

## THE SPINE FILES

### The demand for spine surgeons

Technological advances, clinical innovation, and attractive reimbursement have contributed to high interest in spine care, especially spine surgery. This interest is manifest, for instance, by the development of spine care and neuroscience centers of excellence, and the recruitment and marketing of fellowship-trained spine surgeons.

Quantifying the demand for spine surgeons is important both to those involved in physician recruitment as well as spine surgeons evaluating practice opportunities. Data on spine surgery volumes and activity by surgeon, along with assumptions about physician practice patterns, can be used to construct a demand framework for spine surgeons and develop physician-to-population ratios.

#### Spine surgery volume

Until the end of September 2007, inpatient spine surgery was commonly defined as consisting of Diagnosis Related Groups (DRGs) 496–500, 519, 520, and 546 [1,2]. (A new classification system has been introduced by the Centers for Medicare and Medicaid Services for use beginning in October 2007, based on Medicare Severity, or MS-DRGs.) As shown in Table 1, there were over 575,000 spine surgery discharges from US hospitals in 2005 [3], the most recent year for which data are available. Spine surgery accounted for 1.5% of total acute discharges and represented a use rate of 194 discharges per 100,000 population.

Table 2 shows the payer mix for inpatient spine surgery. Over half of the patients were covered by private insurance. Medicare, which paid for 30% of the cases, has been relatively generous with spine DRG payments [1] and, in many states, workers compensation (which represents most of the “Other” category in Table 2) is an attractive payer.

Spine care is also delivered in a variety of outpatient settings. In 2004, there were an estimated one million outpatient spine procedures [2]. About two-thirds of these procedures were performed in hospital facilities, including emergency departments, and the remainder in physician offices and ambulatory surgery centers.

#### Spine surgeon activity

The data in Table 3, from the Medical Group Management Association (MGMA) survey of physician productivity [4], include both inpatient and outpatient cases. Note

that neurological surgery includes nonspine procedures, which accounts for somewhat lower activity levels than orthopedic spine specialists.

Analysis of individual physician practice patterns indicates that about two-thirds of spine surgery is performed in the inpatient setting. Multiplying by two-thirds the average of the mean values shown in Table 3 for neurosurgery and orthopedic spine surgery results in average surgeon productivity of 286 inpatient spine cases per year.

#### Demand for spine surgeons

Using the US use rate of 194 inpatient spine discharges per 100,000 population and average productivity of 286 cases per specialist results in a demand ratio of 0.7 physicians per 100,000 population. Stated another way, one spine specialist can care for a population of 147,000. Although this can be a useful rule of thumb in determining physician demand, characteristics vary from market to market. Physician demand in a particular market will be influenced by:

- Population size.
- Number of spine surgery cases generated by the population.
- Patient migration patterns.
- Proportion of cases performed by a spine specialist.
- Number of cases an individual spine surgeon performs.
- Proportion of a spine surgeon’s workload represented by spine surgery, as opposed to nonspine orthopedic or neurological surgery.

These six factors, described below, can be incorporated into a demand model for spine surgeons.

#### Population

Population estimates and projections for the target market are readily available, for instance through the US Census Bureau, various state agencies, and commercial vendors.

Factor 1=Population Size

#### Cases per population

The US use rate should be used only if state or local data are not available, as geographic variation in clinical activity can be substantial [5].

Factor 2=Use rate

Table 1  
Inpatient spine surgery in the United States—2005

DRGs	Description	Discharges	Per 100,000 persons
496	Combined anterior/posterior spinal fusion	20,484	7
497	Spinal fusion except cervical w cc	79,638	27
498	Spinal fusion except cervical w/o cc	95,687	32
499	Back and neck procedures except spinal fusion w cc	67,046	23
500	Back and neck procedures except spinal fusion w/o cc	173,266	58
519	Cervical spinal fusion w cc	34,986	12
520	Cervical spinal fusion w/o cc	100,062	34
546	Spinal fusion except cervical w curvature or malignancy	4,304	1
	Total spine	575,473	194
All	Total US hospital discharges	39,163,834	13,123
	Spine surgery discharges as a % of total discharges		1.5

DRG, Diagnosis Related Group, w cc, with comorbid conditions or complications; w/o cc, without comorbid conditions or complications.

*Patient migration*

Patient migration to specialized resources, both physicians and hospitals, is a common phenomenon, and the more complicated the procedure, the greater the migration. Areas without a physician performing spine surgery will, for instance, have 100% out-migration for these procedures. Patients needing spine care will be forced to go to specialists outside of the market, often choosing physicians practicing in neurosciences centers and/or at academic medical centers. Patient migration patterns will change as specialists are introduced into a market, although because of long-standing referral relationships and provider reputations, some out-migration to specialized resources is likely to persist.

Factor 3=Market share

*Proportion of spine surgery performed by spine specialists*

Referral patterns, patient preference, hospital privileges and call schedules, and health plan and insurance panel membership are determinants of how much of the spine surgery in a market will be performed by specialist spine surgeons. Experience from markets where spine surgeons have

Table 2  
Inpatient spine surgery payer mix—2005

Payer	% of total
Medicare	30.1
Medicaid	5.3
Private insurance	52.2
Other	10.6
Uninsured	1.8
Total	100.0

Table 3  
Physician surgery/anesthesia cases—2005

	25th %tile	Median	Mean	75th %tile
Neurological surgery	248	323	407	413
Orthopedic surgery: spine	223	349	451	566

been introduced suggests that a majority of spine surgery quickly migrates to these specialists. Over time, and given good clinical results and high patient satisfaction, specialists will do almost all of the spine surgery.

Factor 4=Specialist proportion

*Number of cases performed by a spine surgeon*

Average physician productivity was used to develop the “rule of thumb” ratio of 0.7 spine specialists per 100,000 population. However, Table 3 illustrates the range in physician activity and these data can be used to illustrate the impact of a very active specialist. For instance, the demand ratio for an orthopedic spine specialist practicing at the 75th %tile would be 0.5 physicians per 100,000 population.

Factor 5=Surgeon productivity

*Proportion of spine surgeons’ activity*

Most spine surgeons would prefer to do only spine surgery. It is what they are trained to do, and it supports an attractive work/life balance, as almost all spine surgery is scheduled, and it can be lucrative. However, considerations such as building a practice or responsibilities to other members in their group may dictate that specialists do general orthopedic or neurological surgery as well, at least for a while.

Factor 6=Spine proportion

**A formula and an illustration**

The following formula combines the factors described above into an estimate of the need for spine surgeons to serve a given population.

$$\text{Physician demand} = (\text{Population size} \times \text{Use rate} \times \text{Market share} \times \text{Specialist proportion}) / (\text{Surgeon productivity} \times \text{Spine proportion})$$

To illustrate the application of this formula, consider a target market of 260,000 without a spine surgeon. No local data are available, but the state discharge survey indicates that there are 175 spine cases per 100,000 population. The hospital considering whether to recruit a spine surgeon has a 70% inpatient market share, and this is set as the target for spine surgery. The orthopedists, who belong to a single group, have agreed to recruit a spine

surgeon and refer all spine cases to this specialist. Conversations with orthopedists currently in spine fellowships indicate that they are looking to perform at or near the MGMA mean, and suggest 450 cases (300 inpatients) per year as their target. The general orthopedists want the spine specialist to take general orthopedic call, but believe that this will only generate 10% of the spine specialist's patient activity.

Incorporating these assumptions into the formula indicates the need for 1.2 spine surgeons to serve the target population.

$$\text{Spine surgeon demand} = (2.6 \times 175 \times 0.7 \times 1.0) / (300 \times 0.9) = 1.2$$

## Two considerations

### Practice setting

A spine surgeon's relationship with his or her colleagues and with the hospital(s) where he or she practices will influence patient referral sources and volumes as well as call coverage responsibilities and how they are fulfilled. These, in turn, will influence both the success of a practice and physician satisfaction.

As is the case with most physicians, spine surgeons typically practice as part of a group, often a single-specialty group. An orthopedic spine surgeon joining a group of orthopedists may well find that the group is already subspecialized (including, for instance, joint replacement, sports medicine, and hand surgery) and that the physicians are fellowship trained. This setting will likely be supportive of a specialized spine surgery practice with no responsibility for general orthopedic call. Because there are fewer neurosurgeons, a neurosurgical spine specialist joining a group is more likely to find that there is a responsibility to practice some general neurosurgery and to be part of the general neurosurgical call schedule.

In arrangements such as solo practice, perhaps as a hospital employee, or being part of a multispecialty group, there may be no established patterns or expectations of the spine surgeon. In these cases, both the surgeon and hospital or group leadership will be well served by an extra measure of care in exploring referral sources, call responsibilities, relationships with colleagues, and so forth.

The key aspects of a spine surgeon's relationship with the hospital involve the business of spine surgery.

### The business of spine surgery

Although the physician and hospital both have a role in providing spine surgery, they have different elements of financial risk. Physicians have little or no risk, as they are paid a predetermined rate for each procedure while their direct expenses per case are low and fairly predictable.

Hospitals are at risk for the cost of implanted material (hardware, bone graft, etc), as well as other expenses in the operating room and for patient care. The profitability of spine surgery depends on controlling these costs, which can vary greatly. One study found a threefold variation in the costs of implanted material used by physicians performing spinal fusion "for essentially the same materials, used for the same operation" [6]. For Medicare patients and any others covered by a fixed payment, the higher costs reduce the hospital's bottom line dollar for dollar.

Physicians who understand the business of spine surgery, as well as the clinical aspects, and are prepared to play a role in controlling costs while maintaining quality, may well find more and better practice opportunities. They will be more attractive to hospitals (which are often involved financially in physician recruitment and practice support), health plans and insurance companies, and any other individuals or entities that have a financial stake in spine surgery.

## References

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## Spine deformity and the artist: Laura Ferguson and the intersection of art and medicine

As C.S. Lewis once said, "God whispers to us in our pleasures, speaks in our conscience, but shouts in our pains: it is His megaphone to rouse a deaf world." Much can be said that a degree of *deafness* and misunderstanding commonly surrounds how individuals with spine deformities are perceived by society and from within. Many individuals with such conditions remain silent and retreat into the depths of their soul, often suffocating in the embrace of resentment, an arrest of self-empowerment, and a negative self-perception. However, such is not the case with New