



## Survey Studies

# The Current State of United States Spine Surgery Training: A Survey of Residency and Spine Fellowship Program Directors

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## Abstract

**Study Design:** Program director survey.

**Objectives:** To collect data on spine surgical experience during orthopedic and neurological surgery residency and assess the opinions of program directors (PDs) from orthopedic and neurological surgery residencies and spine surgery fellowships regarding current spine surgical training in the United States.

**Summary of Background Data:** Current training for spine surgeons in the United States consists of a residency in either orthopedic or neurological surgery followed by an optional spine surgery fellowship. Program director survey data may assist in efforts to improve contemporary spine training.

**Methods:** An anonymous questionnaire was distributed to all PDs of orthopedic and neurological surgery residencies and spine fellowships in the United States (N = 382). A 5-point Likert scale was used to assess attitudinal questions. A 2-tailed independent-samples *t* test was used to compare responses to each question independently.

**Results:** A total of 147 PDs completed the survey. Orthopedic PDs most commonly indicated that their residents participate in 76 to 150 spine cases during residency, whereas neurological surgery PDs most often reported more than 450 spine cases during residency ( $p < .0001$ ). Over 88% of orthopedic surgery program directors and 0% of neurological surgery PDs recommended that their trainees complete a fellowship if they wish to perform community spine surgery ( $p < .001$ ). In contrast, 98.1% of orthopedic PDs and 86.4% of neurological surgery PDs recommended that their trainees complete a fellowship if they wish to perform spinal deformity surgery ( $p = .038$ ). Most PDs agreed that surgical simulation and competency-based training could improve spine surgery training (76% and 72%, respectively).

**Conclusions:** This study examined the opinions of orthopedic and neurological surgery residency and spine fellowship PDs regarding current spine surgery training in the United States. A large majority of PDs thought that both orthopedic and neurological surgical trainees should complete a fellowship if they plan to perform spinal deformity surgery. These results provide a background for further efforts to optimize contemporary spine surgical training.

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**Keywords:** Spine surgery training; Residency training; Fellowship training; Survey; Program Director; Spine deformity surgery; Spine deformity training; Competency-based training; Simulation-based learning

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## Introduction

Current spine surgery training in the United States consists of either an orthopedic surgery or neurological surgery residency program followed by an optional spine surgery fellowship. The Accreditation Council for Graduate Medical Education (ACGME) requires training in the diagnosis and management of adult and pediatric spinal disorders during both orthopedic surgery and neurological surgery residency [1-3]. Spine surgical experience during residency, however, differs substantially between the 2 specialties [4-10]. The minimum length of orthopedic residency training in the United States is 5 years, whereas neurological surgery residency training is required to be 7 years at minimum [1,2].

Furthermore, neurological surgery residency trainees complete more spine surgery procedures on average than orthopedic surgery trainees during residency training [11-13]. In 2011, the ACGME mandated that orthopedic surgery residents perform no fewer than 15 “spine decompression/posterior spine fusion thoracic or lumbar” procedures during residency. One year later, in 2012, the ACGME mandated that neurological surgery residents perform no fewer than 85 adult spinal procedures, 5 cervical spine traction procedures, and 5 pediatric spine procedures during residency.

Like the residency training experience, the likelihood of seeking subspecialty fellowship training and ultimate practice patterns differ between the 2 specialties. Residency program survey data in 2012 indicated that 87.4% of orthopedic surgery trainees planned to complete an advanced fellowship, whereas only 41.5% of graduating neurosurgical residents planned to pursue specialty fellowship training [14,15]. In the current workforce, 14% of orthopedic surgeons have completed an adult spine surgery fellowship [16]. Of the remaining 86%, few perform spine surgery in practice. In contrast, 96% of neurological surgery residents plan to perform some spine surgery in practice, regardless of whether they complete an advanced fellowship [11]. Although community-based spine surgeons may perform a variety of spinal procedures for degenerative and traumatic conditions, complex spinal reconstructive and deformity procedure are typically reserved for tertiary care center spine surgeons, and thus may necessitate advanced fellowship training.

Although clear differences exist in spine surgery training and practice patterns between orthopedic and neurological surgery, Herkowitz et al. [17] developed guidelines for residency training in spine surgery without distinction between the 2 specialties. Despite these published training guidelines and current ACGME residency requirements [1-3], controversy remains regarding the optimal spine surgery training process [6,11,17-19].

This study aimed to survey program directors (PDs) of neurological surgery and orthopedic surgery residencies and spine surgery fellowships to assess their opinions on current and ideal spine surgery training. The authors hypothesized

that neurological surgery residency PDs would have different opinions regarding optimal spine surgery training during residency, compared with orthopedic surgery and spine fellowship PDs.

## Methods

The researchers obtained institutional review board approval before completing this investigation. From November to December 2012, an anonymous 42-question on-line questionnaire was distributed to all PDs of ACGME-accredited orthopedic surgery and neurological surgery residency programs using Web-based survey software (<http://www.surveymonkey.com>, Palo Alto, CA). A similar 35-question survey was distributed to spine surgery fellowship PDs (orthopedic and neurosurgical spine fellowships) in the United States. The survey was forwarded to a total of 382 PDs, including 154 orthopedic surgery residency PDs, 102 neurological surgery PDs, and 116 spine fellowship PDs (either orthopedic or neurosurgical). Incomplete survey responses were eliminated. Results are reported and analyzed for the total number of individuals who answered each question. Nonresponders were reminded via e-mail 1 week after survey distribution. A total of 9 emailed survey reminders were distributed, with reminder e-mails emphasizing the importance of this project.

A 5-point Likert scale was used to assess attitudinal questions: 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; and 5 = strongly agree. Responses were collapsed into 3 categories (disagree, neutral, and agree) to establish a polarized view of responses, thus providing a more definitive view of disagreement, neutrality, or agreement [20].

The researchers performed statistical analysis using Stata version 12 software (Stata Corp., College Station, TX). A 2-tailed independent-samples *t* test or chi-squared test was used to compare the responses of orthopedic residency, neurosurgical residency, and spine fellowship PDs for each question independently. Responses of fellowship directors were also separated and analyzed based on whether their program was run by the orthopedic surgery or neurological surgery department.

Bonferroni adjusted *p* value from .05 was used to determine statistical significance for all appropriate comparisons. When the authors compared the 13 questions that were asked only of residency PDs, *p* < .004 was used for statistical significance (0.05/13). When comparing the 23 questions that were asked of residency and spine fellowship PDs, *p* < .002 was used for statistical significance (0.05/23).

## Results

A total of 147 PDs completed the Spine Training Survey, yielding an overall response rate of 38.5% (147 of 382). Neurosurgical residency PDs had a response rate of 45.1% (46 of 102); orthopedic surgery PDs, a response rate of

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