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*Review Article*

# Second opinion in spine surgery: A scoping review

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## ABSTRACT

**Background:** As a growing number of patients seek consultations for increasingly complex and costly spinal surgery, it is of both clinical and economic value to investigate the role for second opinions (SOs). Here, we summarized and focused on the shortcomings of 14 studies regarding the role and value of SOs before proceeding with spine surgery.

**Methods:** Utilizing PubMed, Google Scholar, and Scopus, we identified 14 studies that met the inclusion criteria that included: English, primary articles, and studies published in the past 20 years.

**Results:** We identified the following findings regarding SO for spine surgery: (1) about 40.6% of spine consultations are SO cases; (2) 61.3% of those received a discordant SO; (3) 75% of discordant SOs recommended conservative management; and (4) SO discordance applied to a variety of procedures.

**Conclusion:** The 14 studies reviewed regarding SOs in spine surgery showed that half of the SOs differed from those given in the initial consultation and that SOs in spine surgery can have a substantial impact on patient care. Absent are prospective studies investigating the impact of following a first versus second opinion. These studies are needed to inform the potential benefit of universal implementation of SOs before major spine operations to potentially reduce the frequency and type/extent of surgery.

**Keywords:** Second opinion, Spine surgery, Discordance rates

## INTRODUCTION

Second opinions (SOs) in spine surgery are particularly important as there are tremendous variations regarding indications and types of spinal operations offered/performed.[7,8,11] Here, we reviewed 14 studies looking at the frequency and impact of SO on the incidence, type, and extent of spine surgery being offered to patients.

## MATERIALS AND METHODS

### Literature review

PubMed, Google Scholar, and Scopus databases were the search engines utilized to identify 14 peer-reviewed articles on SO before spine surgery; these studies were assessed by two reviewers [Figure 1].[2,4,13-15]

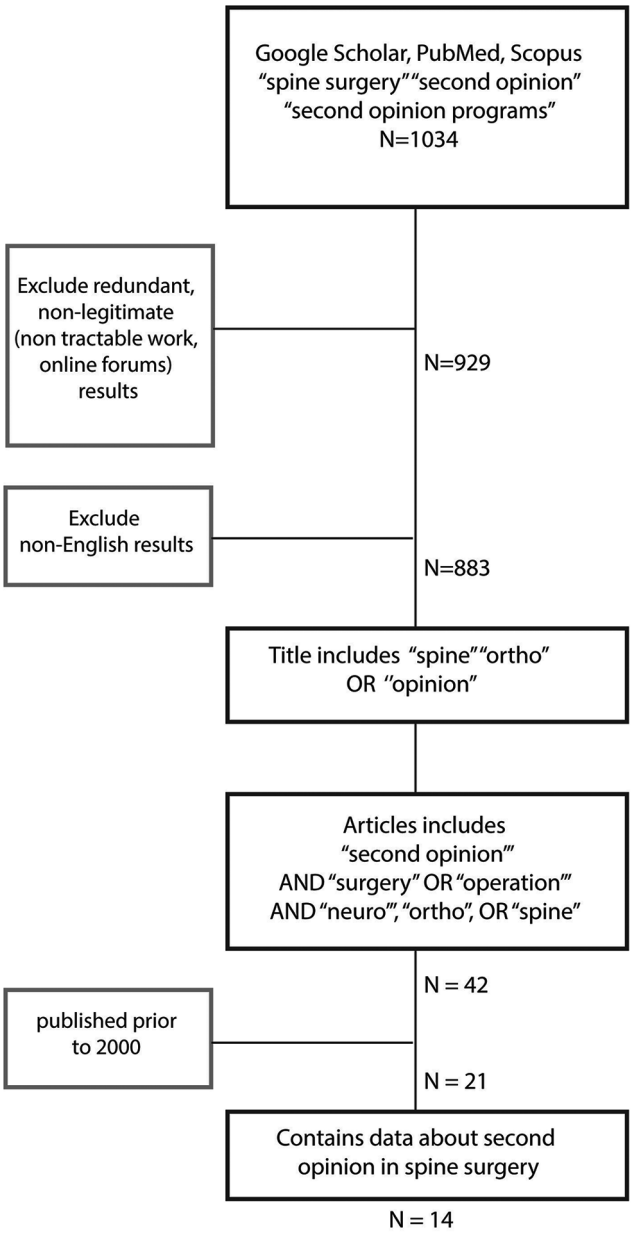


**Figure 1:** Study inclusion criteria. Process of exclusion and inclusion of studies for the scoping review. Search terms included: "spine surgery" AND "SO," and "SO programs." Primary articles/titles included "spine," "orthopedic," "opinion," text included ("SO," "surgery," "operation") and ("neuro"/"ortho" "spine"). SO: Second opinion.

### Evaluation of potential bias

Study descriptors, methodological considerations, and potential sources of bias were noted [Table 1].

In half of the studies, the SO provider also authored the published work, and in the majority of studies there was the potential for selection bias (i.e., the SO was sought by patients as opposed to systematic recruitment).

### Data collection

The following data were extracted: SO recommendation for no or different surgery, SO surgery practices across spine specialties, discordance rates between first and SO treatment and diagnosis, discordance rates for specific operations, likelihood for surgical recommendation during a first versus SOs, and patient-reported outcomes [Tables 2-6].

## RESULTS

Two reviewers reached a consensus on 14 articles that were included in this analysis regarding the utility of SO in spinal surgery [Figure 1 and Table 1].[1-6,9-12,14-17]

### Discordant SO recommendations

Two categories of discordant SO recommendations were reported in five of the studies: (1) surgery was recommended by the first and not the SO, or (2) the type of surgery recommended by the SO was different from the type recommended by the first surgeon [Table 2]. Using pooled data from these studies, the majority (75% [$n$ = 719]) of discordant cases involved a SO recommendation for nonoperative treatment, whereas a different surgery was recommended in 25% [Table 2]. Notably, in the two studies that examined surgical recommendations for both first and SOs from a single provider, the rates of surgical recommendation were comparable but slightly higher in SOs (pooled first opinion surgical recommendation: 35.5% and SO surgical recommendation: 47%).[4,6]

### Frequency of SOs in spine surgery practice

Using pooled data across studies, 40.6% (n = 1020) of spine surgery consultations were for a second opinion [Table 3]. One study only reported discordant SO cases,[3] and another study reported patients who had a previous spinal surgery elsewhere, excluding patients seeking a SO for a first operation.[1] In a one study, where frequency of SO consultation on individual procedure types across a number of specialties was reported, spine surgery had the second most SO requests out of any operation, comprising 23.7% of SO cases[17] [Table 3]. Thus, SOs are common in spine surgery practices and frequently discordant from first opinions.

### Discordance rates

Discordance rates between first and SOs in spine surgery suggest that SOs provide patients with additional information regarding medical risks and financial costs.

One study reported 59.8% diagnosis discordance in spine surgery for SO[9] [Table 4]. Additional studies did not report specifically on spine surgery, but reported on SOs in surgical

**Table 1:** Study design and methods.

| | Study descriptors | | | Methodological considerations | | | | | | Sources of bias |
|---|---|---|---|---|---|---|---|---|---|---|
| | Country | Size | Study duration | Prospective/ retrospective | 1st opinion provider(s) | 2nd opinion provider(s) | Duration between 1st and 2nd opinion | 2nd opinion includes in person consultation? | Follow-up measures | Type of bias |
| Epstein and Hood, 2011 | USA | 274 | 1 year | Prospective | Surgeon | Neurosurgeon | Unspecified | Y | Unspecified | Unblinded, selection, author |
| Epstein, 2011 | USA | 47* | 1 year | Prospective | Surgeon | Neurosurgeon | Unspecified | Y | Unspecified | Unblinded, selection, author |
| Gamache, 2012 | USA | 240 | 14 months | Prospective | Surgeon or primary care/ neurology referral | Neurosurgeon | Unspecified | Y | Patient satisfaction w/ additional opinion | Unblinded ◈ ◈ selection, author, service |
| Epstein, 2013 | USA | 437 | 20 months | Prospective | Spine surgeons | Spine surgeon | Unspecified | Y | Unspecified | Unblinded, selection, author |
| Daffner *et al.*, 2013 | USA | 69 | 3 months | Prospective | Spine surgeon | Spine surgeon | Unspecified | Y | Unspecified | Unblinded, selection, author |
| Epstein and Gottesman, 2014 | USA | 7✣ | 20 months | Prospective | Unspecified | Spine surgeon | Unspecified | Y | Unspecified | Unblinded, selection, author |
| Vialle, 2015 | Brazil | 94 | 1 year | Prospective | Unspecified | Spine surgeons (3rd opinion if disagreement between 1st and SO) | Unspecified | Unspecified | reoperations within a 1-year from SO | Unblinded |
| Meyer *et al.*, 2015 | USA | 6791 | 2 years | Retrospective | Unspecified | Range of specialties: physicians -> expert specialists | Unspecified | N | Clinical impact and patient satisfaction | Unblinded, selection |
| Shmueli *et al.*, 2016 | Israel♦♦ | n=1,392,907 and n=848 | 19 months ◍ ◎ | Retrospective | Specialist A (Variety of specialists) | Specialist B (w/ in same spec) | Unspecified | Y | Unspecified | Selection |

*(Contd...)*

**Table 1:** *(Continiued).*

| | Study descriptors | | | Methodological considerations | | | | | | Sources of bias |
|---|---|---|---|---|---|---|---|---|---|---|
| | Country | Size | Study duration | Prospective/ retrospective | 1st opinion provider(s) | 2nd opinion provider(s) | Duration between 1st and 2nd opinion | 2nd opinion includes in person consultation? | Follow-up measures | Type of bias |
| Shmueli *et al.*, 2017 | Israel♦♦ | n=848 | 12 months | Retrospective | Specialist A (Variety of specialists) | Specialist B (w/ in same spec) | Unspecified | Y | Patient satisfaction, self-reporting of improvement, preference between opinions | Selection |
| Lenza *et al.*, 2017 | Brazil | 485 | 1 year | Prospective | Community surgeon | Physiatrist and orthopedic surgeon followed by review board (orthopedic and neurosurgeons) | Unspecified ◂ | Y | Pain, RMSD, ODI, and adverse events | Service |
| Robarts *et al.*, 2017 | Canada | 102 | Unspecified | Prospective | Referred by nonsurgical SP or GP. | Two assessors: surgeon (2) and physiotherapist (APP). ➢ | Same day | Y | VSQ-9: satisfaction w/ APP | Service, author |
| Shmueli *et al.*, 2019 | Israel♦♦ | 1,392,907, SO population=143,371 | 19 months◎ | Retrospective | Specialist A (Variety of specialists) | Specialist B (w/ in same spec) | Unspecified | Y | N/A | Selection |
| Weyerstraß *et al.*, 2020 | Germany | 1,414 | 64 months | Retrospective | Specialist | Range of specialties: medical team identify expert specialist | Average 5 days∆ | N | 1,3,6 mo satisfaction HRQoL | Selection |

SO: Second opinion, N: No, Y: Yes. Unspecified indicates that information was not listed in the paper. Types of bias include: blinding- \SO provider blinding to initial opinion; service-the SO provider also provided the subsequent service; selection-the SO was sought by the patient rather than through systematic recruitment; author-the SO provider is also the author of the study. *Geriatric patients previously reported in Epstein and Hood 2011. ✤ Patients with neurodegenerative disease previously reported in Epstein 2013. ➢Roberts *et al.*, 2017: The first and SOs were collected simultaneously between two assessors. ♦♦ Shmueli 2016, 2017 and 2019 utilized overlapping datasets. ◈Author provided first opinion and gave all patients the option of participating in study and thereby receiving a SO. ◊ Patients were advised to obtain a SO by their health insurance. ◂ Amount of time between first and SO was unspecified; however, patients referred for a SO received opinions from both a physiatrist and surgeon consecutively. ◍ Medical records analysis spanned 19 months. ◎Telephone survey was conducted during 1 month and requested information regarding the previous 1 year. ◭ Study includes both patients who sought SO of their own volition and patients whose insurance company recommended that they obtain a SO. ◬ Average time following SO request, average time between opinions unspecified. ◈◈Blinding was optional and determined by patient

**Table 2:** Discordant SO recommendations.

| Study | Spine SO recommends nonsurgical management | Spine SO recommends a different surgery |
|---|---|---|
| Epstein and Hood, 2011 | 96% (*n*=47) | 4% (*n*=47) |
| Gamache, 2012 | 100% (*n*=69) | 0% (*n*=69) |
| Epstein, 2013 | 64.5% (*n*=172) | 35.5% (*n*=172) |
| Daffner *et al*., 2013 | NA | NA |
| Vialle, 2015 | 50% (*n*=72) | 50% (*n*=72)♦ |
| Meyer *et al*., 2015 | NA | NA |
| Shmueli *et al*., 2016 | NA | NA |
| Shmueli *et al*., 2017 | NA | NA |
| Lenza *et al*., 2017 | 79% (*n*=359) | 21% (*n*=359) |
| Robarts *et al*., 2017 | NA | NA |
| Weyerstraß *et al*., 2020 | NA | NA |

Percentages were calculated over the total of discordant SOs. NA (not applicable) indicates that the information was not available in the paper. ♦Vialle *et al*., 2015, 46% recommended less aggressive and 4% recommended more aggressive procedure. SOs: Second opinions

**Table 3:** Frequency of SOs.

| Study | Frequency of SO within spine surgery practice | Frequency of spine SO across specialties |
|---|---|---|
| Epstein and Hood, 2011 | 19% (*n*=274)* | NA |
| Gamache, 2012 | 65%✣ (*n*=240) | NA |
| Epstein, 2013 | 42% (*n*=437) | NA |
| Daffner *et al*., 2013 | 32% (*n*=69) | NA |
| Vialle, 2015 | NA♦ | NA |
| Meyer *et al*., 2015 | NA♦ | Orthopedic surgery: 17.6% Neurological surgery: 3.8% (*n*=6791) |
| Shmueli *et al*., 2016☆ | NA♦ | 36.7% (*n*=255,086) and 45.7% (*n*=243) (orthopedic) |
| Shmueli *et al*., 2017 | NA♦ | NA |
| Lenza *et al*., 2017 | NA◊ | NA |
| Robarts, 2017 | NA♦ | NA |
| Weyerstraß *et al*., 2020 | NA♦ | 23.7% (*n*=1414) |

Frequency of SOs was calculated as percentage of SOs out of total number of cases seen throughout the study duration. *n*=total number of patients consulted. NA (not applicable) indicates that the information was not available in the paper. *Epstein and Hood 2011 report only SOs with first opinion surgery recommendations deemed "unnecessary." ✣ Includes 2nd, 3rd, and 4th opinions. ♦Studies conducted from SO programs, included only SOs. ◊Lenza et al. 2017, study recruited only SO patients. Daffner *et al*. 2013, n=number of patients who had had a previous operation with a different surgeon and upon developing new symptoms sought care at the spine centers surveyed. ☆ Shmueli *et al*., 2016 utilized a database and a phone survey as two independent datasets. Shmueli *et al*., 2017, studies utilized overlapping data with Shmueli *et al*., 2016. n represents the total number over which percentages were calculated. SOs: Second opinions

**Table 4:** Discordance rates between first and SOs across specialties and within spine.

| Study | Overall diagnosis discordance rate | Overall treatment discordance rate | Spine diagnosis discordance rate | Spine treatment discordance rate |
|---|---|---|---|---|
| Epstein and Hood, 2011 | NA | NA | NA | 17.2% (n=274)* |
| Gamache, 2012 | NA | NA | NA | 44.5% (n=155) |
| Epstein, 2013 | NA | NA | NA | 94% (n=183) |
| Daffner *et al*., 2013 | NA | NA | NA | NA |
| Vialle, 2015 | | | NA | 76.6% (n=94) |
| Meyer *et al*., 2015 | 14.8% (n=6791) | 37.4% (n=6791) | Neurologic surgery: 17.8% (n=259) Orthopedic surgery: 13.8% (n=1195) | Neurologic surgery: 42.5% (n=259) Orthopedic surgery: 34.6% (n=1195) |
| Shmueli *et al*., 2016 | NA | NA | NA | NA |
| Shmueli *et al*., 2017 | 56.1%▲ (n=344) | 56.1%▲ (n=344) | NA | NA |
| Lenza *et al*., 2017 | NA | NA | 59.8% (n=425) | 84.47% (n=425) |
| Robarts *et al*., 2017 | NA | NA | NA | 13.7% (n=102)△ |
| Weyerstraß *et al*., 2020 | NA | 64.8% (n=1414) | NA | 68% (n=344) |

Discordant treatment and diagnosis rates were calculated as the percentage of SO that disagreed with the first out of the total number of overall and spine SOs. NA (not applicable) indicates that the information was not available in the paper. *Epstein and Hood 2011, total number of SOs not reported; discordance rate calculated as percentage of SO cases deemed unnecessary out of total number of cases seen.△Robarts *et al*. 2017, agreement between two providers (physiotherapist and spine surgeon) on the necessity of a spine surgical consultation, rather than on final treatment recommendation. ▲Shmueli *et al*., 2017, did not distinguish between discordance in treatment or diagnosis

specialties that typically perform spine surgery. Using pooled data from spine/neurological/orthopedic surgery, diagnosis discordance was 24.8% (*n* = 1879) and treatment discordance was 49.2% (*n* = 3031).

In another study, concordance was either "confirmed" or "clarified," possibly deflating discordance values relative to the other studies.[10] Two additional studies used overlapping data. In Epstein, 2011, out of the discordant cases previously identified in Epstein and Hood 2011 (*n* = 47), seven were geriatric cases (age > 65).[2,3,5] A second study re-mined

**Table 5:** Discordance rates in specific spine operations.

| Study | Operation types showing consistent discordance | Most frequent discordant operation types relative to all types |
|---|---|---|
| Epstein and Hood, 2011 | NA | 44% cervical operations, 55% lumbar operations (*n*=47) |
| Gamache, 2012 | NA | NA |
| Epstein, 2013 | NA | 35% cervical surgery 23% lumbar fusions (*n*=172) |
| Daffner et al., 2013 | NA | NA |
| Vialle, 2015 | 100% tumor lesion (*n*=1) 91.7% failed back surgery (*n*=12) 86.2% facet syndrome (*n*=9) | 23% failed back surgery 23% lumbar disc herniation 14% symptomatic disc degeneration (*n*=43) |
| Meyer *et al*., 2015 | NA | NA |
| Shmueli *et al*., 2016 | NA | NA |
| Shmueli *et al*., 2017 | NA | NA |
| Lenza *et al*., 2017 | 100% lumbar arthrodesis (*n*=27) 100% cervical arthrodesis (*n*=14) 100% radiofrequency rhizotomy (*n*=8) | 5% lumbar arthrodesis 2.5% cervical arthrodesis 1.4% radiofrequency rhizotomy (*n*=568) |
| Robarts *et al*., 2017 | NA | NA |
| Weyerstraß *et al*., 2020 | NA | NA |

Discordance rate within operation type was calculated using the total number of patients coming in with the operation type as the first opinion. The most frequent discordant operation types were calculated over the total number of discordant cases. NA (not applicable) indicates that the information was not available in the paper.

data from Epstein 2013, and found that of the patients seen for SO, 3.8% had a neurodegenerative disease, and the discordance rate in this population was 100%, whereby the SO recommended no surgery.[2]

The estimated rate of SO cases diagnosed as nonspinal was 11.8% ($n$ = 404), including myofascial pain syndrome, multiple sclerosis, lupus, and fibromyalgia.[3,9]

In all studies, discordance was observed in all surgical categories reported [Table 5, Columns 1 and 2].

**Table 6:** Reported outcomes after obtaining second opinions.

| Study | Reported patient outcomes |
|---|---|
| Epstein and Hood, 2011 | NA |
| Gamache, 2012 | NA |
| Epstein, 2013 | NA |
| Daffner, 2013 | NA |
| Vialle, 2015 | NA |
| Meyer *et al*., 2015 | NA |
| Shmueli *et al*., 2016 | NA |
| Shmueli *et al*., 2017 | 76.5% experienced improvement after getting SO |
| Lenza *et al*., 2017 | No significant differences at 12-month follow-up in predefined outcomes between the surgery and CM SO cases<br>A significantly larger proportion of individuals from the surgery group (80.7% of *n*=46 vs. 64% of *n*=50) showed a reduction in pain VAS greater than 1.5 units[#]<br>4 patients in the surgical, and 9 in the CM group had failed treatment and were referred for surgical intervention |
| Robarts *et al*., 2017 | NA |
| Weyerstraß *et al*., 2020 | 74.3% rated perceived health status as good/very good |

NA (not applicable) indicates that the information was not available in the paper, *Lenza *et al*., 2017, post hoc analysis.

### Patient reported outcomes after SO

Two studies included patient self-reports of perceived health (74.3% reported improvement and 76.5% rated health as good/very good) [Table 6]. A third study showed that 80.7% of SO patients undergoing surgery experienced significant pain reduction versus 64% of patients treated conservatively.

## DISCUSSION

Approximately half of new visits to spine surgeons (40.6%) are SO consultations. Among those SOs, discordance with first opinion is (59.8%). Many patients seek a SO because they are afraid of having surgery, and the majority of discordant SOs recommend no surgery (75%). SOs, therefore, may inform decisions related to surgical costs and undesirable risks/complications of surgeries.

### Factors contributing to discordance rates

Factors contributing to discordance rates would appear to include: variable training between physicians/spine surgeons, the different times elapsed between spine surgical opinions, and the potential changes occurring in the patients' clinical status between opinions.

In addition, providers of the SO should be separate from those providing the service to avoid any conflict of interest.

## CONCLUSION

This report highlights the discordance rates found regarding spinal surgical recommendations between first and SOs. Prospective studies are needed to objectively investigate the impact of following a first versus a SO since, SOs may reduce the physical and financial costs of spine surgery.

### Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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### Conflicts of interest

There are no conflicts of interest.

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