Pediatric Neurology 52 (2015) 290–301

Contents lists available at ScienceDirect

Pediatric Neurology

journal homepage: www.elsevier.com/locate/pnu

Topical Review

Child Neurology Practice Guidelines: Past, Present, and Future

Benjamin A. Hurwitz MS [a], **Kathleen Bretzius Hurwitz MD** [b], **Stephen Ashwal MD** [c,*]

[a] *Sackler School of Medicine, Tel Aviv, Israel*
[b] *Pediatric Private Practice, Murrieta, California*
[c] *Department of Pediatrics, Loma Linda University School of Medicine, Loma Linda, California*

ABSTRACT

BACKGROUND: Practice guidelines have been developed in child neurology during the last fifteen years to address important clinical questions and provide evidence-based recommendations for patient care. **METHODS:** This review describes the guideline development process and how it has evolved to meet the needs of child neurologists. **RESULTS:** Several current child neurology guidelines are reviewed and the advantages and disadvantages of guidelines, as well as the legal consequences of using them to determine a standard of care are discussed. The future of guidelines and of their influence on integrated support systems also is considered. **CONCLUSIONS:** Child neurology practice guidelines are a helpful resource for clinicians, families and institutions as they provide evidence-based recommendations concerning the diagnosis and management of common neurological conditions affecting children. Incorporating consensus processes has allowed expansion of clinically relevant recommendations that has increased the utility of guidelines.

Keywords: child neurology, consensus statements, evidence-based literature, practice guidelines

Pediatr Neurol 2015; 52: 290-301

Medical guidelines can be traced to ancient Egypt and are known to have been recorded as early as 1600 B.C.E. in a document titled the *Edwin Smith Papyrus*.[1-4] This work contained case histories that were recorded as having outcomes classified as *favorable*, *uncertain*, or *nonfavorable*.[4] The later Hippocratic writings (400-500 B.C.E.) categorized diseases as acute, chronic, or endemic and included deliberate discussions of outcomes. During the Renaissance (1300-1600 A.D.), *Materia Medica* and *Pharmacopoeia* were printed and contained collective works on therapeutic substances used for healing.[5,6] In 1789, the British surgeon, Samuel Sharp, wrote a treatise on preferred surgical techniques and hinted at the concept of "best practices."[7] During the American Civil War, John Billings began analyzing medical data and looking for patterns of illness related to demographic data. He built what would become the National Library of Medicine.[8,9] In 1948, the World Health Organization was founded and developed organized written response protocols to epidemics.[10]

Early medical guidelines were based on a number of faulty criteria including superstition, religious belief, prevailing political thought, tradition, and real or perceived authority.[11,12] The late nineteenth and early twentieth centuries saw anecdotal information, physician's beliefs, and academic publications combined into consensus statements and best practice concepts.[13] More modern methods of data collection and statistical analysis led to clinical trials that became the basis for the paradigm of evidence-based medicine (EBM). Incorporation of EBM into clinical practice has grown along with the development of online, searchable databases as individual providers and groups of providers are increasingly able to find relevant clinical evidence. EBM serves as the backbone of contemporary clinical practice guidelines.

Unprecedented advances in technology in the 1980s made modern guidelines possible. The explosion of data from basic science research and clinical trials made it nearly impossible for individual practitioners to stay abreast of the results and to interpret their clinical significance. Physicians from various medical specialties developed targeted guidelines in an effort to improve the quality and

Article History:
Received September 1, 2014; Accepted in final form November 18, 2014
* Communication should be addressed to: Dr. Ashwal; Department of Pediatrics; Division of Child Neurology; Loma Linda University School of Medicine; 11175 Campus Street; Loma Linda; CA 92350.
E-mail address: sashwal@llu.edu

0887-8994/$ - see front matter © 2015 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.pediatrneurol.2014.11.010

uniformity of patient care.[14] Concurrently, politicians and insurance companies began using guidelines to try to limit physician choice and slow the steadily increasing cost of medical care.[15] Physicians, wishing to maintain their autonomy, realized that it was in their interest to create guidelines before others usurped that authority.[16]

Development of practice guidelines in child neurology

The evidenced-based development processes used for virtually all published guidelines from the fields of adult and pediatric neurology are comprehensively delineated in the 2004 and 2011 American Academy of Neurology (AAN) process manuals.[17-19] As described in these manuals, guidelines can be related to screening, diagnosis, causation, prognosis, and treatment. *Screening* guidelines relate to the diagnostic yield of the use of a test of established accuracy to screen for disease in a population. Perhaps the most common types of guidelines in this area are those related to universal newborn screening for certain inborn errors of metabolism. One such guideline discusses the yield of metabolic testing for inborn errors of metabolism in children with global developmental delay.[20] Another example is the guideline comparing the diagnostic yield of computed tomography versus magnetic resonance imaging for identifying a specific etiology in children with cerebral palsy.[21]

Guidelines related to *diagnostic accuracy* examine whether a specific test or procedure can detect a disease process. An example of a diagnostic guideline can be found in the AAN guideline on sports concussion.[22] This guideline evaluated whether any diagnostic tools (standardized scoring symptom checklists, paper/pencil and computer neuropsychological assessments, tests of balance/gait, and so on) were useful in identifying individuals with a sports-related concussion as compared with the reference standard of a clinical diagnosis. Another example is that of the various genetic tests available for determining the etiology of different neurodevelopmental disabilities. Just by the nature of the increased sensitivity of newer genetic tests in examining smaller DNA sequences, it has been shown that whole exome or genome sequencing can detect a greater number of genetic variants than microarray testing, and both tests are more sensitive that traditional karyotyping. Thus, a hierarchy of diagnostic sensitivity could potentially be established and were this applied to a population of patients with specific types of neurodevelopmental disabilities, one could then undertake population screening to see which test had the greatest diagnostic yield. Such data could be used to develop a screening guideline, and it is likely that within the next 5 years, there will be sufficient evidence to make evidence-based recommendations on this topic.[23]

Guidelines related to *causation* examine whether specific exposures cause a disease. If such a relationship is found, it is implied that avoidance of the exposure would reduce the risk of the disease (AAN Process Manual, 2011). One such guideline examined the link between exposure to lead and intellectual disability.[20] An example from adult neurology examined the link between nonvalvular atrial fibrillation and cryptogenic stroke.[24]

The fourth type of question that can be addressed by a guideline relates to *prognosis* and asks whether specific tests improve a physician's ability to predict the outcome of a disease. An example of this in child neurology would be the use of specific magnetic resonance imaging or spectroscopy findings to determine the risk of long-term disabilities in a neonate who had hypoxic ischemic brain injury or in an older child who suffered an out-of-hospital cardiac arrest from a submersion injury. Systematic reviews of this topic are available for adult patients,[25] but not for children, nor have any guidelines on this topic been published in either adults or children.

Guidelines related to *treatment* are those most commonly developed. For such guidelines, one or more treatments for a specific disease are compared to one another or to placebo. In child neurology, the most common treatment guidelines are those in the field of pediatric epilepsy, cerebral palsy, Duchenne muscular dystrophy, and recurrent headache.[17]

The guideline process is now moving toward incorporating consensus statements into evidence-based recommendations to form the basis for clinical recommendations. Because the AAN guidelines process manual is integral to the development of most child neurology evidence-based guidelines, it will be reviewed first. Then, the process of using combined evidence- and consensus-based guidelines will be discussed. Examples of selected child neurology guidelines by this evidenced-based process can be found in Appendix 1.

The AAN has recently integrated several committees to form *The Guideline Development, Dissemination, and Implementation (GDDI) Subcommittee,* reflecting the realization that the ability to disseminate guidelines and to use quality improvement measures to assess whether guidelines effect changes in clinical practice is of equal if nor greater importance than the development of the guidelines themselves. GDDI subcommittee members review proposals for possible guidelines and carefully select topics based on their potential value for neurologists and their patients. Topics may be broad in scope (e.g., evaluation of the child with autism, treatment of adult dementia) or narrow (e.g., use of immunotherapy for Bell's palsy). An author panel works together with a GDDI subcommittee member (facilitator) to refine the topic into one or more specific clinical questions to be addressed, perform an evidence-based systematic literature review, and, if possible, make clinical recommendations. Literature is evaluated for risk of bias, evidenced is synthesized, and conclusions drawn and then recommendations are ranked according to the strength of the evidence.

Posing the question

Guidelines are developed to address specific therapeutic, diagnostic, or prognostic questions. To make questions as clear and specific as possible, the AAN uses a format with four components known by their acronym PICO.[19]

1. **P**opulation: The type of patient involved
2. **I**ntervention: The exposure of interest
3. **C**omparison: Comparison intervention or patient population to be compared
4. **O**utcome: The outcome to be addressed