Neurosurgeon Praveen Mummaneni, MD, and orthopaedic surgeon Sigurd Berven, MD, collaborate to perform a cervical spine fusion.

Surgical Co-piloting for Complex Spine Surgery

At UCSF, joint operations by neurosurgeons and orthopaedic surgeons give patients the benefits of dual expertise and better outcomes.

Many patients who come to UCSF needing surgery for spinal disorders get an unexpected benefit: two attending surgeons for a single operation. In an uncommon model of care, neurosurgeons and orthopaedic surgeons at the UCSF Spine Center combine their expertise by operating side by side to maximize outcomes for complex cases.

"With two surgeons, operating times are much shorter, blood loss is much less, there are fewer complications, and patients recover faster from the surgery," Vedat Deviren, MD, professor of orthopaedic surgery, said. "We have seen that these factors have a significant benefit to patients' outcomes."

Patients who are the best candidates for a two-surgeon operation are generally those with complex spinal tumors or deformities, those needing revision of a previous surgery, or those whose age or health status put them at increased risk for complications.

"For these difficult cases, having two surgeons makes the procedure safer and reduces stress," Dean Chou, MD, professor of neurological surgery, said. "Patients who require complicated procedures also really appreciate that they have two experienced pairs of hands performing the surgery, versus an experienced surgeon and a trainee."

Supported by clinical research

In a study of the dual-attending approach applied to a difficult spinal deformity procedure, Deviren and neurosurgeon Christopher Ames, MD, found that in addition to shorter operating times and less blood loss, patients were much less likely to have major complications or unplanned additional surgeries within a month of their original operation.

Other medical institutions, such as Brigham and Women's Hospital in Boston, the Hospital for Special Surgery in New York City, and the University of California, San Diego, have since implemented dual-attending protocols with similar results.

Clear value, payment hurdles

In a recent survey of the Scoliosis Research Society membership, the majority of respondents agreed that having two attending surgeons improves safety, decreases complications, and improves outcomes. However, 51 percent of the 199 respondents felt that despite having clear value, having a second attending surgeon was limited by reimbursement and access problems, and 72 percent reported difficulty in getting the second attending reimbursed. Ames and Deviren hope that with more institutions publishing high-quality comparative studies, the protocol will overcome payment hurdles.

Expanding access for high-risk patients

At UCSF, an additional and unexpected benefit to the two-surgeon approach has been the ability to treat an entire population of patients with debilitating conditions who were previously deemed unfit to undergo major surgery.

"As a high-volume tertiary care facility, we routinely care for patients with multiple comorbidities, such as pulmonary issues, osteoporosis, or heart disease," Chou said. "By reducing operating risk with two surgeons and working with our colleagues in anesthesia, neuromonitoring and pain management, we can offer more patients procedures that can dramatically improve their pain and quality of life."

Go inside the operating room and watch the two-surgeon approach at spinecenter.ucsf.edu

(1) Bozic KJ, Ward L, Vail TP, Maze M. Bundled payments in total joint arthroplasty: targeting opportunities for quality improvement and cost reduction. Clin Orthop Relat Res 2014;472:188-93.

(2) Scheer JK, Osorio JA, Smith JS, et al. Development of validated computer-based preoperative predictive model for proximal junction failure (PJF) or clinically significant PJK with 86% accuracy based on 510 ASD patients with 2-year follow-up. Spine (Phila Pa 1976) 2016;41(22):E1328-35.

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Bundled Payments in Spine Surgery: Defining Risk Through Predictive Analytics

by Christopher Ames, MD

In the debate over affordable health care in the United States, there is an increasing expectation for physicians to prove the benefit of their interventions and accurately estimate costs. As we move away from fee-for-service models and towards value-based models, driven largely by Medicare, defining value remains a hotly contested battleground.

The bundled payment model—in which a hospital is given a fixed payment for a procedure over the entire care trajectory—has especially gained traction among policy makers who reason that it incentivizes providers to deliver high-quality care at the lowest possible cost.

As part of the Center for Medicare & Medicaid Innovation's Bundled Payments for Care Innovation project, UCSF was one of the first institutions to test bundled payments in a pilot program for total joint athroplasty (TJA). The investigators of that program found that outcomes heavily depended on factors unrelated to the procedure itself, and 35 percent of episode-of-care payments were related to post-discharge care.[1]

In the TJA study, there was considerable variation found among patients and procedures that affected cost. Within spine surgery, that variation is even more profound. There are currently no validated predictive models of improvement that can generate reliable bundle payment options for complex spine surgery. This is a problem we have been working on here at UCSF, in collaboration with the International Spine Study Group (ISSG), by applying predictive analytics.

For surgical procedures, estimating risk is usually done using odds ratios and regression analyses that factor in variables like age, degree of disability, history of smoking, and body mass index. Predictive modeling, on the other hand, uses advanced computational methods to identify patterns in large datasets that can then be applied to individuals.

Modern datasets for spine surgery patients have yielded some surprising information. Elderly patients, for example, have long been advised against complex spine surgeries over fears related to comorbidities and frailty, but we found that they often do better than their younger counterparts.

When we examined the outcomes of patients who had severe structural deformity but little disability with the outcomes of patients with minimal deformity but severe disability, there was no difference in Oswestry Disability Index (ODI) scores or neck disability after surgery. What are the factors contributing to good or bad outcomes at the individual patient level?

"There are currently no validated predictive models that can generate reliable bundle payment options for complex spine surgery."

In 2014, we began developing models that analyzed variables related to demographics, surgical data, quality of life, and imaging. We started out with a model that incorporated 43 clinical variables and applied it to a prospective dataset collected by the ISSG. It was able to predict with 86 percent accuracy whether a patient would develop proximal junction kyphosis or reach a minimally important difference on the ODI scale after surgery.

In another study, we found 20 variables that could predict with 87.6 percent accuracy the risk of intraoperative and perioperative complications.[2-3] In 2016, an adult spinal deformity frailty index (ASD-FI) incorporating 40 variables was shown to be predictive of length of hospital stay and major complications.[4]

Psychosocial factors are also an important consideration. The complex nature of pain, especially pain that has been long-standing over a period of years or even decades, is not always easily solved, even when the surgery is considered successful from an anatomical perspective. This is a challenge, but validated clinical outcome assessments to measure overall mental health and well-being need to be standardized and incorporated into payment schemes.

Similarly, it is thought that patients with better social support systems have better long-term outcomes. In hospitals that take care of sectors of the population that historically do not have good support systems, this needs to be taken into account.

Building accurate predictive models is critical to prevent incentives for providers to withhold care in value-based care models and for us to be able to better counsel our patients on the risk-benefit of surgery and expectations for recovery. These models also have powerful implications for a wide range of public health issues, ranging from health insurance to informed consent.

Josiah Orina, MD

Josiah Orina, MD, recently completed a yearlong fellowship in orthopaedic spine surgery at UCSF. Originally from Edmond, Oklahoma, Orina received his medical training at Emory University and then completed his residency in neurosurgery at the Mayo Clinic in Rochester, Minnesota.

Outside the operating room he is actively involved in his church's outreach program serving San Francisco's homeless community. Here, he talks about dual perspective, Pandora's Box, and personal fulfillment.

Why did you choose a spine fellowship?

My specialty training is in neurosurgery, and what initially drew me in was the brain, cranial surgery, and microsurgical technique. I was—and still am—fascinated by the brain and understanding its anatomy and function well enough to perform those delicate operations. During my residency at Mayo Clinic, I was also fortunate to receive valuable experience caring for patients with spinal issues of varying complexities including congenital abnormalities, trauma, deformity, degenerative disease, and much more. My interest and passion for spine took off from there, and it's a privilege to be in a field that allows me to treat both.

What has been the best part of your fellowship at UCSF?

I chose this orthopaedic fellowship because I wanted to add a new perspective to my neurosurgical training. The best part of this fellowship is easily the diversity of patients, spinal pathologies, surgical approaches, and ways of thinking that we encounter. The people I have met here at UCSF have been fantastic, and it has been an honor to work with such a talented group.

What has been one of your most interesting cases?

I met a gentleman in clinic with severe cervical kyphosis in which his neck was so flexed forward that his chin was sitting on his chest. We call this dropped head syndrome, and this had happened gradually over time. He could no longer look upright to maintain forward gaze, he was experiencing substantial neck pain, and he was beginning to have difficulty using his hands from his spinal cord being pinched and irritated. We took him to surgery for realignment of his cervical spine via a combined anterior-posterior neck operation. Being able to hold his head upright again after surgery was a new lease on life for him. He's one of the happiest and most thankful people I have ever met, which is a continual reminder to me of how fulfilling this profession can be.

What's been the most exciting breakthrough?

The development and use of motion-sparing surgery, such as cervical and lumbar artificial discs and laminoplasties. While spinal fusions performed for the right indications offer enormous benefits to patients, they can also open up a Pandora's box of long-term complications such as adjacent segment disease and pseudarthrosis by making the spine stiffer. In contrast, artificial discs, laminoplasties, and even simple laminectomies have the advantage of preserving most of the motion in the spine and better approximating normal biomechanical function than do fusions. I think the next leap for spine surgery will be perfecting methods to routinely and effectively treat spinal conditions without fusions, and if we are successful, that will be a landmark achievement.

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Save the Date:
UCSF Spinal Surgery Lab
November 3-4, 2017
Las Vegas, NV

The 7th Annual UCSF Techniques in Complex Spine Surgery Course is a two-day course emphasizing pioneering trends in spinal surgery. This course is designed to be interactive with didactic lectures given by leaders in the spine community as well as a hands-on bioskills lab portion that takes place at the Medical Education and Research Institute in Nevada (MERIN).

Participants will review and practice surgical principles and techniques in the treatment of spinal deformities and tumors. As a result of hands-on sessions and case conferences, residents, fellows, and surgeons with less than an advanced level of experience will have improved skills in cases dealing with complex spinal deformities.

Register for an early bird rate by October 15 at meded.ucsf.edu/cme

Scholarships are available for residents and fellows. Please contact Lori Justice for an application: Lori.Justice@ucsf.edu.

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