

# Medicaid Insurance Is Associated With Larger Curves in Patients Who Require Scoliosis Surgery

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## Abstract

Children with Medicaid may have difficulty accessing care for adolescent idiopathic scoliosis (AIS), a condition that may worsen with time.

We conducted a study to determine whether patients with Medicaid present with a larger curve magnitude. We reviewed the cases of consecutive AIS patients treated with posterior spinal fusion (PSF) between 2008 and 2012. Children seen for second opinions were excluded. Medical records were evaluated to determine time from evaluation to determination for surgery, time from recommendation for surgery to actual procedure, and insurance status. Radiographs were reviewed to determine Cobb angle at initial presentation.

Of the 135 patients who underwent PSF for newly diagnosed AIS, 39% had Medicaid insurance. Compared with private insurance patients, Medicaid patients presented with a larger mean (SD) Cobb angle, 57.2° (15.7°) versus 47.5° (14.3°) ( $P < .001$ ), and had larger curves at time of surgery, 60.6° (13.9°) versus 54.6° (11.7°) ( $P = .008$ ). There was no difference in wait time from the decision to undergo surgery to the actual surgery or in mean (SD) number of levels fused, 10.3 (2.2) for Medicaid patients versus 9.7 (2.3) for private insurance patients ( $P = .16$ ).

Compared with private insurance patients, Medicaid patients who underwent PSF for AIS had larger presenting Cobb angles and larger Cobb angles at time of surgery.

Rising health care costs have led many health insurers to limit benefits, which may be a problem for children in need of specialty care. Uninsured children have poorer access to specialty care than insured children. Children with public health coverage have better access to specialty care than uninsured children but inferior access compared with privately insured children.<sup>1,2</sup> It is well documented that children with government insurance have limited access to orthopedic care for fractures, ligamentous knee injuries, and other injuries.<sup>1,3-5</sup> Adolescent idiopathic scoliosis (AIS) differs from many other conditions managed by pediatric orthopedists, as it may be progressive, with management becoming increasingly more complex as the curve magnitude increases.<sup>6</sup> The ability to access care earlier in the disease process may allow for earlier nonoperative interventions, such as bracing. For patients who require spinal fusion, earlier diagnosis and referral to a specialist could potentially result in shorter fusions and preserve distal motion segments. The ability to access the health care system in a timely fashion would therefore be of utmost importance for patients with scoliosis.

The literature on AIS is lacking in studies focused on care

access based on insurance coverage and the potential impact that this may have on curve progression.<sup>7-9</sup> We conducted a study to determine whether there is a difference between patients with and without private insurance who present to a busy urban pediatric orthopedic practice for management of scoliosis that eventually resulted in surgical treatment.

## Materials and Methods

After obtaining institutional review board approval for this study, we retrospectively reviewed the medical records of patients (age, 10-18 years) who underwent posterior spinal fusion (PSF) for newly diagnosed AIS between 2008 and 2012. We excluded patients treated with growing spine instrumentation (growing rods), patients younger than 10 years or older than 18 years at presentation, and patients without adequate radiographs or clinical data, including insurance status. To focus on newly diagnosed scoliosis, we also excluded patients who had been seen for second opinions or whose scoliosis had been managed elsewhere in the past. Patients with syndromic, neuromuscular, or congenital scoliosis were also excluded.

Medical records were checked to ascertain time from initial

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evaluation to decision for surgery, time from recommendation for surgery until actual procedure, and insurance status. Distance traveled was figured from patients' home addresses. Cobb angles were calculated from initial preoperative and final preoperative posteroanterior (PA) radiographs. Curves as seen on PA, lateral, and maximal effort, supine bending thoracic and lumbar radiographs from the initial preoperative visit were classified using the system of Lenke and colleagues.<sup>10</sup> Hospital records were queried to determine number of levels fused at surgery, number of implants placed, and length of stay. Patients were evaluated without prior screening of insurance status and without prior consultation with referring physicians. Surgical procedures were scheduled on a first-come, first-served basis without preference for insurance status.

### Results

We identified 135 consecutive patients with newly diagnosed AIS treated with PSF by our group between January 2008 and December 2012 (Table 1). Sixty-one percent had private insur-

**Table 1. Characteristics of Patients With Adolescent Scoliosis Treated With Posterior Spinal Fusion, 2008–2012, by Insurance Status**

Characteristic	Insurance Status				P
	Medicaid		Private		
	Mean	SD	Mean	SD	
Age, y	14.2	1.4	14.4	1.5	.67
Cobb angle at:					
Initial presentation	57.2°	15.7°	47.5°	14.3°	<.001
Surgery	60.6°	13.9°	54.6°	11.7°	.008
Time from:					
Diagnosis to surgery, d	250	300	273	264	.64
Decision to surgery, d	129	138	103	62	.14
Scheduled date to surgery, d	99	41	86	48	.1
Levels fused, n	10.3	2.2	9.7	2.3	.16
Total implants, n	14.2	3.5	14.4	2.9	.85
Length of stay, d	2.6	0.8	2.4	0.5	.11

**Table 2. Curve Type (Lenke Classification) by Insurance Status<sup>a</sup>**

Curve Type	Insurance Status	
	Medicaid	Private
1	65.4%	56.0%
2	19.2%	20.2%
3	3.9%	4.8%
4	1.9%	1.2%
5	5.8%	11.9%
6	3.9%	6.0%

<sup>a</sup>There was no statistical difference between curve types (P = .83).

ance; 39% had Medicaid. There was no difference in age or ASA (American Society of Anesthesiologists) score between groups. Mean (SD) Cobb angle at initial presentation was 47.5° (14.3°) (range, 18.0°–86.0°) for the private insurance group and 57.2° (15.7°) (range, 23.0°–95.0°) for the Medicaid group (P < .0001). At time of surgery, mean (SD) Cobb angles were 54.6° (11.7°) and 60.6° (13.9°) for the private insurance and Medicaid groups, respectively (P = .008). There was no difference in curve types (Lenke and colleagues<sup>10</sup> classification) between groups (Table 2, P = .83). Medicaid patients traveled a shorter mean (SD) distance for care, 56.3 (57.0) miles, versus 73.7 (66.7) miles (P = .05). There was no statistical difference (P = .14) in mean (SD) surgical wait time from surgery recommendation to actual surgery, 103.1 (62.4) days and 128.8 (137.5) days for the private insurance and Medicaid groups, respectively. The difference between patient groups in mean (SD) number of levels fused did not reach statistical significance (P = .16), 10.3 (2.2) levels for the Medicaid group and 9.7 (2.3) levels for the private insurance group. Mean (SD) estimated blood loss was higher for Medicaid patients, 445.7 (415.9) mL versus 335.1 (271.5) mL (P = .06), though there was no difference in use of posterior column osteotomies between groups. There was no difference (P = .11) in mean (SD) length of hospital stay between Medicaid patients, 2.6 (0.8) days, and private insurance patients, 2.4 (0.5) days.

### Discussion

According to an extensive body of literature, patients with government insurance have limited access to specialty care.<sup>1,11,12</sup> Medicaid-insured children in need of orthopedic care are no exception. Sabharwal and colleagues<sup>13</sup> examined a database of pediatric fracture cases and found that 52% of the privately insured patients and 22% of the publicly insured patients received orthopedic care (P = .013).<sup>13</sup> When Pierce and colleagues<sup>14</sup> called 42 orthopedic practices regarding a fictitious 14-year-old patient with an anterior cruciate ligament tear, 38 offered an appointment within 2 weeks to a privately insured patient, and 6 offered such an appointment to a publicly insured patient. Skaggs and colleagues<sup>4</sup> surveyed 230 orthopedic practices nationally and found that Medicaid-insured children had limited access to orthopedic care; 41 practices (18%) would not see a child with Medicaid under any circumstances. Using a fictitious case of a 10-year-old boy with a forearm fracture, Iobst and colleagues<sup>3</sup> tried making an appointment at 100 orthopedic offices. Eight gave an appointment within 1 week to a Medicaid-insured patient, and 36 gave an appointment to a privately insured patient.<sup>3</sup>

There are few data regarding insurance status and scoliosis care in children. Spinal deformity differs from simple fractures and ligamentous injuries, as timely care may result in a less invasive treatment (bracing) if the curvature is caught early. Goldstein and colleagues<sup>9</sup> recently evaluated 642 patients who

presented for scoliosis evaluation over a 10-year period. There was no difference in curve magnitudes between patients with and without Medicaid insurance. Thirty-two percent of these patients were evaluated for a second opinion, and the authors chose not to subdivide patients on the basis of curve severity and treatment needed, noting only no difference between groups. There was no discussion of the potential difference between patients with and without private insurance with respect to surgically versus nonsurgically treated curves. We wanted to focus specifically on patients who required surgical intervention, as our experience has been that many patients with government insurance present with either very mild scoliosis ( $10^\circ$ ) or very large curves that were not identified because of lack of primary care access or inadequate school screening. Although summing these 2 groups would result in a similar average, they would represent a different cohort than patients with curves along a bell curve. Furthermore, it is the group of patients who would require surgical intervention that is so critical to identify early in order to intervene.

Our data suggest a difference in presenting curves between patients with and without private insurance. The approximately  $10^\circ$  difference between patient groups in this study could potentially represent the difference between bracing and surgery. Furthermore, Miyajima and colleagues<sup>6</sup> evaluated the relationship between Cobb angle and health care consumption and correlated larger curve magnitudes with more levels fused, longer surgeries, and higher rates of transfusion. Specifically, every  $10^\circ$  increase in curve magnitude resulted in 7.8 more minutes of operative time, 0.3 extra levels fused, and 1.5 times increased risk for requiring a blood transfusion.

Cho and Egorova<sup>15</sup> recently evaluated insurance status with respect to surgical outcomes using a national inpatient database and found that 42.4% of surgeries for AIS in children with Medicaid had fusions involving 9 or more levels, whereas only 33.6% of privately insured patients had fusions of 9 or more levels. There was no difference in osteotomy or reoperation for pseudarthrosis between groups, but there was a slightly higher rate of infectious (1.1% vs 0.6%) and hemorrhagic (2.5% vs 1.7%) complications in the Medicaid group. Hospital stay was longer in patients with Medicaid, though complications were not different between groups.

The mean difference in the magnitude of the curves treated in our study was not more than  $10^\circ$  between patients with and without Medicaid, perhaps explaining the lack of a statistically significant difference in number of levels fused between groups. Although the groups were similar with respect to the percentage requiring posterior column spinal osteotomies, we noted a difference in estimated blood loss between groups, likely explained by the fact that a junior surgeon was added just before initiation of the study period, potentially skewing the estimated blood loss as this surgeon gained experience. Payer status has been correlated to length of hospital stay in children with scoliosis. Vitale and colleagues<sup>8</sup> reviewed the effect of payer status on surgical outcomes in 3606 scoliosis patients from a statewide database in California and concluded that, compared with patients having all other payment sources,

Medicaid patients had higher odds for complications and longer hospital stay. Our hospital has adopted a highly coordinated care pathway that allows for discharge on postoperative day 2, likely explaining the lack of any difference in postoperative stay.<sup>16</sup>

The disparity in curve magnitudes among patients with and without private insurance is striking and probably multifactorial. Very likely, the combination of schools with limited screening programs within urban or rural school systems,<sup>17</sup> restricted access to pediatricians,<sup>18,19</sup> and longer waits to see orthopedic specialists<sup>20</sup> all contribute to this disparity. It should be noted that school screening is mandatory in our state. This discrepancy may be related to a previously established tendency in minority populations toward waiting longer to seek care and refusing surgical recommendations, though we were unable to query socioeconomic factors such as race and household income.<sup>21,22</sup> It is clearly important to increase access to care for underinsured patients with scoliosis. A comprehensive approach, including providing better education in the schools, establishing communication with referring primary care providers, and increasing access through more physicians or physician extenders, is likely needed. Orthopedists should perhaps treat scoliosis evaluation with the same sense of urgency given to minor fractures, and primary care providers should try to ensure that appropriate referrals for scoliosis are made. Also curious was the shorter travel distance for Medicaid patients versus private insurance patients in this study. We hypothesize this is related to our urban location and its large Medicaid population.

Our study had several limitations. Our electronic medical records (EMR) system does not store data related to the time a patient calls for an initial appointment, limiting our ability to determine how long patients waited for their initial consultation. Furthermore, the decision to undergo surgery is multifactorial and cannot be simplified into time from initial recommendation to surgery, as some patients delay surgery because of school or other obligations. These data should be reasonably consistent over time, as patients seen in the early spring in both groups may delay surgery until the summer, and those diagnosed in June may prefer earlier surgery.

## Summary

Children with AIS are at risk for curve progression. Therefore, delays in providing timely care may result in worsening scoliosis. Compared with private insurance patients, Medicaid patients presented with larger curve magnitudes. Further study is needed to better delineate ways to improve care access for patients with scoliosis in communities with larger Medicaid populations.

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