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NATIONAL DATABASES OR SINGLE-SURGEON REGISTRIES:

IS BIG DATA BETTER?

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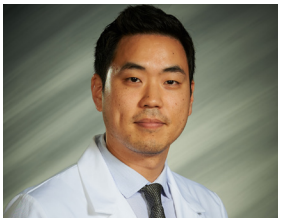
National Databases or Single-Surgeon Registries: Is Big Data Better?



Elliot D.K. Cha, MS

Conor P. Lynch, MS

Kern Singh, MD

Since the turn of the century, large-scale acquisition of data through either personal or commercial devices has led to the progression of innovative technologies, such as machine learning, which enable users to predict trends or outcomes in a wide variety of disciplines. Healthcare has recently been introduced to the use of "big data," which was a term first coined in the 1990s to describe information that is beyond the processing capacity of a single software. With electronic health records digitized, patient-acquired outcomes surveyed through online portals, and even use of telemedicine, medical research has undergone a gradual but inevitable transition toward a data-rich environment.

In an effort to track and analyze outcomes for a high number of patients, large, broadly focused national databases such as the American College of Surgeons National Quality Improvement Program (ACS-NSQIP), the National Inpatient Sample, and Centers for Medicare and Medicaid Services, as well as spine-specific registries including the North American Spine Society Spine Registry, the SWISSspine registry, and the European Spine Registry have increasingly been utilized for clinical spine research. In addition to these much larger databases, other forms of spine registries exist at both the single-institutional or single-surgeon level. Although national registries typically allow analysis of vastly larger samples (as compared to the single-level databases), the question remains to what extent this advantage overshadows the use of smaller databases in terms of changing clinical practice within the context of spine surgery.

In order to facilitate the collection and use of larger national datasets, standardization of recorded variables is required. In doing so, variations in demographics or perioperative characteristics can be reduced and outcome variables can be optimized to report more commonly used metrics rather than rarely used measures. Also, collection of data from a wide variety of providers and patient populations permits investigators to report a more generalizable result rather than a potentially isolated or, in some cases, biased finding. Along with standardization, another irrefutable strength of big data is its greater statistical power and thereby potential for more complex statistical methods. With such high numbers of enrolled patients, in some cases ranging into the tens of thousands, potential trends, associations, and prognostic models become less hypothetical and allow

for detection of subtle yet important relationships. Large patient cohorts also benefit from the investigation of rare spinal diseases or specific clinical scenarios (eg, revision procedures among patients with severe diabetes) that would otherwise be scarce among single-provider/institution populations. Additionally, large-scale analysis of adverse events and associated risk factors across a diverse population also has the potential to allow establishment of national benchmarks for quality and safety, which may provide a basis for accepted standards and in turn guide clinicians and surgeons to make necessary changes to their practices. Although the advantages of big data appear invaluable, large national registries are not without their own sets of limitations.

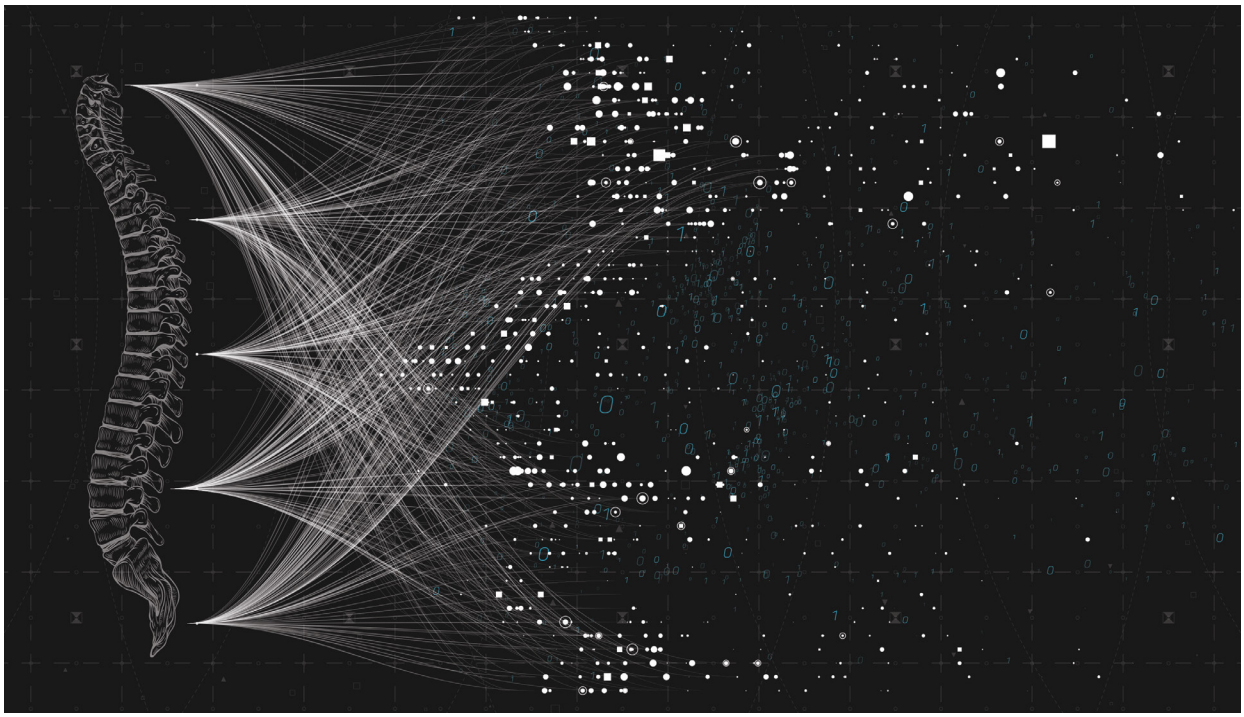
In large-scale studies, such as in genomics, heterogeneity is considered a less favorable trait because it requires a higher level of analytics to account for recorded confounders. The ACS-NSQIP has more than 700 participating institutions, which introduces substantial variability in operative and baseline patient characteristics. To further complicate the matter, only those confounding variables that are routinely recorded by a given database can be systematically accounted for and there typically is no room for a "chart review" to confirm or deny the presence of such confounders. For example, certain databases may record use of an anticoagulant but fail to provide the specific agent used. Therein lies another limitation of large-scale databases: an inability to confirm the veracity of the shared data. Every attempt is made to externally validate and have extensive oversight on the included data in national clinical databases such as the ACS-NSQIP. However, other databases, such as the National Inpatient Sample, are reliant on International Classification of Diseases and insurance codes, which have been proven to have inaccuracies,[1] potentially influencing the results of surgical studies.[2] Moreover, a number of spine-related studies have reported variations in the data collected and results reported when the same methodology is performed using different databases,[3,4] further bringing into question the accuracy of the purported conclusions.

More specific to the field of spine research is the fact that most large-scale datasets are limited to a select set of reported outcomes. For example, spine surgery has thoroughly adopted the use of patient-reported outcome measures to evaluate postoperative improvements, but these measures are noticeably limited in the ACS-NSQIP. Additionally, tracking adverse events or postoperative complications is limited to 30-days postoperatively and lacks data regarding pseudoarthrosis rates or implant information,[5] all of which could help suggest changes in practice. Also, with more investigators participating and using national databases, the cost of maintenance and risk of privacy leaks on both ends are increasingly important. While some maintain that information is de-identified, there is a dearth of studies that evaluate the true ramifications to patients if security were to be breached. As the field of spine research continues to utilize national databases, these shortcomings will continue to persist, but use of registries maintained by

a single institution or surgeon may provide an effective alternative to address many of the limitations faced by larger databases.

On a smaller scale, databases driven by a single principal investigator similarly enable surgeons and institutions to track results in an effort to ameliorate outcomes for their patient base. Enrollment in a national database requires extensive oversight to achieve a baseline level of accuracy; however, surgeons or institutions maintaining their own database may be able to achieve a similar or greater level of accuracy with lower costs but also greater ease of access. In contrast to the inaccuracies mentioned with national registries, there is personal accountability by surgeons for the recorded information. In the event of questionable veracity, a simple and less taxing process of validating the information can take place. For spine surgery specifically, a more homogeneous population could be seen as a disadvantage for research; however, this may allow for the elucidation of trends or associations with minimal confounders, both recorded and unrecorded. Also, there is the subject of the very data that are being recorded. Beyond patient demographics and operative characteristics, single-surgeon/institution registries are afforded the advantage of collecting spine-specific outcomes, complications, implant information, and even biological samples, which collectively make for a more comprehensive and potentially more impactful dataset. Furthermore, this precise and relatively modifiable control over the characteristics and metrics collected may facilitate studies to address more specialized or practice-specific research questions.

Shortcomings of these more localized types



of registries primarily have to do with patient volume limitations or a shift in the research community's preference toward larger scale data for clinical studies. In order to achieve a similar level of statistical significance, a single surgeon must have the foresight to initiate collection of patient information early in his or her career and must additionally maintain a highly productive clinical practice alongside his or her research activities. Furthermore, the longer time span required for a single provider to collect a statistically meaningful sample renders them less positioned to capture time-sensitive trends or provide analysis of a rapidly evolving aspect of practice. For example, larger databases may be better suited to determine initial safety profiles for a new implant technology for which a single provider may only perform a few cases each year. Even when these limitations are addressed, there remains the question of the data representing an overly specific population, which may not generalize well to other demographics. Still, the benefits of smaller but potentially more accurate/detailed single-surgeon/institution registries should not be overlooked because they may offer high-level evidence to address specific spine research questions.

There is not one true source of data that can be universally favored over another as the advantage of large scale vs small scale surgical registries is highly dependent on the research question itself. There may be more benefits to use of a national database with regard to demographics that may place patients at higher risk for poorer outcomes or for relatively uncommon clinical scenarios that may only occur a few times within a given practice. Conversely, use of pharmaceuticals or more specialized outcomes measures, which are not readily reported in large scale data, can be thoroughly explored and accurately reported by use of smaller surgical registries. Both large national databases and single-provider registries have an important role to play in elucidating the complex and rapidly evolving field of spine surgery. Understanding which type of data is best suited to a given question will facilitate the production of timely and high-quality literature. ■

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Cost-Effectiveness of Image Guidance in Spine Surgery

Yu-Po Lee, MD

Image guidance in spine surgery is becoming more widely utilized. Several studies have shown the use of this technology to increase the accuracy of pedicle screw placement, which can decrease the rate of revision surgery and surgeon radiation exposure. However, the use of image guidance requires implementation of new technologies, and with this comes increased cost. Also, the additional set-up required for some cases results in increased operative time. Given these costs and benefits, surgeons must evaluate whether image guidance has a place in their practices.

One of the biggest impediments to using image guidance is the direct cost of the technology. In one study, the authors reported that their computed tomography image guidance system (NaviVision [Vector Vision-BrainLAB] and Arcadis Orbic [Siemens]) cost $475,000.[1] Alternatively, the Mazor X (Medtronic) has been reported to cost as much as $850,000, the ROSA spine system (Zimmer Biomet) has been reported to cost approximately $700,000, and the Excelsius GPS (Globus Medical) has been reported to cost as much as $1,500,000.[2] Added to these upfront costs are the annual maintenance expenses, which can be approximately $25,000 per year, and costs of the disposables, which can amount to approximately $1,500 per case.[2] In a smaller hospital, which may perform relatively few spine surgeries each year, these costs may be prohibitive. In a larger hospital system, however, these costs could be spread out among a greater number of surgeons.

Other factors to consider include the need for radiology technicians and staff who are both trained and familiar with a specific imaging system. Having trained staff who know how to operate the system decreases the set-up times, which represents another impediment to implementation of image-guidance systems. In practices in which most spine surgeons perform relatively smaller cases (consisting of laminectomies and one- and two-level fusions), the set-up time may prohibit the use of image guidance. In contrast, for practices where longer fusions are performed with abnormal anatomy commonly encountered due to scoliosis or prior surgery, imaging guidance may expedite the surgery.

The primary benefit of image guidance is the improved accuracy of pedicle screw placement. Many studies have shown that image guidance improves pedicle screw placement. In one such study, Watkins et al[1] reported that the rate of revision surgery was reduced from 3% to 0% with the use of image guidance (P=0.08). While this finding may not be statistically significant, some surgeons may find this reduction in revisions to be of clinical significance. In fact, Watkins

et al[1] reported that this reduction resulted in a cost savings of $71,286 per 100 cases, which was balanced against the initial cost of $475,000 their system. In another study, Menger et al[3] evaluated the benefits of using robotic-assisted surgery in 1,985 cases over the course of 1 year. The authors estimated that robotic surgery would result in an estimated savings of $608,546 during a 1-year period at an academic center performing 557 elective thoracolumbar instrumentation cases.[3]

In light of these potential benefits, the use of image guidance and robotic technology is gaining acceptance in spine surgery. However, the costs of these systems must be considered in an institution-specific manner. In a smaller hospital that performs relatively few spine surgeries, the costs can be prohibitive. However, in a system that performs hundreds of cases per year or performs complex scoliosis and revision surgeries, use of image guidance could result in a net savings to the hospital in 1 to 2 years. In addition to these cost savings, image guidance brings the added benefits of decreased radiation and the ability to market the hospital's ability to perform more complex surgeries. Therefore, surgeons and hospital administrators must evaluate whether image guidance makes sense for them based on the volume and complexity of their cases. ■

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Improvement (or Lack Thereof) After Surgery for Cervical Spondylotic Myelopathy


Alexander Satin, MD


Ram Haddas, PhD


Peter B. Derman, MD, MBA

Traditionally, the goal of decompressive surgery for cervical spondylotic myelopathy (CSM) was to arrest neurological deterioration and prevent further disability rather than provide functional recovery.[1,2] The long-standing skepticism regarding functional improvement after surgery has faded in recent decades. Nevertheless, there has been some debate regarding whether or not surgery is more effective than nonoperative care for mild disease. While some studies demonstrated excellent results after surgery,[3-6] critics pointed to their retrospective nature. Several subsequent large prospective studies have investigated the efficacy of surgery in patients with CSM.[7-11] In recent years, functional gait and balance analysis has provided additional insight into functional improvement following surgery for CSM.[12-14]

Clinical studies evaluating the efficacy of surgery for CSM can be evaluated based on the presence (comparative) or absence (noncomparative) of a nonoperative control group.[1] More recent studies do not contain a control group due to ethical concerns regarding treatment equipoise—it would presently be inappropriate to withhold surgical treatment from a patient with CSM.[9,15]

Comparative Studies

Using the Cervical Spine Research Society database, Sampath et al[16] compared the short-term (mean follow-up = 11 months) results of nonoperative treatment to operative treatment of cervical myelopathy. In this prospective, multicenter, non-randomized study, a total of 20 patients underwent surgery and 23 received nonoperative treatment, with both cohorts evaluated separately using novel outcome tools. Methodological weaknesses aside, patients in the surgical cohort experienced improvement in functional status and neurological symptoms, whereas patients in the nonoperative cohort exhibited significant worsening of both.

Kadanka et al[7] published the first prospective randomized study comparing nonoperative and operative treatment of patients with mild and moderate (modified Japanese Orthopaedic Association [mJOA] score ≥ 12) CSM. In their study, 48 patients were randomized and followed for 2 years. At final follow-up, average functional im-

provement was comparable between the treatment groups. To determine whether the impact of surgery might appear later, the authors subsequently completed a similar randomized study of 68 patients followed to 3 years.[8] Once again, no important differences in outcomes were found between the patients treated surgically and those managed conservatively. While these studies were randomized, critics have pointed to the small sample size and loss to follow-up.[1,17] Furthermore, the results directly conflict with a number of large, noncomparative prospective series that demonstrate significant functional improvement after surgery for CSM (including mild and moderate).

Noncomparative Studies

The AO Spine North America Prospective Multi-Center Study was published in 2013 and consisted of 278 CSM patients from 12 centers across North America.[9] It included patients with mild (30.6%), moderate (39.6%), and severe (29.9%) CSM. Details of surgical management were up to surgeon discretion. The authors demonstrated significant improvement from baseline to 1 year postoperatively ($P<0.05$) in the mJOA score, Nurick grade, Neck Disability Index score, and all 36-item Short Form Health Survey, version 2 (SF-36v2) health dimensions (including the mental and physical health composite scores). With the exception of the change in the mJOA, the degree of improvement did not depend on the severity of the preoperative symptoms. While their results suggest that surgery is most effective for patients with moderate or severe disease, patients

with mild symptoms at presentation still had significant improvement in function after surgery.

The findings of this North American study were confirmed by the subsequent AO Spine International CSM study,[10] which consisted of 478 CSM patients from 16 sites across the globe. At 2-year follow-up, patients demonstrated clinically significant improvements in the same functional, disability, and quality-of-life outcomes as the North American study despite wide regional variation in patient demographics, pathology, and surgical approach. The authors concluded that decompressive surgery for CSM is safe and improves function and quality of life regardless of practice location and resources.

Given the aforementioned debate regarding the treatment of mild CSM, Badhiwala et al[11] identified 193 patients from the AO Spine North American and International studies with mild CSM (mJOA 15-17) and evaluated their baseline impairment and surgical outcomes. The authors found that patients with mild CSM had significant impairment in all domains of the SF-36v2 before surgery when compared to population norms. Furthermore, significant improvement was found in all outcome measures at 2-year postoperative follow-up. Based on their findings, the authors favored operative care for mild CSM, especially given that nonoperative management offers at best stability without improvement.

Gait and Biomechanics Studies

Functional outcome measures gleaned from the Texas Back Institute Spine Biomechanics Laboratory play an important role in clinical practice at our institution and have enriched our understanding of the spatiotemporal gait and balance dysfunction experienced by CSM patients. By comparing parameters before and after surgery, we have been able to identify objective improvement after operative treatment. In a prospective cohort study of 25 CSM patients, Haddas et al[13] used a three-dimensional motion capture system to evaluate the effect of decompression surgery on the biomechanics of the spine and lower extremities in CSM patients and compared them with 30 asymptomatic controls. Prior to surgery, CSM patients exhibited significantly slower walking speeds, reduced cadence, and longer step times. Following surgical decompression, CSM patients had significantly improved gait measures that were comparable to those of asymptomatic controls.

Haddas et al[12] completed further work evaluating the effect of decompression on functional balance in patients with CSM. Before surgery, CSM patients exhibited markedly diminished balance on Romberg (ie, increased sway) and tandem gait tests (ie, increased time and wider stance). Although CSM patients demonstrated significant improvement in balance at 3-month follow-up, kinematic and spatiotemporal parameters did not completely normalize to the levels observed in asymptomatic controls. Similar findings were reported in a study quantifying ground reaction forces: surgical intervention resulted in improvements in but not complete resolution of gait disturbances.[14]

Conclusion

While ethical considerations presently preclude direct comparison of surgical with nonoperative care in patients with significant CSM, multiple modern prospective clinical and functional analysis studies demonstrate that operative management of CSM is safe and leads to at least some functional improvement. Patients with more severe CSM can, on average, anticipate greater relative functional recovery, but even patients with mild CSM tend to experience gains following surgery. It is important to remember that the results of these studies are averages, however, and individual outcomes vary. Nonetheless, the traditional dogma regarding a general lack of improvement after surgery for CSM is not supported by the current literature. Future studies should be aimed at identifying predictors of clinical outcome and optimal surgical approaches. ■

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Will My Strength Come Back?

Advising Patients Presenting With Preoperative Lower Extremity Weakness Due to Lumbar Pathology

Sravisht Iyer, MD

Neurologic deficits due to lumbar pathology may be seen in up to 20% to 80% of lumbar disc herniations.[1,2] Although a vast majority of these deficits are mild,[2,3] they are understandably of significant concern to the patient and are a common reason for referral to spine surgeons.

The etiology of weakness in the lumbar spine is thought to involve venous congestion and decreased blood flow due to compression from an acute disc herniation or other degenerative pathology.[4] These changes may occur at multiple motion segments, leading to multiple sites of compression for a given nerve root or even compression of multiple nerve roots that innervate a given motor unit (eg, compression of the L4 and L5 nerve roots affecting the tibialis anterior).[5-7]

Several clinical and radiographic factors have been associated with the presence of weakness, including diabetes, acute onset of symptoms, large disc herniations (typically >50% of the canal cross-sectional area) and the presence of sequestered fragments that affect traversing roots at multiple levels.[6]

Given how unsettling a neurologic deficit can be for the patient, seeing these patients in the office usually requires a fairly lengthy conversation and typically covers any number of questions. In this article, I sought to review the evidence regarding some of the most common questions I encounter: Do I need surgery? Should I get an injection? Will my weakness get better after surgery? How quickly do I need surgery? How quickly will the strength come back after surgery?

Do I need surgery?

Most surgeons consider the presence of neurologic deficits to be an indication for surgery and, consequently, there have been few studies that have examined non-operative management in this group of patients. The few studies that exist, however, are not "slam dunks" when it comes to establishing the need for surgery.

Weber[8] described his experience with nonoperative management in a series of 64 patients in 1975. Although this case series is of largely historic interest (conservative treatment was bedrest for 14 days!), the methodology and patient selection was actually quite reasonable.

Patients were observed for 14 days to ensure pain inhibition did not contribute to their motor deficit. Patients who improved were treated conservatively, patients who did not were indicated for surgery. Those with more "doubtful" progress were randomly assigned surgical or conservative management. In this group, 32 received surgery and 31 were managed conservatively. Surprisingly, surgical

intervention did not result in an improved prognosis; overall, there was an approximately 60% to 70% rate of partial recovery and 30% rate of complete recovery.

A more recent prospective observational study by Duborg et al[9] reported the results of 67 patients with severe weakness (≤3/5) and less than 1 month of symptoms. They found no difference in outcomes between the surgical and nonsurgical cohorts with approximately 25% to 40% rate of complete recovery and 50% rate of partial recovery.[9] However, the surgical cohort did have more severe preoperative weakness and a longer duration of symptoms than the nonsurgical group; these characteristics represent significant confounding variables as they have been repeatedly linked to poorer outcomes.

A systematic review[10] including both of these studies (Weber[8] and Duborg et al[9]) identified a total of 7 trials that have attempted to address the question of surgical vs conservative management in this setting. They identified a neurologic recovery rate of 38.4% in the surgical cohort and 32% in the nonoperative cohort with age and deficit severity being the most significant prognostic factors for surgery.

Should I get an injection?

Because the most common cause for weakness is an acute lumbar disc herniation, patients frequently inquire about the possibility of epidural injections prior to surgery. Butterman[1] reported on a series of 196 patients with lumbar disc herniation treated over 3 years. He noted that while surgical patients generally had the most rapid decrease in symptoms, about 40% to 50% of patients treated with an epidural had meaningful, lasting improvement in their symptoms. The remaining patients in the epidural cohort were converted to surgery.

In patients with preoperative weakness who received an epidural injection, the additional time to surgery did not impact the rates of neurologic recovery. It is important, however, to note that the authors noted a neurologic deficit rate of 80% at presentation, suggesting that they considered relatively mild weakness and/or weakness due to pain inhibition in their cohort.

Although there is no strong evidence for injections as definitive management for these patients, this evidence makes me feel comfortable recommending injections to patients who have mild or pain-induced weakness.

Will my weakness get better?

The rates of complete recovery (return of 5/5 motor strength) vary widely, ranging from the 30% range with nonoperative measures[8-10] to more than 60% in patients treated with surgery, with most falling in the 70% to 85% range.[1-3,11] Following either surgery or nonoperative care, partial improvement in motor strength is much more common. Girardi et al[3] showed an average improvement of approximately 1 muscle grade with partial improvement in 98% of patients.

The most common theme in the literature, however, is the interplay between symptom severity and rates of recovery. Almost all studies consistently report that patients with severe weakness (usually defined as ≤3/5)

have a much lower rate of complete recovery, generally in the 50% to 60% range.[2,11]

How quickly do I need surgery?

It stands to reason that if lack of blood flow is the cause of weakness,[7] then the duration of symptoms must surely impact the rates of recovery. Unfortunately, the literature is not quite so clear. Several studies in the literature have not found a strong link between the time to surgery and ultimate neurologic recovery,[1-3,12] and there are no firm "cut-offs" in the literature regarding when these patients need surgery. Postacchini et al[11] observed a significantly higher rate of recovery in patients treated earlier with surgery, but the "early" and "late" cohorts had a large range from deficit onset to surgery (7 to 90 days in the early group vs 8 to 730 days in the late group). The presence of these large ranges makes the data highly susceptible to skewing by outliers, and the authors made no attempts to account for this in their methodology. Still, based on their experience, they recommended a cut off of 35 to 70 days for patients with severe motor deficits.

On the basis of these data, there is a role to play for observation in the early, mild neurologic deficit (>4/5); at the very least, if the patient is reluctant to proceed to surgery, he or she can be reassured that waiting and watching for a few weeks is a reasonable option.

The management of more severe deficits, however, is more urgent. There is emerging evidence to suggest that patients with severe deficits should be treated with surgery in an emergent fashion[13,14] and that time to surgery may have a much more significant impact in their rates of recovery.[15]

Petr et al[13] examined a series of 330 patients with acute motor deficits caused by a disc herniation treated with surgery. They divided the group into ≤48 hours and >48 hours of weakness. They found that while surgical delay did not impact patients with moderate deficits, patients with severe weakness (≤3/5) had a significantly higher rate of recovery following early surgery—an almost 80% rate of complete recovery.[13] In a follow-up study,[14] the same group found a 75% rate of complete recovery in patients with severe weakness who had surgery within 72 hours of symptom onset, compared to a 0% rate of recovery in patients treated after 72 hours.

Although patients presenting so early after disc herniation may have significant weakness due to pain inhibition,[1,8] these data are certainly compelling. While stronger evidence are needed to perform these cases as urgent "add-ons," I emphasize the need for timely surgical intervention in patients with severe weakness.

How quickly will the strength come back after surgery?

Most patients notice appreciable changes in the early postoperative period. Postacchini et al[11] noted that among patients presenting with mild symptoms that subsequently recovered, 60% had achieved maximal improvement by 2 months, 83% by 4 months, and 96% by 6 months.[11] In patients with more severe symptoms, 33% had achieved their maximal improvement by 2 months,

48% by 4 months, 84% by 6 months, and the remaining 16% continued to improve until their final follow-up. Aono et al[15] had similar findings in their patients with severe preoperative foot-drop; they noted improvement was possible for up to 24 months, but the majority of patients had achieved their maximal improvement by 6 to 12 months.[15]

Conclusion

Treating patients with lumbar spine weakness requires a careful and considered discussion about their symptom severity, duration of symptoms, treatment options, and ultimate recovery. Patients with ≤3/5 weakness have the worst prognosis for complete recovery (about 50 to 60%) and require timely surgical intervention. Patients with more mild weakness (>4/5) have a more favorable prognosis for improvement; there is a role for observation and/or epidural steroid injections in this group. ■

Among patients presenting with mild symptoms that subsequently recovered, 60% had achieved maximal improvement by 2 months, 83% by 4 months, and 96% by 6 months.

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Patient Satisfaction After Spine Surgery

Brandon P. Hirsch, MD

Across medicine, the paradigm of consumer-driven health care continues to mature. The proliferation of high-deductible health plans and health savings accounts give patients increasing responsibility and control over the use of their health care dollars. Physician review sites have become increasingly popular, such that patients now use them to choose a doctor in the same way they might use a review site to choose a restaurant. Since 2012, the Centers for Medicare and Medicaid Services (CMS) have used patient satisfaction survey responses (along with other performance metrics) to allocate incentive payments to hospitals. Now more than ever, the concept of the "patient as customer" guides much of the decision-making regarding care delivery within hospitals and health care organizations.

Many methods exist for measuring patient satisfaction. Today, most surgeons are familiar with the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS), which is used by CMS to survey patients regarding their stay in an inpatient facility. This questionnaire is completed by a sample of patients following discharge and asks questions regarding nursing care, physician care, the physical hospital environment, and the patient's overall experience. The Press Ganey Medical Practice Survey was a similar questionnaire used by health care organizations prior to the adoption of HCAHPS by CMS. Currently, HCAHPS scores influence CMS payments to hospitals via the Hospital Value-Based Purchasing Program, in which facilities may receive a bonus or penalty of up to 2% annually based on performance.[1] In most institutions, physicians are given regular feedback on scores corresponding to their patients. For physicians employed by the institution they work in, these scores are frequently tied to compensation and, in some cases, even to the continuation of employment.

Studies have investigated factors that influence patient satisfaction scores following spine surgery.[2,3] While the existing literature is heterogenous in terms of study design, it does offer some insight into what impacts patients' perception of their care. Not surprisingly, many of these factors are related to patient demographics. Preoperative mood disorders have been found to negatively affect patient satisfaction in multiple studies. Levin et al[4] analyzed 237 patients undergoing lumbar surgery and found that depressed patients were significantly less likely to have a favorable view of their hospital experience. More specifically, depressed patients also had significantly lower HCAHPS scores related to doctor and nurse communication and were less often

satisfied with their ability to receive help in a timely manner in the hospital.[4]

In a subsequent study by the same group, the number of patient-reported allergies was found to correlate with significantly lower HCAHPS scores regarding pain control and communication about medications.[5] Interestingly, in spite of differences in these specific domains, the presence of preoperative depression and number of patient-reported allergies did not show significant correlation with the patients' overall hospital rating (OHR) in either study. The OHR is of particular interest as it is the only component of the HCAHPS survey used by CMS to adjust reimbursement.

Regarding patient demographics, studies evaluating the effect of patient age have yielded conflicting results, with some authors finding that older patients tend to be more satisfied[6,7] and others showing no age-related differences.[8,9] Data on the impact of gender have been similarly inconsistent.[7,10,11] Patients who smoke, who are unemployed, or who have had prior surgery have also demonstrated lower rates of satisfaction.[6,12]

In addition to demographic factors, certain aspects of patients' in-hospital experience appear to influence their overall satisfaction with their care. Levin et al[13] evaluated the HCAHPS responses of 453 patients to determine which individual questionnaire items had a significant impact on the patients' OHR and found associations with many of the individual survey questions.[13] Interestingly, the patients' perception that hospital staff did all they could to help with pain exhibited the strongest relationship to OHR (OR,

Patient satisfaction after spine surgery is a complex but increasingly important topic as the field continues to refine a patient-centric definition of value.

12.47; 95% CI, 6.56-23.70). This relationship was even stronger than that of the question asking whether the patients' pain was always well controlled (OR, 5.72; 95% CI, 3.10–10.56), suggesting that the patients viewed efforts to alleviate pain as even more important than whether these efforts were successful in doing so. Other survey items demonstrating strong associations with OHR were related to courteous treatment by nurses, whether nurses listened carefully, whether medication side effects were explained, and whether patient/family preferences were considered by the health care team.

The relationship between long-term patient-reported outcome measures and patient satisfaction is relatively understudied. In a 2017 study of 249 patients, Levin et al[4] did not find significant differences in outcome scores when comparing satisfied and dissatisfied patients on the basis of their OHR.[4] More data exist on the impact of immediate postoperative outcomes on patient satisfaction. In a 2020 study, Mets et al[7] found that the occurrence of any postoperative adverse event, including readmission, was associated with lower overall patient satisfaction. Similarly, postoperative emergency department visits have been shown to be associated with less favorable HCAHPS ratings.[14] Furthermore,

other investigators have also demonstrated that increased postoperative length of stay is negatively associated with patient satisfaction.[7,15,16]

Patient satisfaction after spine surgery is a complex but increasingly important topic as the field continues to refine a patient-centric definition of value. Multiple factors appear to influence patients' perception of their care, including inherent demographic factors, experience during the hospital stay, and occurrence of complications in the immediate postoperative period. While certain intrinsic patient factors may not fall within the control of the surgeon or health care system, knowledge of their impact can help identify patients who are more likely to be dissatisfied with their care and assist surgeons in setting these patients' expectations prior to surgery. Those factors that are modifiable (eg, length of stay, avoidance of complications, approach to pain management) should be areas of continued focus for any spine surgeon or organization looking to improve upon patients' satisfaction with their spine care. ■

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A Power Struggle:

Exploring Physician Unions as a Method for Regaining Control From Payers


Benjamin Kelly, BA


Grace Malone Ewell, BA


Grant D. Shifflett, MD

Physicians and physician groups are notoriously independent and fiercely competitive. This ethos of competitiveness combined with the decentralized structure of medicine make it inherently challenging for physicians to work together to collectively achieve any desirable outcome. These forces have perhaps had their greatest impact in allowing the expansion of power of insurance companies at the expense of physicians.

Insurance companies already have the odds stacked in their favor: they control access to patients, bias choices toward certain providers, and pay for the care that is rendered. Furthermore, insurance companies are driven by a desire to maximize profits with little concern for quality. This mission often perpetuates a race to the bottom, whereby physicians compete against one another to take lower-level rates to "drive business."

The combination of slumping reimbursement rates, increasingly arbitrary decisions regarding medical necessity, and expansion of required clinical paperwork has increasingly positioned physicians with their backs up against the wall. Further complicating the matter, insurers also pit physicians and physician groups against one another. Without a collective voice, it seems impossible to overcome this battle. But what if physicians banded together and fought back? Would this require physicians to "unionize?" Is it even legal to do this? Are there other viable strategies to level the playing field?

Physician Unions Background

The Clayton Act and the Norris-LaGuardia Act both guaranteed and extended the right to unionize for certain physician categories under the National Labor Relations Act.[1] However, for independent physicians, unionizing likely will not serve as a cure because collective bargaining is typically only available in an employer-employee relationship. Substantively, absent exclusions to these limitations, invoking union status for the purpose of increasing market power would, in the eyes of antitrust agencies, be no different from the type of price-fixing found among the OPEC oil companies.[2]

Employee physicians, who can legally unionize, are generally those who are employed by a hospital or other healthcare system and receive a salary as reported on a W-2 form. Members of a health maintenance organization, or HMO (eg, Kaiser), are likely

considered independent contractors and are therefore ineligible to unionize.[3] Even the employee physician category has exclusions. Physicians who are in a supervisory role are not eligible to unionize, even if they are employees. A supervisor is considered a person who can "make hiring and other personnel decisions concerning other employees and who is entitled to use independent judgment in making those decisions."[3] Managerial employees who participate in the formulation of policies for the employer may also be barred from unionization. These exclusions likely leave only a small census of providers able to unionize, and such a group's potential impact certainly would be debatable.

Independent physicians, simply put, cannot unionize because of their position as both employer and employee. Furthermore, independent physicians cannot participate in collective bargaining with HMOs or health insurers due to antitrust laws. When independent physicians, who compete with one another, band together to negotiate with payer systems, antitrust agencies will look at the arrangement as collusive price-fixing.[4] Even discussing prices with competitors could violate §1 of the Sherman Antitrust Act, provided certain market conditions are in play.[5] Although most union activity is exempt from antitrust enforcement, antitrust agencies will have little patience for collective bargaining efforts in this context. For a union to be effective, it must fit within one of the frameworks provided by statutes or the courts.

First, statutory exemptions accommodate

traditional union activities like organizing, boycotting, and picketing.[6] However, statutory exemptions do not protect collective bargaining agreements for non-labor groups like they do for employers and employees.[7] Thus, unionizing to collectively bargain with payers would not be covered under the statutory exemption.

Second, courts have recognized several exemptions for collective bargaining agreements. So long as an employer-employee relationship exists between the parties, courts will generally allow collective bargaining. Courts have found that the judicial exemptions only apply when (a) the restraint on competition affects primarily only the parties to the agreement; (b) the agreement addresses typical subjects of collective bargaining (ie, wages, hours, and other forms and conditions of employment); and (c) the agreement results from an arm's-length negotiation between employers and employees.[8] Applying these criteria, the numerous non-employee physicians are plainly excluded from enjoying the benefits of the exemption.

Unfortunately, without an exemption, efforts to undertake this type of bargaining will be met with resistance from antitrust agencies. This conclusion is a devastating blow to independent physicians who have no leverage to negotiate with insurers that have and will continue to push reimbursement rates lower. Therefore, other options should be considered.

Alternatives to Unionizing

While unionization may be impracticable, other potential solutions exist for physicians to organize and bargain with payers, including combining practices, creating provider networks, forming Independent Provider Associations (IPAs), entering an employment agreement, and more.[9] Of course, each of these alternatives comes with their own benefits and downsides.

The most straightforward way physicians can collectively negotiate with payers is to merge individual practices into a larger group practice. Antitrust laws view large group practices as single economic entities, allowing physician members within the organization to jointly negotiate with outside market participants. However, combining practices often results in loss of physician autonomy, as integration subjects previously independent physicians to new policies and practice cultures that may not align with their values. To avoid loss of autonomy, physicians can form an economically integrated network to contract with payers. A network is considered economically integrated if the physicians share substantial financial risk. After formation, the network can negotiate terms on behalf of its members. However, physicians should be wary of potential changing standards and views of economic integration by the Federal Trade Commission.

Alternatively, the Department of Justice and the Federal Trade Commission have allowed IPA messenger systems. An IPA arrangement is a viable option for non-economically integrated networks. While IPA formation requirements vary by state, generally, physicians must form a corporation with the physicians as the shareholders and adhere to various state and federal regulations. In an IPA, independent agents act as interme-

diaries between the payer and the IPA. This arrangement allows physicians to organize and bargain with payers while maintaining their autonomy. IPA members can review and discuss coding and compensation with health insurance companies through the intermediaries. However, the physicians themselves are banned from collectively bargaining. Unfortunately, individual agents are unlikely to achieve the same effects the voices of many physicians collectively would. Moreover, the government may look to "pierce the veil" of the IPA and find the arrangement to be nothing more than a union in disguise as an agent, especially where collective bargaining is involved.[9] Physician groups can only collectively bargain if the providers have reorganized under a single tax identification number, which would no longer qualify as an IPA model.

From an organizational perspective, several alternatives exist to unionization for physicians seeking to negotiate with payers. Although these options do not present the same level of benefit as a union likely would, they provide avenues to achieve similar effects in the absence of legislative action, allowing exceptions to union and antitrust laws for physicians.

Clearly, a greater effort must be made among physicians to collaborate, share ideas, and ultimately work together toward the goal of reducing the gap between providers and insurers.

Summary

It is clear that physician unions are unlikely to be a part of the health care landscape anytime soon. Alternative models, while present, still only benefit smaller numbers of physicians and will remain dogged by the fractured medical landscape. Nevertheless, doctors who are interested in affecting change will remain limited to these models or coordinating with currently established representative bodies (eg, American Medical Association, North American Spine Society), which, despite their questionable effectiveness, are the only vehicles currently available. Clearly, a greater effort must be made among physicians to collaborate, share ideas, and ultimately work together toward the goal of reducing the gap between providers and insurers. ■

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