and outdoor allergens; airborne particulate matter, such as that found in environmental tobacco smoke and diesel fumes; and social and socioeconomic stressors. Although the current approach to describing the relationship of genetic and environmental factors is informative, it is clear that the development of new genomic technologies and improved personalized exposure studies to identify specific biomarkers are needed for a better understanding of the pathogenesis of asthma.\(^{12}\) Because we cannot change a child’s genetic constitution, a systems approach must address the interactions of these genetic, socioeconomic, and environmental factors.

As Williams\(^\text{13}\) notes, addressing factors external to the health care system is critical to creating a system that can truly mitigate childhood asthma. Evidence suggests that factors external to both the delivery system and the physical environment may play an important role in addressing some of the socioeconomic reasons for disparities in care. The rate of childhood poverty in the United States is 16%, and large numbers of children, particularly black and Hispanic children, live in high-poverty, “low-opportunity” communities.\(^{14}\) It will likely be impossible to eliminate the racial/ethnic disparities in asthma outcomes until the distribution of opportunity is more equitable.

With respect to environmental triggers, there are opportunities for progress. To date, the major factors identified in this area include indoor allergens associated with dust mites, cockroaches, mice, animal dander, and mold; environmental tobacco smoke; and particulate matter (both indoor and outdoor). Gilliland\(^\text{15}\) notes the adverse effects of local traffic emissions and combustion products on asthma symptoms of children living in communities where pollution levels are high. The risks of engaging in outdoor activities or living near heavily polluted roadways are associated with the development of asthma in childhood and subsequently diminished lung function. In addition, as Eggleston\(^\text{16}\) notes, children with asthma come into contact with bioactive pollutants and allergens simultaneously. He indicates that many of these small-molecule pollutants likely serve as adjuvants to magnify the immunoglobulin E-mediated inflammation that is characteristic of asthma in children. Gilliland\(^\text{15}\) presents convincing data that, in addition to improvements through reductions in exposure to polluted air, asthma symptoms may be improved through induction of enzymatic antioxidant defenses to pollutants through dietary means.

**SYSTEMS CHANGES THROUGH IMPLEMENTATION OF PROVEN ASTHMA INTERVENTIONS**

There are complex, bidirectional, causal relationships for many of the factors identified with asthma. For example, asthma morbidity can negatively influence the psychosocial environment of both the child with asthma and the family, and this can decrease the effectiveness of the child’s asthma management, leading to increased asthma morbidity.\(^{17}\) As Eggleston\(^\text{16}\) points out, the effects of allergen exposures can be accentuated by environmental pollution or viral infections. Additional complexity results from the fact that not all of these factors interact in the same way for all children. Clark et al\(^\text{18}\) describe the importance of determining individual risks and tailoring interventions for individuals with asthma, as well as designing community-level interventions that take into account both the physical and social environments. They point out that interventions are most effective when they address the needs of the individual and the family as well as the community.

Although vast sums have been spent developing and evaluating the efficacy and impact of asthma interventions ranging from pharmacologic to behavioral, results from the various interventions cannot be readily compared, as demonstrated by Mattke et al,\(^\text{19}\) because there is no standardized set of measures for asthma outcomes. The lack of a standardized set of measures not only prevents us from comparing data across studies but also inhibits our ability to measure the effectiveness of interventions as we attempt to integrate evidence-based (“proven”) interventions into health care systems and communities.

Articles in this supplement suggest that the health care system knows what to do to address asthma outcomes; the real question is how to do it. More in-depth research is needed on the “translation” and implementation of evidence-based interventions, particularly in populations and communities with high asthma morbidity rates. Practical reliable methods for rigorously evaluating both the effectiveness of and the business case for implementing such interventions in health care settings and communities are lacking. Both the relatively slow
development of methods for implementation research and the complexity of identifying appropriate metrics are significant impediments to the advancement of implementation studies. Although basic and clinical asthma research has far outpaced translational and implementation research, rigorous research is needed for better understanding of the biological, social, ecological, and economic factors that affect successful implementation of evidence-based interventions, especially in populations facing social constraints and health threats.20

**SYSTEMS CHANGES TO PROMOTE AND TO PROVIDE QUALITY CARE**

The challenge of translational and implementation research is to enhance the quality of basic and clinical investigations so that research findings can be translated into improved health care. As James and Rosenbaum21 point out, childhood asthma provides an excellent model for tying quality of care to performance measurement and professional compensation, as we attempt to close the gap between what is known about quality asthma care and what is actually done. They suggest that, with the appropriate quality measures, incentivized compensation can play a significant role in ameliorating the disparities in childhood asthma outcomes noted for minority and low-income families. Incentives should support what is known, that is, guideline-driven, evidence-based care. Gupta and Weiss22 point out that, because good care is well defined, a systems change requires incentives and structures to support the provision of guideline-consistent, evidence-based care.

**CONCLUSIONS**

All of these considerations from the articles developed after the Merck Childhood Asthma Network, Inc conference, as well as the primary recommendations made at the conference (Table 1), lead to clear overall recommendations for systems changes. First, the systems for asthma surveillance need to be expanded to support communities in monitoring asthma morbidity and mortality rates, implementing appropriate remediation in a timely manner, and monitoring the effects of those actions. The surveillance expansion should be tied to ongoing developments in health information technology. Second, health care system factors related to access to quality asthma care must be addressed. Although many think that having health insurance should be a matter of individual choice, children cannot make that choice. Although providing coverage for all children would at least eliminate lack of insurance as a cause of asthma disparities, ensuring access to quality care and increasing children's access to medical homes would likely reduce the morbidity of asthma in children, especially those who are medically underserved. Third, there is a need for continuing and intensifying research on the multifactorial pathogenesis of asthma, including genetic, psychosocial, and environmental factors. To implement our research findings at the individual/family and community levels, translational and implementation initiatives are needed. Furthermore, methods to evaluate the effectiveness of these initiatives are needed. The implementation of culturally appropriate initiatives is likely to make significant changes in the social, economic, and

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**TABLE 1 Priority Recommendations From the State of Childhood Asthma and Future Directions Conference**

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<th>I. Expand asthma surveillance to support community monitoring</th>
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<td>Develop a national network for local, real-time, asthma surveillance to gather, to evaluate, and to disseminate timely information (eg, incidence, prevalence, cost, morbidity and mortality rates, socioeconomic status, and ethnicity) to key community audiences (ie, policymakers, public health officials, health care professionals, researchers, communities, and families of children with asthma)</td>
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<td>Develop data sources that link local and national surveillance efforts</td>
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<th>II. Enhance access to quality asthma care</th>
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<td>Reposition childhood asthma as an urgent public health priority in the United States</td>
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<td>Galvanize a national children's asthma movement linked directly to local community-based organizations and coalitions, focusing on key policy issues and barriers to care</td>
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<td>Promote implementation of the National Asthma Education and Prevention Program clinical guidelines</td>
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<td>Collect data on the cost-effectiveness and return on investment of quality initiatives/best practices</td>
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<td>Establish a repository and promote best practices, especially practices that are currently or potentially reimbursed by Medicaid and the State Children's Health Insurance Program, to ensure that those who are most in need have access to quality care</td>
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<td>Convince leaders, including public and private health insurers, managed-care organizations, hospitals, and community-based organizations, to invest resources in evidence-based community and individual interventions</td>
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<th>III. Continue and intensify research on the multifactorial pathogenesis of asthma</th>
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<td>Encourage federal agencies to develop a coordinated asthma research strategy that includes standardization of definitions and outcome measures that are clinically based, genetically based, and exposure-based</td>
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<td>Investigate patient-specific treatment regimens to achieve asthma control</td>
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<td>Investigate the role of epigenetic factors in asthma and gene-environment interactions</td>
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<td>Investigate the roles of psychosocial variables and social determinants as important risk factors for asthma in children</td>
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<td>Promote implementation research to equip the asthma care team with environmental, educational, counseling, and case management tools</td>
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<td>Continue investigations that promote a multilevel approach, addressing community-based, home-based, and individual asthma risks</td>
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<td>Promote research in multifactorial interventions that can be tailored to individualized and situation-specific risks</td>
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<th>IV. Promote incentives and dissemination models for high-quality health care that are grounded in evidence-based medicine</th>
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<td>Implement known effective strategies that incentivize health care providers and improve access to and quality of care</td>
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physical environments that are needed to optimize children’s living conditions and their ability to develop into healthy adults. Finally, incentives and dissemination models that promote best practices are needed to promote high-quality health care that is grounded in evidence-based medicine.

REFERENCES
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