

Clinical Study

## Visual loss after corrective surgery for pediatric scoliosis: incidence and risk factors from a nationwide database

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### Abstract

**BACKGROUND CONTEXT:** Perioperative visual loss (POVL) after spinal deformity surgery is an uncommon but severe complication. Data on the incidence and risk factors of this complication after corrective surgery in the pediatric population are limited.

**PURPOSE:** The present study aimed to investigate nationwide estimates of POVL after corrective surgery for pediatric scoliosis.

**STUDY DESIGN:** This is a retrospective study that uses a nationwide database.

**PATIENT SAMPLE:** The sample includes 42,339 patients under the age of 18 who underwent surgery for idiopathic scoliosis.

**OUTCOME MEASURES:** The outcome measures were incidence of POVL and risk factors.

**METHODS:** Patients under the age of 18 who underwent elective surgery for idiopathic scoliosis between 2002 and 2011 were identified using the Nationwide Inpatient Sample database. The incidence of POVL (ischemic optic neuropathy, central retinal artery occlusion, or cortical blindness) was estimated after application of discharge weights. Demographics, comorbidities, and operative parameters were compared between patients with and without visual loss. A multivariate logistic regression was performed to identify significant risk factors for POVL development. No funds were received in support of this work.

**RESULTS:** The incidence of POVL was 1.6 per 1,000 procedures (0.16%). Patients with visual loss were significantly more likely to be younger and male, have Medicaid as insurance, and undergo fusion of eight or more spinal levels compared with patients without visual loss. Following multivariate analysis, older patients (odds ratio [OR]: 0.84; 95% confidence interval [CI]: 0.77–0.91) and female patients (OR: 0.08; 95% CI: 0.04–0.14) were significantly less likely to develop POVL compared with younger and male patients. On the other hand, having Medicaid as insurance (OR: 2.13;

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95% CI: 1.32–3.45), history of deficiency anemia (OR: 8.64; 95% CI: 5.46–14.31), and fusion of eight or more spinal levels (OR: 2.40; 95% CI: 1.34–4.30) were all independently associated with POVL.

**CONCLUSIONS:** In this nationwide study, the incidence of POVL after scoliosis surgery in patients under the age of 18 was estimated at 0.16%, similar to the rate reported in adult patients. Cortical blindness accounted for all cases of POVL in the present study. Younger patients, patients with history of deficiency anemia, and patients undergoing long-segment fusions may be at increased risk of POVL after corrective surgery for pediatric scoliosis. © 2016 Elsevier Inc. All rights reserved.

**Keywords:** Adolescent idiopathic scoliosis; Cortical blindness; Infantile scoliosis; Juvenile idiopathic scoliosis; Nationwide Inpatient Sample; Visual loss

## Introduction

First described by Slocum et al. in 1948, perioperative visual loss (POVL) after spine surgery is a severe and devastating complication [1]. This complication is estimated to occur in 0.03% to 0.2% of patients who undergo spinal surgery [2], and several etiologies for its development have been identified [2–5]. These include external ocular injury (corneal abrasion), cortical blindness, central retinal artery occlusion, and ischemic optic neuropathy [6]. The risk factors for POVL include patients younger than 18 years (compared with adult patients), obesity, male gender, history of peripheral vascular disease or hypertension, need for blood transfusion, intraoperative hypotension, deformity surgery, and others [2,6].

Although POVL has been well described in patients undergoing surgery for degenerative spine disease and adult spinal deformity [6], few studies have specifically investigated this complication in the younger population [2], specifically pediatric patients who undergo surgery for scoliosis. The purpose of the present study was to estimate the risk of POVL after surgery for spinal deformity in patients younger than 18 years and to identify potential risk factors for its occurrence.

## Materials and methods

### Study design and data source

This is a retrospective review of the Nationwide Inpatient Sample (NIS) database from 2002 to 2011, the largest inpatient database in the United States. The NIS contains inpatient information from a 20% sample of non-federal hospitals across the country, which corresponds to over 8 million admissions per year (<http://www.hcup-us.ahrq.gov/nisoverview.jsp>). It uses the International Classification of Diseases, Ninth Edition codes to characterize diagnoses, procedures, and complications.

Patients with a discharge diagnosis of idiopathic scoliosis (737.30) or progressive infantile idiopathic scoliosis (737.32) were identified. Patients over 18 years, who are not undergoing spinal fusion (codes 81.04–81.09), and who have non-elective admissions were excluded (Figure). Perioperative

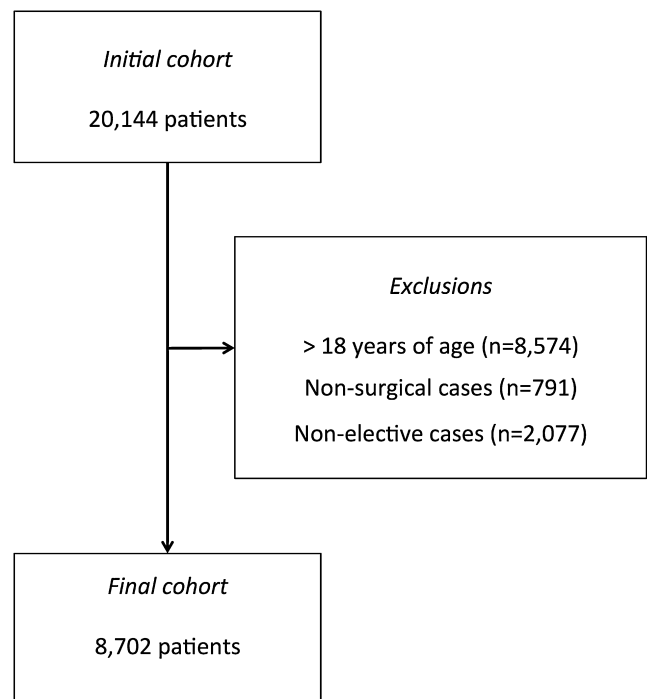


Figure. Patient selection algorithm. The initial cohort included all patients with a discharge diagnosis of idiopathic scoliosis or progressive infantile scoliosis admitted between 2002 and 2011. Discharge weights (supplied by the Nationwide Inpatient Sample [NIS]) were applied to each admission, which roughly correspond to a fivefold multiplication (given that the NIS is a 20% sample database of all admissions for a given year); this yielded a total of 42,339 estimated cases.

visual loss was identified using the following codes: unspecified sudden visual loss (368.11), ischemic optic neuropathy (377.41), cortical blindness (377.75), and retinal vascular occlusion (362.3, 362.30, 363.31, and 362.35). Other gathered data included patient's age, gender, race, insurance status, operative parameters, length of stay, and inpatient mortality.

### Statistical analysis

Discharge weights supplied by the NIS were used to produce national discharge estimates. Given that the NIS is a 20% sample database of all discharges in the United States

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