

Spine Institute



Overview and Outcomes Report 2012

Contents

	Page
Improving Spine Care through Innovation and Collaboration	1
Foundation of Excellent Care	3
Spine Specialty Operating Rooms	4
Inpatient Unit	6
Neurophysiology	8
Spine Radiology	10
Interventional Neuroradiology	11
Nasseff Spine Center	12
Hospital-Based Services	13
Pain Management	13
Integrative Health Services from the Penny George™ Institute for Health and Healing	14
Spine Rehabilitation at the Courage Kenny Rehabilitation Institute™	16
Publications and Presentations	17
About Abbott Northwestern	20



Improving Spine Care through Innovation and Collaboration

Amir Mehbod, MD, medical director, Abbott Northwestern Spine Program



Abbott Northwestern Hospital's Spine Institute provides comprehensive spine services through the collective work of the Institute for Low Back and Neck Care, Kim Neurosurgery, Metropolitan Neurosurgery, Neurosurgical Associates, Twin Cities Spine Center, Courage

Kenny Rehabilitation Institute™, Penny George™ Institute for Health and Healing, and Virginia Piper Cancer Institute®.

This report details the unique and collaborative efforts of the independent specialty physician groups who devote most or all of their practices to spine patients, and the state-of-the-art facilities, technologies, services and staff that make Abbott Northwestern Hospital the hospital of choice for specialty spine care.

Pursuing the triple aim

The Spine Institute is well positioned to pursue concentrated and integrated efforts that support the triple aim of health care:

- improving the patient care experience (including quality and satisfaction)
- improving the health of populations
- containing the per capita cost of health care.

Improving the patient experience

During the past 18 months, a Spine Quality Council that includes surgeons, mid-level providers, nurses, managers and data analysts has met monthly. It is charged with identifying areas for alignment, improvement and advancement that will positively affect spine care quality, satisfaction and outcomes. For example, its Spine Length of Stay Committee has initiated measurements, protocols and best practices for select procedures that are aimed at optimizing the length of stay. It has made changes to standard orders to ensure that activity is initiated sooner in the post-operative period, such as encouraging the patient to get out of bed on the day of surgery and sit up in a

chair for meals, establishing an early feeding protocol to reduce postoperative ileus, and minimizing sedation during the day. Care boards, care maps and education have been used to enhance communication about care, activity and pain goals, helping the bedside nurse advance the patient's progress and recovery.

The Spine Institute continuously monitors patient satisfaction throughout the care delivery continuum. This includes surveying patients cared for at the independent physician clinics as well as at Abbott Northwestern. Results achieved in 2012 are outlined in this report.

The focus on measuring patient outcomes has never been higher, with great attention being directed toward increasing patients' functional abilities as well as lowering perceived pain levels.

Improving the health of populations

Organizing spine care delivery around a clinical service line allows the Spine Institute to create value for spine patients by having surgeons and other clinicians design consistently superior approaches to this complicated and specialized area of care. Enhancing electronic health record use and workflows makes providing (and measuring) the most clinically appropriate care more consistent and efficient. The Spine Institute works with patients to set and achieve goals for treatment of their acute spinal condition and establish long-term goals for optimal health and well-being.

Education and research play a major role in improving the health of populations and communities. Shared

knowledge with health care consumers and providers promotes better health care choices. The Spine Institute's educational outreach ranges from information sessions about maintaining spine health through healthy lifestyle choices to international meetings of spine surgeons where best practices and research outcomes are presented, analyzed and debated. This report details many of these efforts.

Controlling health care costs

Controlling spine-related health care costs involves preventing spine problems when possible and providing optimal care when treatment is necessary. The Spine Institute monitors cost-driving factors such as complication rates and length of stay and implements processes to improve performance. It also encourages discussion about and performs ongoing evaluation of surgical devices, implants and supplies to ensure cost-effectiveness.

The Spine Institute is dedicated to providing quality care for all types of spine problems through collaboration, innovation, research and technology. Our focus on the triple aim will help us bring continued innovation and advances to the field of spine care in service to our patients, referring physicians and the community.

We invite you to read more about our work and the specialized facilities, advanced capabilities and latest developments in spine care at Abbott Northwestern on the following pages, and we welcome your questions and comments.



Designated as a

**Blue
Distinction®
Center**
for Spine Surgery



For the health of all.

Blue Cross® and Blue Shield® of Minnesota is a nonprofit independent member of the Blue Cross and Blue Shield Association.

Regional and national recognition

Abbott Northwestern is consistently ranked by *US News & World Report* as one of the nation's best hospitals for neurology, neurosurgery and orthopedics, including spine care and spinal surgery. To be nationally ranked, a hospital must excel across a range of tough cases within that given specialty. The Spine Institute is also designated a Blue Distinction Center for spine surgery.

Foundation of Excellent Care





Spine Specialty Operating Rooms

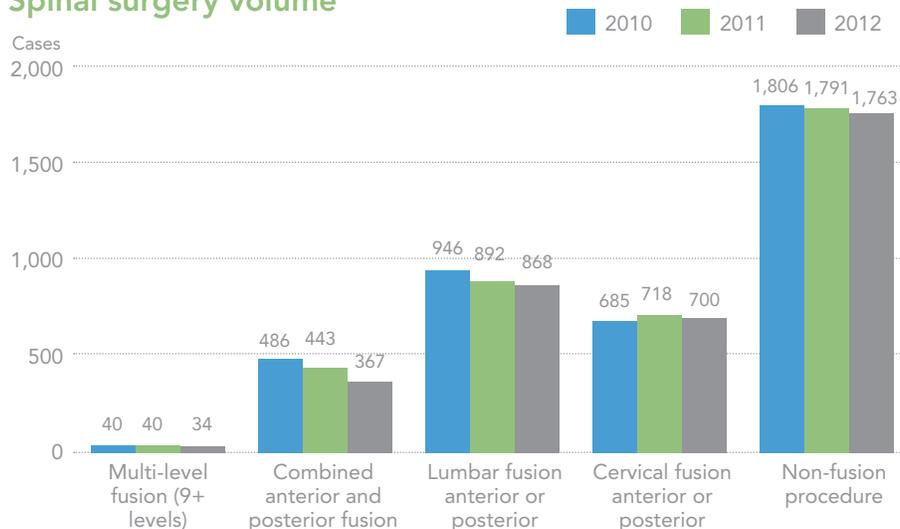
Abbott Northwestern's spine specialty operating rooms are staffed by a team of more than 30 registered nurses and surgical technologists. The team is highly experienced in caring for patients having complex spinal procedures. The spine specialty team performs more spine procedures than any other hospital operating room team in the state.

The spine specialty operating rooms have advanced equipment and technologies, including microscopes, computerized navigation systems and the O-arm imaging system. Intraoperative MRI is also available.

Intraoperative monitoring of spinal cord and nerve root function is routinely done to protect patients from neurological injury.

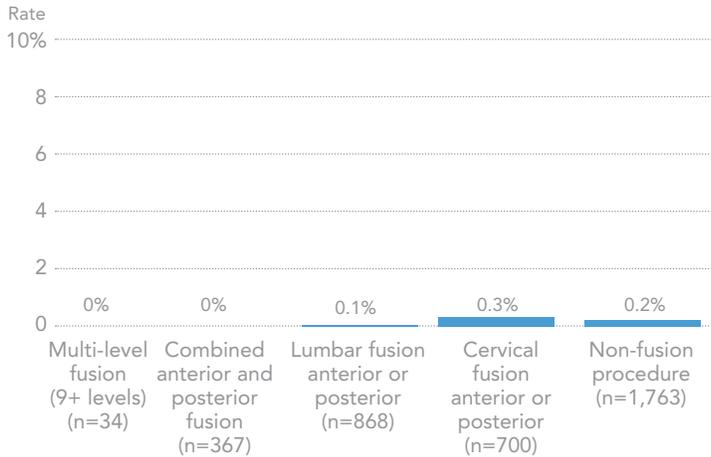
The combination of highly experienced staff and leading-edge technology provides spine and neurosurgeons at Abbott Northwestern with the most advanced and comprehensive services to ensure outstanding surgical care.

Spinal surgery volume

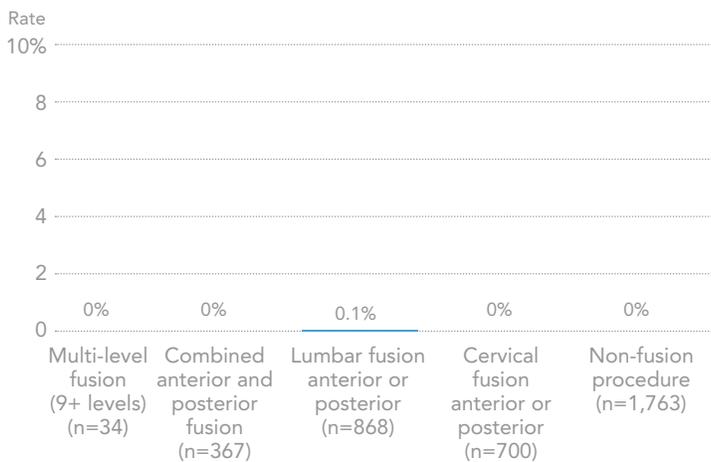


The spine specialty team performs more spine procedures than any other hospital operating room team in the state.

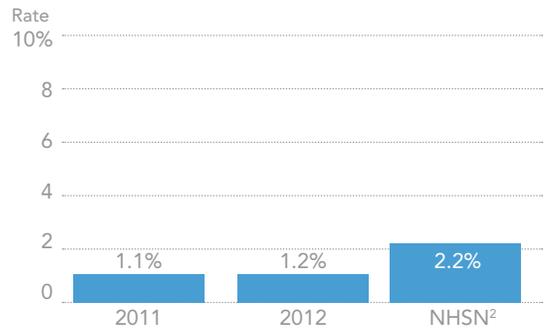
Deep vein thrombosis rate, 2012



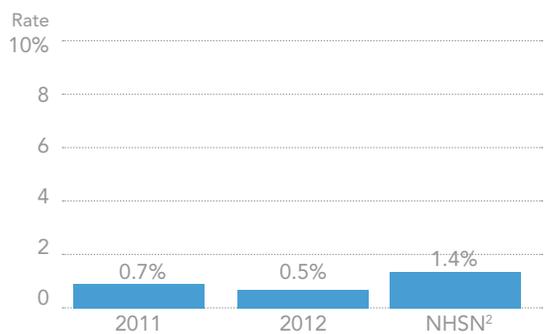
Pulmonary embolism rate, 2012



Spine fusion Surgical site infection rate, 2012¹ (n=1,988)

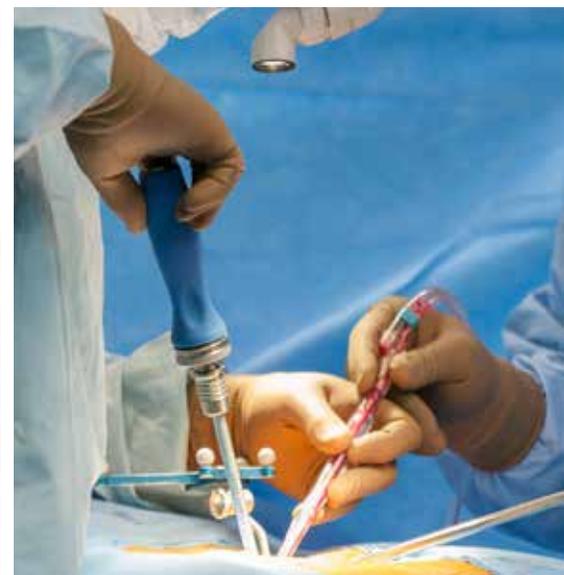


Laminectomy Surgical site infection rate, 2012¹ (n=3,284)



¹ Data is collected based on Centers for Disease Control definitions of infection. Superficial, deep and organ space surgical site infections are included. Data is current as of January 2013.

² NHSN is National Health Safety Network.





Inpatient Unit

The spine inpatient units H7000 and H8000 are located on the top floors of Abbott Northwestern's Heart Hospital. This award-winning space provides a complete healing environment, with care centered on the needs of spine patients and their families.

Each of the 83 private rooms includes amenities for patients and visitors, including a refrigerator, safe, DVD/VCR player and a family area with a separate phone, wireless internet, reading lamp and seating that converts to a bed, allowing a family member to

spend the night. For patient safety and comfort, each room has an overhead lift track that can be used to reposition patients or move them from the bed to the bathroom or a chair. Each private bathroom is equipped with grab bars, a lipless shower, a shower chair and several other safety features.

In addition to well-designed patient rooms, H7000 and H8000 have attractive waiting areas for patients and family members. The solarium features a fireplace, microwave oven, coffee maker, refrigerator and ample

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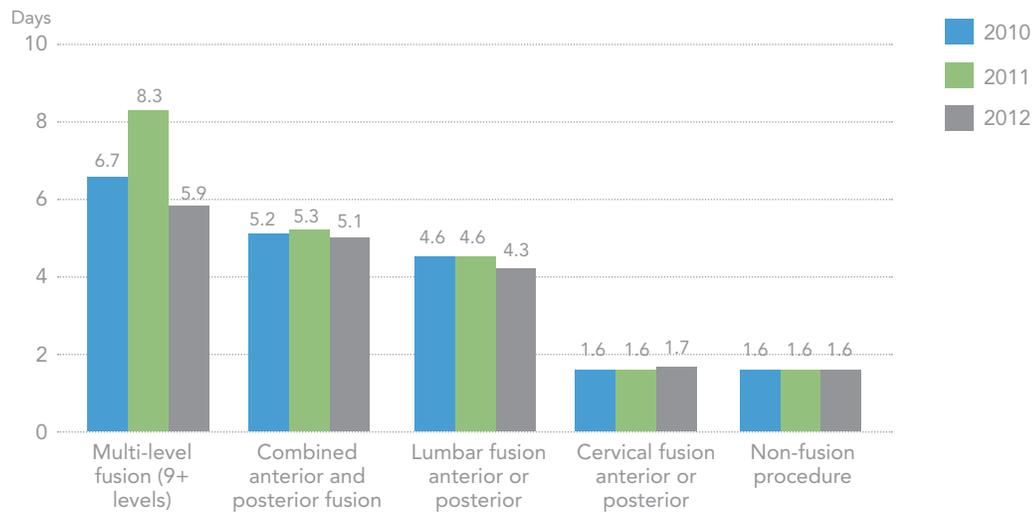
seating. The atrium offers a sense of tranquility and an expansive view.

Two rehabilitation areas are incorporated into the unit to enable early assessment and initiation of treatment. The occupational therapy room includes a full kitchen and bathroom to help patients practice and regain activities of daily living. The physical therapy room

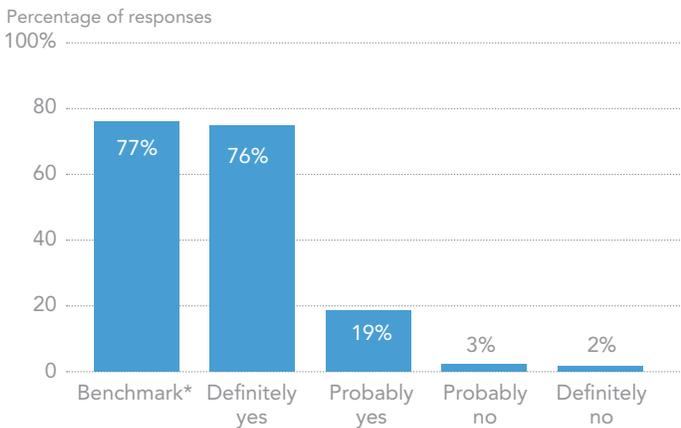
contains state-of-the-art rehabilitation equipment, including a driving simulator.

The units are staffed by highly dedicated registered nurses. During the first year of employment on H7000 and H8000, nurses receive specialized training in the care of patients with spine conditions.

Spine surgery Average length of stay

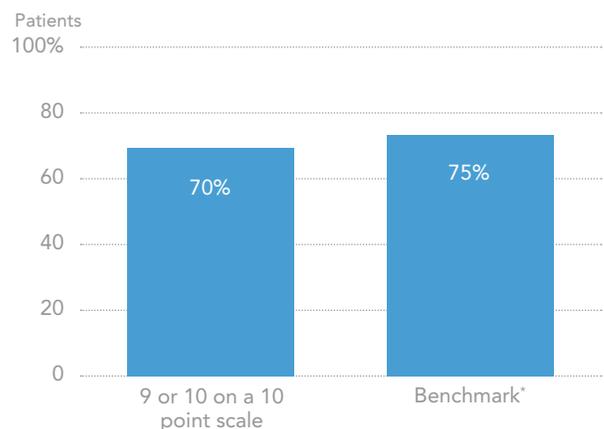


Would you recommend this hospital to your friends and family? (n=1,741)



*National Healthcare Consumer Assessment of Hospital and Provider Services (HCAHPS) benchmark based on July 2011-June 2012 data; 75th percentile.

Thinking of your overall stay, how would you rate the overall quality of care and services? (n=1,723)



*National HCAHPS benchmark based on July 2011-June 2012 data; 75th percentile.



Neurophysiology

Stanley Skinner, MD, medical director



The Neurophysiology Program performs the full spectrum of electrodiagnostic studies, including electroencephalography (EEG), evoked potentials (EP), electromyography (EMG), and intraoperative neuromonitoring (IONM). Two physician neurophysiologists staff the operating rooms.

Program professionals focus on comprehensive electroclinical care and ongoing neurophysiology research, especially the development of advanced methods in electromyography and evoked potentials. These methods have permitted our intraoperative team of neurophysiologists and certified technologists to diagnose and intervene during the early evolution of intraoperative neural dysfunction, preventing or minimizing postoperative neurological deficits.

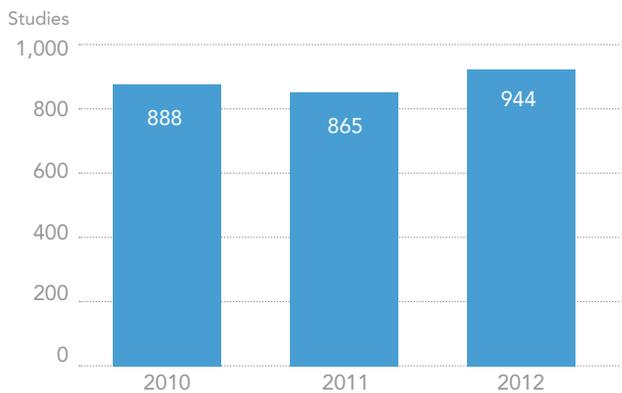
We are also actively involved in education, providing hands-on training and didactic instruction of departmental technologists and students from local neurophysiology programs. We have presented our experience nationally, and where appropriate, have integrated the experiences of others within our program. We believe patient care is enhanced by these endeavors.

The neurophysiology team has focused particular clinical and research attention on spinal cord and nerve root pathophysiology. Our bibliography of peer-reviewed journal articles documents our ongoing research interest in intraoperative spine monitoring.

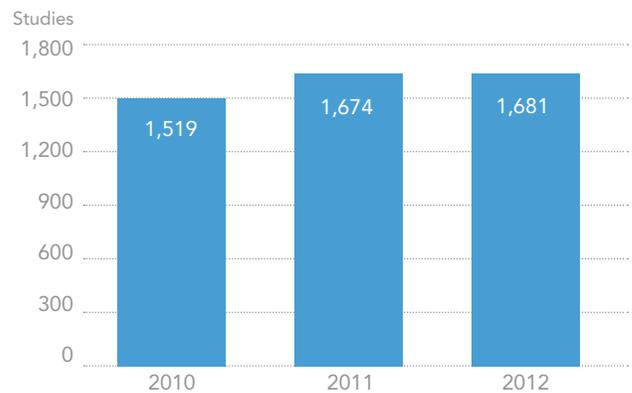
The Spine Institute's dedication to high quality neurophysiological care has led to an increased demand for these services. Each study, whether in the lab or operating room, is tailored to the patient. Professional interpretations are reported expeditiously (real time in the operating room) to the referring physician. Our individualized, patient-centered approach to IONM is exceptional among neuromonitoring services.



Intraoperative neurophysiologic monitoring volume



Electrodiagnostic volume



Our commitment to referring physicians and their patients is to:

- meet the highest standards of laboratory and intraoperative neurophysiology
- provide timely, accurate and pertinent reports to referring physicians
- improve the application of clinical neurophysiology through basic and clinical research.

Spine Radiology

Spine radiology services are provided by Abbott Northwestern's Diagnostic Neuroradiology Program, (which is staffed by four fellowship-trained neuroradiologists.) They are responsible for interpreting MRI and CT scans of the head, neck and spine and for performing CT- and fluoroscopically-guided biopsies, aspirations and injections.

The neuroradiologists actively collaborate with the neurosurgeons and spine surgeons at Abbott Northwestern. They attend weekly spine conferences with physicians from the Institute for Low Back and Neck Care, Metropolitan Neurosurgery, Neurosurgical Associates and Twin Cities Spine Center, supporting a multidisciplinary approach to diagnostic and pre-surgical consultation.

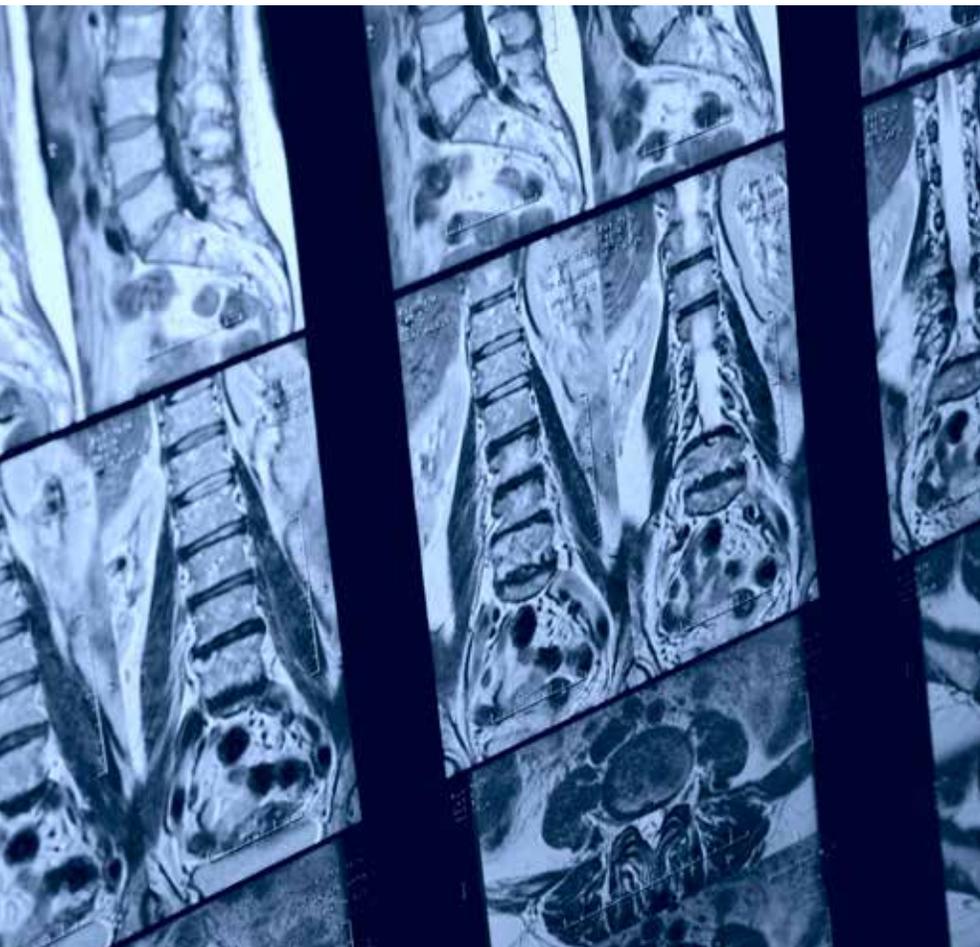
Abbott Northwestern's Radiology Department has four high-field MRI scanners; two operate at a field strength of 1.5 Tesla and two operate at 3 Tesla. The department has four modern CT scanners with C-arm technology for fluoroscopy-guided minimally invasive procedures. The

department also provides O-arm fluoroscopy studies, which show a three-dimensional view of the spine to aid in planning surgery.

Numerous spine MRI scans and spine CT scans are performed daily. In addition, more than 600 minimally invasive spine injection procedures are performed annually.

Diagnostic procedures include lumbar and cervical myelograms to investigate the cause of pain or weakness in the back, legs, neck or arms. Diagnostic nerve root injections are also performed to localize symptoms of nerve compression and aid in surgical planning.

Minimally invasive spine procedures provide short- and long-term pain relief using epidural steroid injections in the lumbar, thoracic or cervical region of the spine. Several types of injections are available, including lumbar transforaminal epidural steroid injections, lumbar and cervical interlaminar epidural steroid injections, facet injections and nerve blocks.



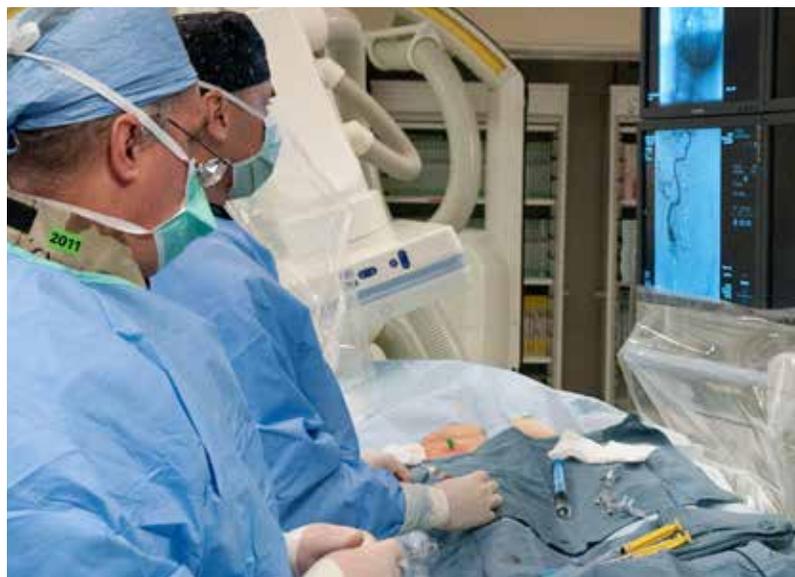
Interventional Neuroradiology Program

Benjamin M. Crandall, DO; Josser E. Delgado, MD; Yasha Kadkhodayan, MD and David Tubman, MD

One of the nation’s busiest and most sophisticated interventional neuroradiology practices is located at Abbott Northwestern Hospital, with three full-time interventional neuroradiologists. With a 25-year history at Abbott Northwestern, the program is enhanced by two nurse practitioners experienced in neurology and neurosurgery care; a patient care coordinator; and a dedicated research coordinator who assists in ongoing research studies and clinical outcomes tracking. The interventional neuroradiology service coordinates care with colleagues in neurosurgery, neurology, neuro-oncology, intensive care and otolaryngology.

The scope of the practice includes inpatient and outpatient consultative and therapeutic services. The interventional neuroradiologists perform many technically demanding neurovascular and percutaneous procedures. Some of the neurovascular procedures include spinal angiography and spinal arteriovenous malformation (AVM) and fistula (AVF) embolization. Percutaneous procedures performed to manage spinal and sacral pain secondary or due to pathologic and osteoporotic compression fractures include vertebral augmentation (vertebroplasty and kyphoplasty) and sacralplasties. Other pain management procedures are epidural steroid injections and facet and sacroiliac joint injections. Lumbar drain placement is also performed to treat intraoperative and spontaneous cerebral spinal fluid leaks.

The technically demanding nature of this specialty requires appropriate resources for an optimal operative/procedural environment. Abbott Northwestern Hospital operates



two biplane neurointerventional suites, with modern 3D vascular imaging and on-the-fly CT imaging.

The Interventional Neuroradiology Program staff maintains competence through educational programs and clinical research. Advances in the field and improved results for patients are derived from volume-based expertise in clinical care and ongoing incorporation of new information.

For example, vertebral augmentation patient outcomes are monitored by the interventional neuroradiology staff. Approximately 92 percent of vertebral augmentation patients seen from 2008 to 2012 reported that their pain was reduced. The 24-question Roland-Morris Disability Questionnaire administered in 2012 showed a 74 percent improvement in disability related to back pain.

Interventional Neuroradiology procedure volume

2008	256
2009	203
2010	172
2011	129
2012	76

Vertebral augmentation pain relief within 30 days postprocedure, 2008-2012 (n=490)

Pain relief:	91.8%
No change:	7.3%
Increased pain:	0.8%

Roland-Morris Disability Questionnaire* (n=161)

Average preprocedure disability score:	19
Average postprocedure disability score:	5
Patients with decrease in disability:	93.8%

*Administered by Interventional Neuroradiology nurse practitioner

Nasseff Spine Center



The spine care market is evolving from a fragmented fee-for-service model toward a model that rewards integrated programs that are rooted in conservative therapy and oriented toward condition management. Payer and regulatory scrutiny is increasing for spine care with an emphasis on transparent reporting of quality outcomes, cost of care and patient experience. The community is in need of information to make decisions on where to obtain spine care.

The Nasseff Spine Center, which opened at Abbott Northwestern – WestHealth in 2013, provides a clinical model that is patient-centered, effective, efficient and timely. Its goal is to support spine health as part of overall wellness and to provide access to excellent spine care when required. The Nasseff Spine Center offers an innovative care model to the community (patients, payers and employers) that is both trusted and affordable. Its comprehensive services enhance integration across Allina Health, promote successful relationships with providers and provide excellent care to patients.

The Nasseff Spine Center provides:

- medical spine evaluation and treatment in partnership with primary care
- conservative therapy program that includes best practice protocols for appropriate imaging, rehabilitation, narcotic use, injection therapy and integrative health services
- care coordination and spine care triage services
- pre-operative education in partnership with the Pre-Operative Clinic at Abbott Northwestern
- collaboration with partners to serve the continuum of care needs (including Courage Kenny Rehabilitation Institute™, Penny George™ Institute for Health and Healing, and Lifetime Fitness).

Hospital-Based Services

Intensivist

Abbott Northwestern's Intensivist Service manages the care of Spine Institute patients who require intensive care before or after surgery. The group includes 12 board-certified critical care specialists who provide in-house coverage 24 hours a day. This group is highly skilled in caring for a wide variety of critically ill patients, providing an extra level expertise for patients in the intensive care units.

Hospitalist

Abbott Northwestern Hospitalist Service is a group of about 60 physicians who are available 24 hours a day to manage the care of hospitalized patients. The group is highly experienced in the diagnosis, treatment and coordination of care for hospitalized patients. Hospitalists can act as primary care providers for hospitalized patients. They also work closely with nurse coordinators and social workers to assist in



discharge planning, and they help to identify and address any social service needs that the patient requires during or after the hospital stay.

Pain Management Services

Acute Pain Service

High quality postoperative pain control is a critical factor in improving surgical outcomes, reducing complications, decreasing the hospital stay and reducing costs. To improve postoperative pain management, Abbott Northwestern uses an Acute Pain Service made up of anesthesiologists and nurses. This service partners with surgeons and other physicians to offer innovative pain management strategies for a variety of patient populations.

The most frequently used modalities include epidurals for patients having thoracic and abdominal surgery and continuous peripheral nerve blocks for orthopedic patients. For patients having orthopedic surgery, a perineural catheter with a disposable pump is used to extend the duration that peripheral nerve blocks deliver effective pain control to several days after surgery. Patients are able to go home with the catheter in place and remove it themselves. Patients report an overwhelmingly positive experience with this approach to acute postoperative pain management.

Chronic Pain Service

Effective postoperative pain management is important for patients with underlying chronic pain as well. The Chronic Pain Management Service provides evaluations at Abbott Northwestern to address issues related to chronic pain control and management after surgery. It works with the patient's primary treatment team to address chronic pain issues, coordinate secondary consultations and promote continuity of care. Services include assistance with assessment, management and triage of patients with acute, chronic or cancer pain. The chronic pain service provides expert consultation from a pain management physician who has more than 30 years of experience, along with a nurse practitioner and clinical nurse specialist who focus on chronic pain management. They are assisted by pharmacists, integrative therapy practitioners and others to provide comprehensive pain management services, including acupuncture, medication management, massage therapy and resources for discharge.



Integrative Health Services from the Penny George Institute for Health and Healing

Founded by the George Family Foundation and the Ted and Dr. Roberta Mann Foundation, the Penny George Institute for Health and Healing is the largest integrative health center embedded in a health system in the country.

Patients with spinal diseases and disorders and those requiring spine surgery benefit from the integrative services offered by the Penny George Institute's dedicated spine team, including acupuncturists, massage therapists and nurse clinicians with board certification in holistic nursing.

Patients with complex surgeries may have a longer hospital stay or issues related to chronic pain. The Penny George Institute's Pre-Hospital Program offers mind-body coaching to prepare patients for a positive hospital experience. By meeting with a mind-body coach prior to surgery, patients become consciously aware of the strengths and resources they have to help them through the surgery and recovery process. They also learn techniques to help them relax and feel more in control.

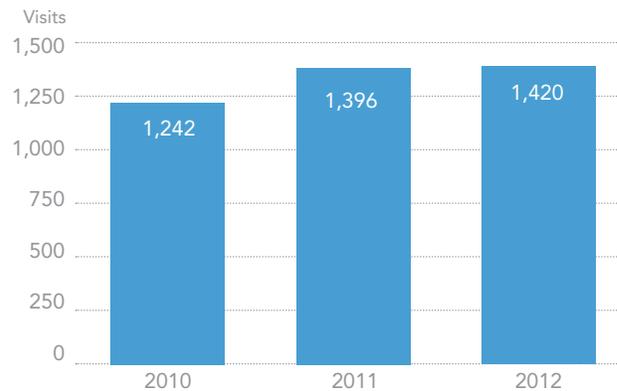
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The LiveWell Fitness Center offers a highly credentialed staff of exercise physiologists, physical therapists, licensed nutritionists and aftercare specialists. They collaborate with the Spine Institute's physicians and rehabilitation professionals and help Spine Institute patients develop fitness and nutrition plans to optimize health before and after surgery.

In addition, the Penny George Institute Outpatient Clinic - Abbott Northwestern offers acupuncture, biofeedback, integrative medicine consultations, nutrition services, therapeutic massage and more.

Integrative health visits



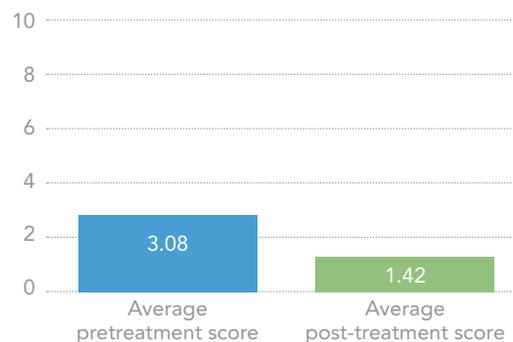
Pre- and post-treatment pain scores, 2012 (n=715)

Pain score using verbal 0-10 scale



Pre- and post-treatment anxiety scores, 2012 (n=471)

Anxiety score using verbal 0-10 scale





Spine Rehabilitation at Courage Kenny Rehabilitation Institute

Courage Kenny Rehabilitation Institute collaborates with and supports the goals of the John Nasseff Neuroscience Institute by providing comprehensive therapy services along the care continuum from acute hospitalization through outpatient care at all Allina Health hospitals and clinics.

- Pre- and postoperative education and therapy services are available at all Allina Health hospitals to optimize patient function before and after surgery.
- Acute comprehensive inpatient rehabilitation units at Abbott Northwestern Hospital and at United Hospital provide comprehensive treatment for patients recovering from a traumatic spinal cord injury. The inpatient care teams use a patient-centered team approach to help patients improve function and mobility with the goal of returning patients to their communities. Abbott

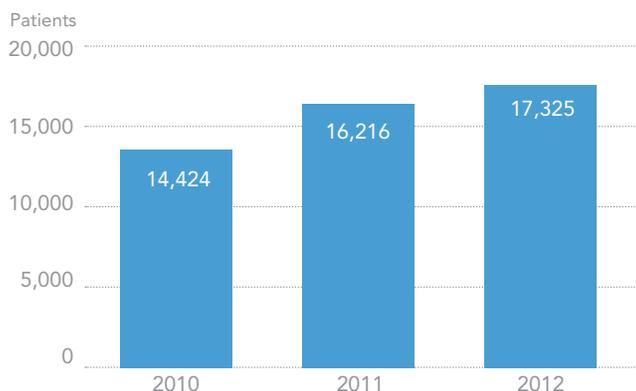
Northwestern's program for treating patients with spinal cord injury is the only such program in the Twin Cities accredited by the Commission on the Accreditation of Rehabilitation Facilities.

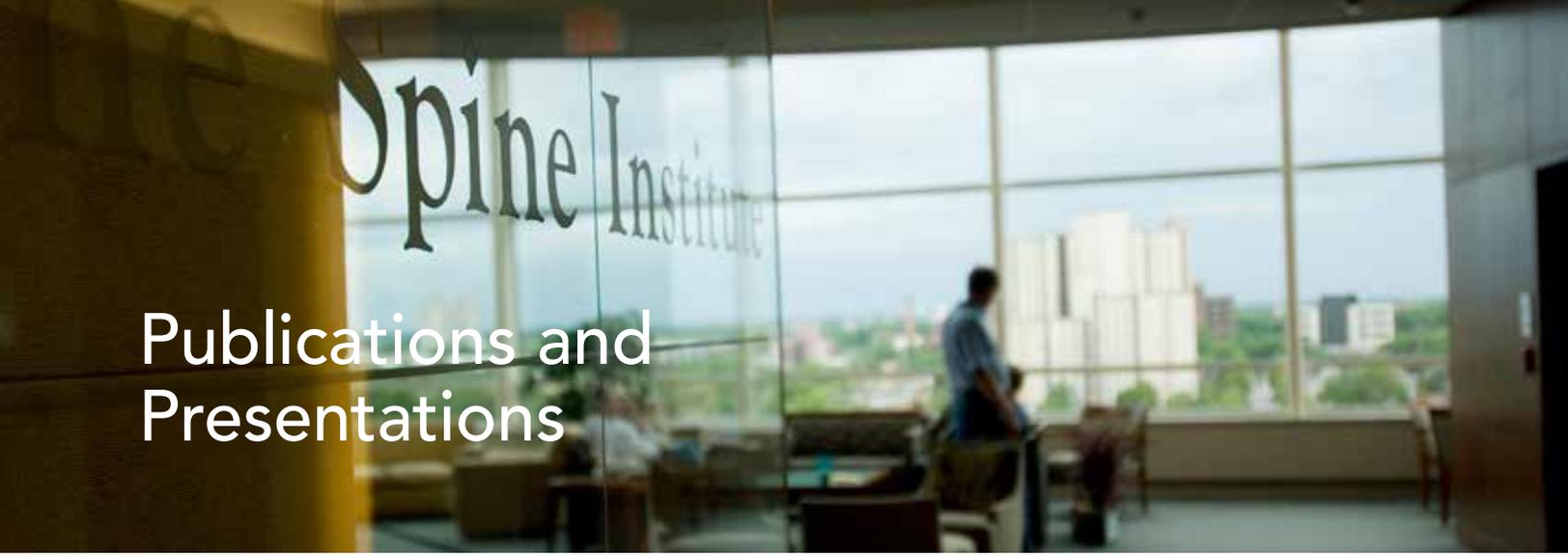
- More than 12,000 patients a year receive spine physical therapy at 24 Courage Kenny Sports & Physical Therapy locations. Each patient is evaluated by a physical therapist trained in orthopedics. A plan of care is developed that is customized to the needs of the patients.
- Some patients may benefit from a more intensive strengthening regimen through the Courage Kenny Spine Rehabilitation program. This program is led by a physician specializing in spine care. Patients with acute, sub-acute and chronic neck and back pain receive an individualized exercise program that often includes the use of MedX machines.

New spine patient volume

Courage Kenny Sports & Physical Therapy Center

Data gathered from Sister Kenny Sports & Physical Therapy Center prior to 2013 merger that created Courage Kenny Rehabilitation Institute.





Publications and Presentations

Publications

Abbott Northwestern's Spine Institute

Skinner SA. Spinal cord injury from electrocautery: observations in a porcine model using electromyography and motor evoked potentials. *J Clin Monit Comput.* [In press, available online].

MacDonald DB, **Skinner SA**, Shils J, Yingling C. Intraoperative motor evoked potential monitoring. A position statement by the American Society of Neurophysiological Monitoring [In review].

Skinner SA. Guest editorial: Electrodiagnostic pedicle screw testing. *J Clin Neurophysiol.* Dec 2012;29(6):481.

Skinner SA. Threshold testing of lumbosacral pedicle screws: a re-appraisal. *J Clin Neurophysiol.* Dec 2012;29(6):493-501.

Skinner SA. Neurophysiologic monitoring of the spinal accessory nerve, hypoglossal nerve, and the spinomedullary region. *J Clin Neurophysiol.* Dec 2011; 28(6):587-598.

Neurosurgical Associates

Beatty Z, **Bergman T.** Meningeal hemangiopericytoma with intracranial metastases in an HIV-positive male: case report and review of the literature. *Case Rep Oncol.* 2012 Jan;5(1):159-163.

Grossbach A, Baimeedi P, McDonald W, **Bergman T.** Multicentric chordoma: A case report and review of the literature. *Neurosurgery.* 2011 69(6):1319.

Norby KE, Siddiq F, Vazquez C, **Roark CD, Galicich WE, Bergman TA.** Anterolateral spinal fusion alone for thoracolumbar burst fractures: long-term outcomes. Submitted to *Journal of Neurosurgery* 2012.

Siddiq F, Norby KE, Adil MM, **Roark CD, Galicich WE, Bergman TA.** Predictors of loss of kyphotic deformity correction and scoliosis after anterolateral vertebrectomy and anterior spinal fusion for thoracolumbar burst fractures. Submitted to *Neurosurgery* 2012.

Institute for Low Back and Neck Care

Strothman DH, Schwender JD. Minimally invasive posterior lumbar instrumentation. In: Herkowitz HN, Garfin SR, Eismont FJ, Bell GR, Balderston RA, eds. *Rothman-Smeone The Spine.* 6th ed. Saunders, an imprint of Elsevier Inc; 2011.

Strothman DH, Schwender JD. Mini-open (Wiltse approach) decompression/fusion. In: Wang JC, ed. *Advanced Reconstruction: Spine.* American Academy of Orthopaedic Surgeons; 2011.

Twin Cities Spine Center

Bronfort G, Maiers MJ, Evans RL, Schulz CA, Bracha Y, Svendsen KH, Grimm RH Jr, Owens EF Jr, **Garvey TA, Transfeldt EE.** Supervised exercise, spinal manipulation, and home exercise for chronic low back pain. A randomized clinical trial. *Spine J.* 2011 May 27. [Epub ahead of print]

Chaudhari R, Zheng X, Wu C, **Mehbod AA, Transfeldt EE, Winter RB.** Effect of number of fusion levels on S1 screws in long fusion construct in a calf spine model. *Spine.* 2011 Apr 15;36(8):624-9.

Cho W, Wu C, Zheng X, Erkan S, Suratwala SJ, **Mehbod AA, Transfeldt EE.** Is it safe to back out pedicle screws after augmentation with polymethyl methacrylate or calcium phosphate cement? A biomechanical study. *J Spinal Disord Tech.* 2011 Jun;24(4):276-9.

Cho W, Wu C, Erkan S, Kang MM, **Mehbod AA, Transfeldt EE.** The effect on the pullout strength by the timing of pedicle screw insertion after calcium phosphate cement injection. *J Spinal Disord Tech.* 2011 Apr;24(2):116-20.

Joglekar SB, **Mehbod AA.** Surgeon's view of pedicle screw implantation for the monitoring neurophysiologist. *J Clin Neurophysiol.* 2012 Dec;29(6):482-8.

Liu H, Ploumis A, **Schwender JD, Garvey TA.** Posterior cervical lateral mass screw fixation and fusion to treat pseudarthrosis of anterior cervical fusion. *J Spinal Disord Tech.* 2011 Apr 10. [Epub ahead of print]

Lonstein JE, Koop SE, Novachek TF, **Perra JH.** Results and complications following spinal fusion for neuromuscular scoliosis in cerebral palsy and static encephalopathy using Luque Galveston instrumentation. Experience in 93 patients. *Spine.* 2011 Jun 13. [Epub ahead of print]



Paré PE, Chappuis JL, Rampersaud R, Agarwala AO, **Perra JH**, Erkan S, Wu C. Biomechanical evaluation of a novel fenestrated pedicle screw augmented with bone cement in osteoporotic spines. *Spine*. 2011 Feb 15. [Epub ahead of print]

Ploumis A, Wu C, **Mehbod A**, Gelalis I, Wood K, **Transfeldt E**. Mechanical load study of lumbar cor and lordosis and its potential relationship to formation of rotatoryolisthesis. *Spine Deformity*, 2012 (Accepted for publication).

Ploumis A, **Transfeldt EE**, Gilbert TJ, **Mehbod AA**, **Pinto MR**, **Denis F**. Radiculopathy in degenerative lumbar scoliosis: correlation of stenosis with relief from selective nerve root steroid injections. *Pain Med*. 2011 Jan;12(1):45-50. Epub 2010 Nov 18.

Sansur CA, Smith JS, Coe JD, Glassman SD, Berven SH, Polly DW Jr, **Perra JH**, Boachie-Adjei O, Shaffrey CI. Scoliosis research society morbidity and mortality of adult scoliosis surgery. *Spine*. 2011 Apr 20;36(9):E593-7.

Smith JS, Shaffrey CI, Sansur CA, Berven SH, Fu KM, Broadstone PA, Choma TJ, Goytan MJ, Noordeen HH, Knapp DR Jr, Hart RA, Donaldson WF 3rd, Polly DW Jr, **Perra JH**, Boachie-Adjei O. Rates of infection after spine surgery based on 108,419 procedures. A report from the Scoliosis Research Society Morbidity and Mortality Committee. *Spine*. 2011 Apr 1;36(7):556-563.

Williams BJ, Smith JS, Fu KM, Hamilton DK, Polly DW Jr, Ames CP, Berven SH, **Perra JH**, Knapp DR Jr, McCarthy RE, Shaffrey CI. Does bone morphogenetic protein increase the incidence of perioperative complications in spinal fusion? A comparison of 55,862 cases of spinal fusion with and without bone morphogenetic protein. Scoliosis Research Society Morbidity and Mortality Committee. *Spine*. 2011 Sep 15;36(20):1685-1691.

Winter RB. Congenital thoracic scoliosis with unilateral unsegmented bar, convex hemivertebrae, and fused concave ribs with severe progression after posterior fusion at age 2: 40-year follow-up after revision anterior and posterior surgery at age 8. *Spine*. 2012 Apr 15;37(8):E507-10.

Winter RB, Burger EL. L5 hemivertebra resection and T12-S1 fusion in a 14-year-old female with a 36-year follow-up. *Spine*. 2012 Apr 1;37(7):E445-50.

Winter RB, Akbarnia BA. Case report: 122° kyphosis secondary to C5-L3 laminectomy and quadriplegia, surgical correction and 30-year follow-up. *Spinal Cord*. 2011 Sep;49(9):1023-4. Epub 2011 Apr 5.

Winter RB. Severe neurofibromatosis kyphoscoliosis, posterior wedge osteotomy, halo-traction, and anterior autograft strut fusion, with 28-year follow-up. *Spine*. 2011 Dec 15;36(26):E1774-7.

Presentations

Abbott Northwestern Spine Institute

Skinner SA. (1) EMG in spinal cord monitoring: what it adds to TcMEP. (2) Neuromonitoring in complex spinal surgery. (3) Remote monitoring and automated neuromonitoring systems: where are we going in the United States? Presented at: Intraoperative Neurophysiological Monitoring in Neurosurgery; Part III: Spine and Spinal Cord Surgery; Oct. 18-20, 2012; Verona, Italy.

Skinner SA. (1) Electromyography. (2) Lower spinal surgery. American Clinical Neurophysiology Society 2012 Mid-Year Course; September 2012; Minneapolis MN.

Skinner SA. Meeting program co-chairman. (1) Research in the OR: the Achilles' heels of evidence-based medicine. (2) Re-appraisal of pedicle screw and TcMEP IONM. Presented at: American Society of Neurophysiological Monitoring Annual Meeting; May 2012. Salt Lake City, UT.

Skinner SA. Invited lecture and workshop discussion. (1) Electromyography: theory and implementation in the Operating Room. (2) Peripheral and central intraoperative monitoring of EMG. Presented at: American Academy of Neurology 2012 Annual Meeting and Courses; Intraoperative Monitoring Skills Workshop; April 2012; New Orleans, LA.

Skinner SA. (1) Electromyography in the OR. (2) EMG monitoring of central motor pathways. Presented at: American Society of Neurophysiological Monitoring Regional Meeting; March 2012; Clearwater, FL.

Skinner SA. (1) IOM basic course. (2) Suprasegmentally generated EMG discharges. Presented at: American Clinical Neurophysiology Society 2012 Annual Meeting and Courses; Feb. 7, 2012; San Antonio, TX.

Skinner SA. (1) Lower spine IOM potpourri: case discussions. (2) Pedicle screw monitoring: a re-appraisal. Presented at: American Society of Neurophysiological Monitoring Regional Meeting; December 2011; Scottsdale, AZ.

Skinner SA. (1) Electromyography: theory and implementation in the operating room. (2) Case discussions: lower spine IOM. (3) Pedicle screw monitoring: a re-appraisal. Presented at: American Clinical Neurophysiology Society 2011 Regional Meeting and Courses; September 2011; Atlanta, GA.

Skinner SA. (1) The Bayesian dilemma: false positive monitoring when alarm criteria are too sensitive. (2) Electromyography: theory and implementation in the operating room. Panel moderator: TCE MEP alarm criteria. Presented at: American Society of Neurophysiological Monitoring Annual Meeting; May 2011; Orlando, FL.

Skinner SA. (1) Orthopaedics and Rehabilitation Grand Rounds: Spinal cord multimodality monitoring. (2) Neuroscience Grand Rounds: EMG monitoring of central motor pathways. Visiting professor; University of Vermont Department of Orthopaedics and Rehabilitation; May 2011.

Skinner SA. (1) Electromyography in the OR. (2) EMG monitoring of central motor pathways. Presented at: American Society of Neurophysiological Monitoring Regional Meeting; March 2011; Clearwater, FL.

Skinner SA. (1) EMG monitoring of central motor pathways during spine surgery. (2) Use of automated devices for neuromonitoring. Presented at: American Clinical Neurophysiology Society Annual Meeting; February 2011; New Orleans, LA.

Neurosurgical Associates

Mullan JC. One Call Transfer System stream: streamlining the continuum of care. Presented at: Abbott Northwestern Hospital Frontline Neurology Symposium; Oct. 5, 2012; Edina, MN.

Mullan JC. The current management of metastatic spine tumors. Presented at: Abbott Northwestern Hospital Frontline Neurology Symposium; Oct. 4, 2011; Edina, MN.

Mullan JC. Operating room safety: What can we learn from aviation? Presented at: Abbott Northwestern Hospital; March 29, 2011; Minneapolis, MN.

Nagib M. (1)The application of IoMRI for the management of brain tumors for the adult and pediatric population. (2)The value of cervical arthroplasty for the surgical management of cervical myelopathy/radiculopathy and spondylosis. Presented at: Affiliated Community Medical Centers, Grand Rounds; April 2, 2011, Willmar, MN.

Twin Cities Spine Center

Garvey T. Is it my hip or is it my spine? Presented at: Arthritis Foundation Presentation. Nov. 13, 2012; Minneapolis, MN.

Garvey T. Getting the right diagnosis for hip or back pain. Presented at: Abbott Northwestern Hospital & Arthritis Foundation's Outreach Event. Nov. 1, 2012; Minneapolis, MN.

Lonstein J. Scoliosis Update: Screening and treatment. Presented at: Allina Health Spine Symposium. April 12, 2012; Minneapolis, MN.

Mehbod A. Case reviews. Presented at: Dan Doc Seminar. Dec. 1, 2012; Minnetonka, MN.

Mehbod A. Correction of sagittal imbalance: a relationship between proximal junctional kyphosis and reversal of compensatory pelvic retroversion. Presented at: Scoliosis Research Society Annual Meeting. Sept. 1, 2012; Chicago, IL.

Mehbod A. Operative vs. nonoperative treatment of thoracolumbar burst fractures without neurological deficit: 15 to 20 year follow-up. Presented at: Scoliosis Research Society Annual Meeting. Sept. 1, 2012; Chicago, IL.

Mehbod A. Correction of sagittal imbalance: A relationship between proximal junctional kyphosis and reversal of compensatory pelvic retroversion. Presented at: Minnesota Orthopaedic Society Annual Meeting. May 1, 2012; Minneapolis, MN.



Mehbod A. Lumbar spine: non-operative care, surgery, and outcomes. Presented at: Cambridge Provider Meeting. May 1, 2012; Cambridge, MN.

Mehbod, A. Pediatric to geriatric. Presented at: Minnesota Association of Rehabilitation Providers. March 1, 2012; Minnetonka, MN.

Mullaney K. Orthopaedic perspective on pain. Presented at: 7th Annual MAPS Pain Conference. Nov. 16, 2012; Edina, MN.

Mullaney K. Pain. Presented at: MAPS Pain Conference. Nov. 12, 2012; Edina, MN.

Mullaney K. Measuring outcomes in spinal surgery. Presented at: Allina Health Spine Symposium. April 12, 2012; Minneapolis, MN.

Pinto M. Case reviews. Presented at: Dan Doc Seminar. Nov. 10, 2012; Bloomington, MN.

Pinto M. Avoiding complications in degenerative lumbar scoliosis surgery: techniques for managing suboptimal bone quality. Nov. 1, 2012; San Juan, Puerto Rico.

Pinto M. LLIF for adult scoliosis. Presented at: Lumbar Degenerative Stenosis and Deformity Conference: Globus Medical. Nov. 1, 2012; San Juan, Puerto Rico.

Pinto M. LLIF indications. Presented at: Lumbar Degenerative Stenosis and Deformity Conference: Globus Medical. Nov. 1, 2012; San Juan, Puerto Rico.

Pinto M. Case studies. Presented at: Dan Doc Seminar. Nov. 1, 2012; Bloomington, MN.

Pinto M. LLIF training faculty. Presented at: Chicago Skin to Skin MIS LLIF Training Lab. Oct. 1, 2012; Burr Ridge, IL.

Pinto M. Case reviews. Presented at: Dan Doc Seminar. March 1, 2012; Bloomington, MN.

Pinto M. Covering the basics in spine. Presented at: FPA Referral Forum. May 1, 2012; Edina, MN.

Transfeldt E. Neck, back pain, and sciatica. Presented at: University of Minnesota; Annual Talk to Second Year Medical Students. Nov. 29, 2012; Minneapolis, MN.



About Abbott Northwestern Hospital

Abbott Northwestern Hospital is the largest not-for-profit hospital in the Twin Cities area, with 633 available beds and 65 bassinets. Each year, the hospital provides comprehensive health care for more than 200,000 patients and their families from the Twin Cities area and throughout the Upper Midwest. More than 5,000 employees, 1,600 physicians and 550 volunteers work as a team for the benefit of each patient served.

Abbott Northwestern Hospital is a part of Allina Health, a family of hospitals, clinics and care services in Minnesota and Western Wisconsin.

For more than 125 years, Abbott Northwestern has had a reputation for quality services. The hospital is well known for its centers of excellence:

- cardiovascular services in partnership with the Minneapolis Heart Institute®
- Mental Health Services
- medical/surgical services
- Neuroscience Institute
- Orthopaedic Institute
- Penny George™ Institute for Health and Healing
- physical rehabilitation through the Courage Kenny Rehabilitation Institute™
- Spine Institute
- Virginia Piper Cancer Institute®
- The Mother Baby Center at Abbott Northwestern Hospital and Children's – Minneapolis.

Abbott Northwestern and its Medical Staff are dedicated to providing outstanding care and service to patients and their families. It offers the community exceptional physicians, nurses and support staff; a commitment to research, education and outcomes; a foundation of clinical partnerships that span the region; and a cultural enthusiasm for growth and improvement. Brought together in one institution, these factors create an energetic and sophisticated environment that inspires caregivers to collaborate in new ways for the benefit of patients.

Abbott Northwestern's passion for finding new and better approaches to care drives extensive research efforts in clinical areas across the hospital. This ensures that new treatment advances benefit patients as quickly as possible, supports a dynamic environment for medical and nursing education, and is the catalyst for its outcomes measurement program.

