

Current Use of Evidence-Based Medicine in Pediatric Spine Surgery

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KEYWORDS

• Evidence-based medicine • Scoliosis • Spondylolysis • Pediatrics • Early onset scoliosis

KEY POINTS

- Low-quality data make the use of evidence-based medicine in decisions on scoliosis natural history, treatment, and outcomes difficult.
- Decisions regarding nonoperative management of scoliosis have been investigated using evidence-based medicine, and these studies have shown brace use is successful at controlling spinal deformities.
- The natural history, imaging, treatment, and outcomes of pediatric spondylolysis treatment have been evaluated in the literature using evidence-based techniques.
- Early onset scoliosis lacks quality data to allow evidence-based decisions to be made, but recent work has identified high-impact topics whereby quality studies could help with evidence-based medicine decision-making.

INTRODUCTION

As the focus of medicine has undergone a transformation to more quality-based outcomes, the concept of evidence-based medicine (EBM) has gained importance and acceptance throughout the field. Despite the generic acceptance of EBM, confusion still exists as to exactly what it is and its purpose. In general, EBM is a process of decision-making aimed at making the best decisions for patients as they relate to patients' health care. This process integrates aspects of clinical expertise and experience, patient values, and the best available evidence on a topic to come to these decisions.¹

Although skeptics of EBM often complain that this is akin to cookie-cutter medicine, there is a real difference between EBM and cookie-cutter medicine. As all 3 of the aforementioned components are necessary for EBM, the inclusion of clinical expertise and experience in this process

ensures that clinicians still guide the process of making patient care decisions. The best available evidence is necessary for this process; but this evidence must be evaluated, interpreted in the individual clinical situation, and applied within the bounds of patients' values, thus, leaving clinicians plenty of autonomy in the EBM decision-making process.

In addition, given the rapid pace of medical advancement, often times higher levels of clinical evidence may lag behind clinical standards of care, leaving the clinician the responsibility to interpret the data available and combine this with patients' values and clinical experience to make EBM decisions. Therefore, although the highest levels of clinical evidence are preferred in the EBM process, lower levels of clinical evidence must suffice in times when these are the only data available, leaving patients' values and clinical experience as key components in the EBM process.

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This general lack of high quality data is very much the current status of EBM within the area of pediatric spine surgery. Pediatric spinal deformity surgery is an evolving field because of the constant introduction of new technological advancements as well as the progressive understanding of the cause and clinical course of pediatric spinal deformity. Currently, it seems the use of EBM within this field relies more on patients' values and clinical expertise and less on high-quality evidence for decision-making, due mainly to the paucity of high-quality data generated from large randomized trials and high-quality meta-analyses. Although some high-quality studies do exist, which can and should be integrated in the decision-making process when treating patients with pediatric spinal deformity, there is a dire need for more high-quality data to continue to improve the EBM process within the area of pediatric spinal deformity treatment.

EVIDENCE-BASED MEDICINE AND IDIOPATHIC SCOLIOSIS

Idiopathic scoliosis is a common condition in the pediatric population. Despite the ubiquitous nature of this condition in terms of the number of patients affected and the significant cost to society, there is a real lack of high-quality evidence that drives treatment decisions. Instead, clinical experience seems to be a driving force in much of the decision-making process for idiopathic scoliosis. Much of this clinical decision-making, as it relates to decisions for treatment, lies in the data generated by the classic cohort, the natural history study published by Weinstein and colleagues.² Unfortunately, because these data have influenced a standard care pathway for idiopathic scoliosis, there has been little additional study of the natural history of untreated pediatric idiopathic scoliosis, thus, little to guide new evidence-based decisions on the treatment of this condition as they relate to the natural history of the condition.

One of the most well-studied aspects of the treatment of idiopathic scoliosis is the nonoperative treatment of this condition. For many years, bracing has been a mainstay of the treatment of idiopathic scoliosis in growing children with a deformity magnitude between 20° and 45°, despite a relative lack of high-quality data for this treatment. The publication of a multicenter randomized controlled trial by Weinstein and colleagues³ demonstrating the effectiveness of this treatment generated the first high-quality data to justify this treatment. After this publication, a systematic review of the effect of bracing

has been published in the Cochrane Database of Systematic Reviews that found brace treatment did not change patients' quality of life during treatment at the long-term follow-up but did find consistent (although low quality) evidence to suggest brace treatment was able to prevent scoliosis deformity progression.⁴ The investigators of this review found significant issues with the quality of the studies included due to high failure rates of randomized controlled trials and difficulties in family acceptance of randomization in these trials. These issues may highlight the difficulties in generating high-quality data in the treatment of scoliosis, as patient acceptance of randomization and participation in randomized controlled trials in the treatment of scoliosis seem to be difficult issues to resolve.

Surgical treatment of idiopathic scoliosis is well accepted, typically for progressive deformities more than 50° to 55° in magnitude. Despite this generally accepted surgical threshold, controversy remains in regard to the optimal surgical approach, optimal target for percentage of deformity correction, and instrumentation construct. Currently no randomized controlled trials exist investigating the surgical treatment of idiopathic scoliosis as compared with nonoperative treatment, leaving the evidence for treatment based on small, nonrandomized, low-quality studies. In their systematic review of the literature as it pertains to the surgical outcomes of patients treated for idiopathic scoliosis, Westrick and Ward⁵ found surgical treatment consistently arrests progression of scoliosis, maintains permanent deformity correction, and improves cosmetic appearance; however, definitive evidence that these outcomes were superior to the natural history of this condition was lacking.

As can be appreciated, the treatment of idiopathic scoliosis is based primarily on clinical experience and data from historic studies of low quality in terms of EBM. Difficulties certainly exist, as has been shown in some systematic reviews, in developing and completing high-quality randomized controlled trials of this condition. Despite this lack of high-quality data and these difficulties, given the number of patients affected and the high cost of care associated with idiopathic scoliosis, better efforts are needed to generate high-quality data to improve the ability to apply EBM to this condition.

EVIDENCE-BASED MEDICINE AND SPONDYLOLYSIS

In recent years, the EBM committee for the Scoliosis Research Society (SRS) has performed

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