



# Does School Screening Affect Scoliosis Curve Magnitude at Presentation to a Pediatric Orthopedic Clinic?

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## Abstract

**Background:** With new data supporting the efficacy of bracing, the role of school screening for early detection of moderate scoliosis curves has been revisited. Because of a high rate of false-positive screening and cost concerns, a comprehensive county-wide school screening program was discontinued in 2004. We aim to determine the impact of a comprehensive school screening program on curve magnitude at presentation and initial scoliosis treatment for all local county patients presenting to a pediatric orthopedic clinic from all referral sources.

**Methods:** Between 1994 and 2014, a total of 761 county patients presented to a pediatric orthopedic clinic for new scoliosis evaluation. Curve magnitude and recommended treatment were recorded. Treatment indications for bracing, surgery, and observation were consistent over the study period.

**Results:** From January 1994 to July 2004 (school screening period), 514 children were seen by a pediatric orthopedic specialist for scoliosis evaluation compared to 247 patients from August 2004 to December 2014 (no school screening). There was a 48% decrease in the number of county children who were evaluated for idiopathic scoliosis by pediatric orthopedics once school screening was discontinued. Mean maximal Cobb angle at presentation increased from 20° (range, 4°–65°) to 23° (range, 7°–57°). At presentation, 5 of 514 (0.97%) patients in the screened group required surgery and 68 of 514 (13.2%) required bracing, compared to 3 of 247 (1.2%) patients in the non-screened group requiring surgery and 47 of 247 (19%) requiring bracing ( $p > .05$ ,  $p = .04$ , respectively).

**Conclusion:** After school screening was discontinued, mean curve magnitude and rates of bracing at presentation statistically increased in county patients evaluated for new scoliosis, although the clinical significance is unclear. After school screening was discontinued, there were fewer patient referrals, braces prescribed, and unnecessary evaluations (patients discharged at first visit). This study provides data to evaluate the role of school screening for children with regular access to health care.

**Level of Evidence:** Level 3.

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## Introduction

Adolescent idiopathic scoliosis is the most common spinal deformity in children, affecting up to one in 300 individuals. The role and utility of school screening to detect scoliosis early in the disease course is debated in the literature [1-4]. The goal of scoliosis school screening is to detect curves when they are moderate and amenable to bracing so as to prevent progression to surgical management [5]. Those opposed to screening state that such programs consume valuable resources, cause worry to families and children [6], and result in unnecessary radiographs and radiation exposure for individuals who have false positive screening results [7]. Although many US school districts

adopted a practice of universal scoliosis school screening, budgetary pressures and the lack of data proving the efficacy of brace treatment led to the discontinuation of screening programs in many regions. With recent studies conclusively demonstrating that bracing can prevent curve progression, there is renewed interest in the value of school screening for scoliosis [8,9].

Our investigation evaluates the role of school screening on all new scoliosis referrals to pediatric orthopedics from residents in one US county. The total population of the county was 137,521 in 2006 and includes a city of 92,000 people, where our pediatric orthopedic center is located. The radius of the county is approximately 20 miles. Children attend school at one of five public school districts and a variety of private schools. Earlier studies have established that our county experience provides a reasonable estimation for incidence rates of most diseases [10]. A survey of county residents indicated that 95% or more receive their medical care at one of the two health care centers, of which only our center provides pediatric orthopedic care [11]. Referral patterns did not significantly change during this study period. The nearest neighboring pediatric orthopedic center/spine surgeon is 70 miles away. Our pediatric orthopedic center accepts all major local insurance types including public assistance, and there is a low number of undocumented children in our region.

In 2004, 4 of 5 public school districts and all private schools in our county discontinued school screening, which was previously provided by the county health department. Prior to this, there was a strong, standardized school screening program in place in both county public and private schools that was run by the county [7]. We sought to compare the number of county patients seen by the pediatric orthopedic practice for school screening, and the curve magnitude and recommended treatment at initial presentation for new patients seen between 1994–2004 (during school screening) and 2004–2014 (after school screening) for evaluation of scoliosis. We hypothesized that patients presenting from 2004 to 2014 would have larger-magnitude curves compared to patients presenting prior to 2004 and would more frequently require immediate bracing or surgery.

## Materials and Methods

Our research team contacted our county schools to verify the years and timing of school screening and when it had been discontinued. Prior to 2004, school screening for scoliosis throughout the county was performed by a school public health nurse (licensed practical nurse level or higher). Students were screened in grades 5, 7, and 8. If the student met screening parameters (clinical suspicion or scoliometer reading of  $6^\circ$  or more), a second nurse examined the child. If there was still concern, the patient's parent was called and a letter was sent. There was no direct referral to pediatric orthopedics via the school screening process. Rather, the school simply requested

communication as to whether the scoliosis had been assessed by a medical professional. Screening in 4 of 5 county public school districts and all the private schools was stopped in 2004. The remaining public school districts did not have complete records, but stated that no screening had been done after 2007. Thus, county patients presenting to pediatric orthopedics between 1994 and August 2004 were considered the School Screening Cohort. Patients presenting to pediatric orthopedics between September 2004 and September 2014 were considered the No Screening Cohort. We hypothesized that curve magnitude at presentation would be increased in the No Screening Cohort. Patients in both cohorts were either self-referred or referred by their primary care provider for an orthopedic evaluation. During the study period, there was no pathway for schools or the health department to directly refer patients to an orthopedic surgeon for scoliosis care.

During the study period, a stable pediatric orthopedic practice existed in our county with four surgeons, several nurse practitioners, and one physician assistant providing consistent care. During the study period, no other orthopedic surgeons or neurosurgeons are known to offer pediatric scoliosis care within a 70-mile radius, and no specific training was provided to primary physicians that may have affected referral patterns. Standards for initiating bracing (skeletal immaturity, curve  $>20^\circ$ – $25^\circ$ ), and surgery (curve  $>45^\circ$ – $50^\circ$  for skeletally immature patient and  $>50^\circ$  for skeletally mature patient) were consistent over the study period.

We also assessed whether other health care providers were managing scoliosis bracing or surgery in the region. There is only one orthotics office within a 70-mile radius that manufactures scoliosis braces. They had not received a prescription for a scoliosis brace for anyone other than from the pediatric orthopedic providers included in this analysis. We surveyed 13 regional chiropractors to see if they had prescribed braces for adolescent idiopathic scoliosis treatment. Many stated that they would treat children with scoliosis but would refer for moderate or severe scoliosis and would not prescribe a brace.

Medical records for all new county patients presenting to the pediatric orthopedic practice for scoliosis from 1994 to 2014 were reviewed. Patients with neuromuscular scoliosis or diagnoses other than idiopathic scoliosis were excluded. Patients who moved to the county area with scoliosis treatment already provided at another center were excluded. All county residents between age 8 and 18 presenting to pediatric orthopedics for new scoliosis evaluation were included. We have noted that some patients present for scoliosis evaluation at age 8 or 9, are followed, and ultimately diagnosed with adolescent idiopathic scoliosis. Thus, we included 8- and 9-year-olds in the study. Curve magnitude at initial presentation to pediatric orthopedics was measured. Initial prescribed treatment was recorded, including bracing, surgery, observation, or no further follow-up. Need for subsequent surgery or bracing was also recorded over the follow-up period.

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