

Michael Richard Murray, MD

OFFICE: UNIVERSITY OF PENNSYLVANIA SPINE CENTER – PENN ORTHOPAEDICS
University of Pennsylvania Perelman School of Medicine
479 Thomas Jones Way
Exton, Pennsylvania 19341

EDUCATION: EMORY UNIVERSITY SPINE CENTER, Atlanta, GA
Fellowship in Spine Surgery- Fellowship Director: Dr. John Heller
August 2012- July 2013

NORTHWESTERN UNIVERSITY, Chicago, IL
Residency in Orthopaedic Surgery
July 2007- June 2012

UNIVERSITY OF ILLINOIS AT CHICAGO, Chicago, IL
M.D. Aug 2003- May, 2007- Graduated With Honors

CASE WESTERN RESERVE UNIVERSITY, Cleveland, OH
Graduate Student, Biomedical Sciences Training Program, Case Western Reserve
University, Cleveland, OH, July 2001-April 2002

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
B.S. in Biological Psychology, December, 2000

Medical Licensures:

Pennsylvania Medical License: MD459577. Status: Active

Examinations:

- American Board of Orthopaedic Surgery Status: Board Certified
- American Board of Orthopaedic Surgery Part II: Passed 7/2015
- American Board of Orthopaedic Surgery Part I: Passed 7/2012

- Orthopaedic In-Training Examination 2008 (PGY-2): 186 (97th percentile)
- Orthopaedic In-Training Examination 2009 (PGY-3): 201 (97th percentile)
- Orthopaedic In-Training Examination 2010 (PGY-4): 193 (95th percentile)
- Orthopaedic In-Training Examination 2011 (PGY-5): 198 (88th percentile)

- United States Medical Licensing Examination Step 1: 263 (99th percentile)
- United States Medical Licensing Examination Step 2: 269 (99th percentile)
- United States Medical Licensing Examination Step 3: 243 (99th percentile)

Professional Societies

American Academy of Orthopaedic Surgery, Member, 2007
Society of Lateral Access Surgery (SOLAS), Member 2016

AWARDS:

Becker's "Spine Surgeon's to Know": Becker's Spine Listing of Spinal Surgeons in the US. Listed in 2016 and 2017 (Minimally Invasive Surgeon to Know).

Kirby von Kesler M.D. Golden Apple Award: Awarded by the orthopaedic residency program to their favorite faculty member for excellence in teaching and guidance. Union Memorial Hospital. June 2015

FELLOWSHIP: Awarded OMEGA grant to support fellowship education. August 2012- July 2013

RESIDENCY: Awarded the Carl L. Nelson Physician in Training Award at the 2011 Mid-America Orthopaedic Association Meeting (\$1000 award)
Selected as Northwestern University's nomination to the 2011 Orthopaedic Resident Leadership Forum
Article published in AAOS Now, "Development and Implementation of a High Risk Spine Protocol at Northwestern Memorial Hospital" was ranked #3 for the year 2011 in the category of "Editor's Choice" by AAOS Now.

MEDICAL SCHOOL: Alpha Omega Alpha Honor Society (AOA): Elected as a junior (Fall 2005), representing the top 4% of the medical school class
Received highest grade of "outstanding" in all clinical rotations
Otto Saphir Scholarship for Excellence in Pathology- Highest cumulative grade in the year-long M2 pathology course from the UIC Medical School Class of 2007.
Association of Pathology Chairs (APC) Honor Society

UNDERGRADUATE: **Dean's List:** Fall 1996, Spring 1997, Spring 1998, Fall 1998, Fall 1999, Fall 2000,
Phi Eta Sigma Honorary Society, Member, 1997

Team Coverage Experience:

Medical provider for NFL Baltimore Ravens 2013-2015
Spine Consultant for Morgan State University, Division I Collegiate Football; 2014-2015.
Chicago Blackhawks (NHL) team sports physicals; June 2010, July 2011
Division 1 NU Midlands wrestling tournament- physician coverage; Dec 2009

Administrative Service:

Blue Cross Blue Shield Musculoskeletal Subcommittee: 2016-present
Christiana Hospital Spine Work Group: 2017. Developed clinical pathways for common spinal conditions.
Christiana Hospital Bone Health Advisory Committee: 2015-2017. Developed pathway for treatment of osteoporotic vertebral compression fractures
Christiana Hospital Musculoskeletal Service Line Executive Division: 2015-2017

Medstar Union Memorial Website Steering Committee: 2014
Union Memorial Residency Selection Committee: 2013-2014
Northwestern Resident Curriculum Development: 2009-2011 Created and implemented new sports medicine, and total joint arthroplasty educational curriculums for the Northwestern orthopaedic residency program. 2009-2010
University of Illinois Medical School- Anatomy teaching assistant: Coordinated and led musculoskeletal anatomy review for first year medical students. 2007
University of Illinois Medical School- Society of Prospective Surgeons (Medical School Interest group), Member, 2003-2005; Co-President 2004-2005

Local and National Service:

Operation Walk 2011- Nepal. Participated in the pre-operative evaluation and performance of total joint arthroplasty for patients of the Nepal Orthopaedic Hospital; Kathmandu, Nepal, Nov 2011.
UIC Academic Support Network; histology tutor, 2005-2006
Student Run Free Clinic (UIC affiliation), 2004-2005
Adolescent Substance Abuse Program (ASAP), 2003-2004
Emergency Room Volunteer, NWCH, Arlington Heights, IL February 2003-May 2003

Grant Support

Recipient of OMEGA grant that provided financial support for a fellowship in spinal surgery at Emory University from 2012-2013

Grant of \$32,000 provided by Sage Products on Jan 1, 2010 for use in clinical research trial; "Efficacy of Home Pre-operative Use of Sage 2% Chlorhexidine Cloth Prior to Shoulder Surgery".

Grant of \$5,000 provided by the Northwestern University Department of Orthopaedics for use in biomechanical research project; "Stiffness of a calf functional spinal unit after replacement of nucleus pulposus with hyaluronic acid gel".

PUBLICATIONS:

Reviewership:

The Spine Journal, 2016. Ed: Eugene Carragee, MD

Articles:

Wilson SG, Chesler EJ, Hain H, Rankin AJ, Schwarz JZ, Call SB, Murray MR, West EE, Teuscher C, Rodriguez-Zas S, Belknap JK, Mogil JS. Identification of quantitative trait loci for chemical/inflammatory nociception in mice. *Pain* 2002 Apr;96(3):385- 91

Ball SC, Abraha A, Collins KR, Marozsan AJ, Baird H, Quinines-Mateu ME, Penn- Nicholson A, Murray M, Richard N, Lobritz M, Zimmerman PA, Kawamura T, Blauvelt A, Arts EJ. Comparing the ex vivo fitness of CCR5- tropic human immunodeficiency virus type 1 isolates of subtypes B and C. *Journal of Virology* 2003 Jan;77(2):1021-38

- Michael Murray MD, "What's the diagnosis". Article in "AAOS Now" publication. AAOS Now 2011 Feb
- Michael Murray MD, Michael Schafer MD. "Development and Implementation of a High Risk Spine Protocol at Northwestern Memorial Hospital". AAOS Now 2011 Feb
- Michael Murray, MD, Matthew Saltzman, MD, Stephen Gryzlo, MD, Michael Terry MD, Chase Woodward BS, Pradeep Kodali, MD, Gordon Nuber, MD. Efficacy of Home Pre-operative Use of Sage 2% Chlorhexidine Cloth Prior to Shoulder Surgery. *Journal of Shoulder and Elbow Surgery* 2011 Sept;20(6):928-933
- Gregory Schroeder MD, Michael Murray MD, Wellington Hsu MD. A Review of Dynamic Stabilization in the Lumbar Spine. *Operative Techniques in Orthopedics* 2011 Sept;21(3):235-239
- Michael Murray MD, Joseph Weistroffer MD, Michael Schafer MD. Case report of an abscess at the site of a post-operative hematoma following direct lateral interbody fusion (DLIF). *The Spine Journal* 2012 Jul;12(7):e1-4
- Michael Murray MD, Tianyi Wang BS, Gregory Schroeder MD, Wellington Hsu MD. The 100 Most Cited Spine Articles. *European Spine Journal* 2012 Oct; 21(10):2059-2069
- Gregory Schroeder MD, Michael Murray MD, Cary Templin MD, Jeffrey Stambough MD, MBA. Traumatic and Neoplastic Instability of the Cervical Spine. *Seminars in Spine Surgery* 2013 June; 25(2):100-109
- Gregory D. Schroeder MD, Michael R. Murray MD, Cary R. Templin MD. Current Concepts in the Management of Cervical Spine Metastatic Disease. *Orthopaedic Knowledge Online*. 2014, March 1. American Academy of Orthopaedic Surgery.
- Michael R. Murray. Enhancing Diagnostic Accuracy: A saliva score for scoliosis. *Maryland Physican Magazine*. June 30, 2014
- Michael R. Murray MD, Gregory Schroeder MD, Wellington Hsu MD. Granulomatous disease in the spine. *Journal of the American Academy of Orthopaedic Surgeons (JAAOS)*. 2015 September; 23(9): 529-538
- Michael R. Murray MD, Branko Skovrlj MD, Sheeraz Qureshi MD. Surgical Treatment of Isthmic Spondylolisthesis. *Controversies in Spine Surgery*. 2016 February; 29(1) : 1-5
- Michael R. Murray MD, Benjamin Geddes BS, Scott Boden MD, Timothy Yoon MD, Daniel Refai MD, Gerald Rodts MD, John Heller MD. Prospective study of dysphagia rates following ACDF using rhBMP2. In process; data collection ongoing.

Book Chapters:

Michael Murray MD, Wellington Hsu MD. "Post-operative infection". In Patel, Patel, Harrop, Burger (Eds). Spine Surgery Basics. Springer, 2014

Michael Murray MD, Wellington Hsu MD. "Infections of the spine". In Kim D, Vaccaro A, Whang P, Kim S, Kim S. Lumbosacral and Pelvic Procedures. CRS Press, Dec 2013

Abstracts and/or Proceedings

Koh JL, Murray M. Navigation-assisted assessment of rotational and translational stability of various ACL graft types. Abstract presented at 2010 Computer Assisted Orthopaedic Surgery Conference. June 16-19, 2010, Paris, France

Michael Murray, MD, Matthew Saltzman, MD, Stephen Gryzlo, MD, Michael Terry MD, Chase Woodward BS, Gordon Nuber, MD. Efficacy of Home Pre-operative Use of Sage 2% Chlorhexidine Cloth Prior to Shoulder Surgery. Abstract presented at the 2010 closed meeting of the American Shoulder and Elbow Surgeons. October 20-23, 2010; Scottsdale, Arizona

Michael Murray, MD, Matthew Saltzman, MD, Stephen Gryzlo, MD, Michael Terry MD, Chase Woodward BS, Gordon Nuber, MD. Efficacy of Home Pre-operative Use of Sage 2% Chlorhexidine Cloth Prior to Shoulder Surgery. Abstract presented as a podium presentation at the 2011 annual meeting of the American Academy of Orthopaedic Surgeons. February 18, 2011; San Diego, California

Michael Murray, MD, Matthew Saltzman, MD, Stephen Gryzlo, MD, Michael Terry MD, Chase Woodward BS, Gordon Nuber, MD. Efficacy of Home Pre-operative Use of Sage 2% Chlorhexidine Cloth Prior to Shoulder Surgery. Presented as a poster presentation at the 2011 Northwestern Memorial Research Day, April 7, 2011

Michael Murray, MD, Matthew Saltzman, MD, Stephen Gryzlo, MD, Michael Terry MD, Chase Woodward BS, Gordon Nuber, MD. Efficacy of Home Pre-operative Use of Sage 2% Chlorhexidine Cloth Prior to Shoulder Surgery. Abstract presented at the 2011 Mid-America Orthopaedic Association. April 8, 2011; Tuscon, Arizona

Michael Murray, MD, Matthew Saltzman, MD, Stephen Gryzlo, MD, Michael Terry MD, Chase Woodward BS, Gordon Nuber, MD. Efficacy of Home Pre-operative Use of Sage 2% Chlorhexidine Cloth Prior to Shoulder Surgery. Abstract presented as an e-poster at the 2011 annual meeting of the Arthroscopy Association of North America. April 14-16, 2011; San Francisco, California.

Michael Murray, MD, Matthew Saltzman, MD, Stephen Gryzlo, MD, Michael Terry MD, Chase Woodward BS, Gordon Nuber, MD. Efficacy of Home Pre-operative Use of Sage 2% Chlorhexidine Cloth Prior to Shoulder Surgery. Presented as a poster presentation at the 2011 annual meeting of the American Orthopaedic Association. June 22-25, 2011; Boston, Massachusetts.

James M. Saucedo, MD, MBA; Michael Murray, MD; Lalit Puri, MD, MBA. Integrating Business Education into Residency Training Programs. Presented as a poster presentation for the 2011 annual meeting of the American Orthopaedic Association. June 22-25, 2011; Boston, Massachusetts

Heller JG, Murray MR. Airway complications following cervical spine surgery. Presented as an Instructional Course Lecture at the 2012 annual meeting of the Cervical Spine Research Society (CSRS), Dec 5, 2012; Chicago, Illinois

Gregory Schroeder MD, Michael Murray MD, Wellington Hsu MD et al. The Development of an Inexpensive and Reproducible Model for Evaluating the Biomechanical Effects of a Discectomy. Presented at the 2013 Mid-America Orthopaedic Association annual meeting. April 17-21, 2013; Amelia Island, Florida

Michael R. Murray, MD; Steven K. Leckie, MD; Bradley W. Moatz, MD; Adam J. Schell, MD; Ajay Premkumar, BS; John G. Heller, MD. Prospective Comparison of Dysphagia following Anterior Cervical Discectomy and Fusion (ACDF) with and without rhBMP-2. Presented as a poster at the European Cervical Spine Research Society. May 15, 2015; London, England

Michael R. Murray, MD; Steven K. Leckie, MD; Bradley W. Moatz, MD; Adam J. Schell, MD; Ajay Premkumar, BS; John G. Heller, MD. Prospective Comparison of Dysphagia following Anterior Cervical Discectomy and Fusion (ACDF) with and without rhBMP-2. Presented as a podium presentation at the Cervical Spine Research Society. Dec 4, 2015; San Diego, California

Invited Lectures/ Course Faculty:

“Introduction to MIS (Minimally Invasive Surgery) posterior techniques” Served as faculty for lecture and cadaveric instruction at NuVasive’s Residents and Fellows course. Baltimore, MD. Sept 30, 2017.

“Minimally Invasive Spine Surgery ” Served as faculty for lecture and cadaveric instruction at DuPuy-Synthes Future Leader’s Course. West Chester, PA. June 10, 2017

“Cervical Spine Injuries in Sports” Lecture to Christiana Care Sports Medicine Fellows. February 1, 2017

“Minimally Invasive and Motion Preserving Spine Surgery” Continuing Education Lecture to the Physician Assistants of Christiana Hospital. October 12, 2016

“Understanding and Treating Spinal Arthritis” University of Delaware Annual Arthritis Symposium. Newark, DE. May 9, 2016

“Case of Symptomatic Subdural Hygroma Following Lumbar Decompression” Annual meeting of the Spine Study Group (SSG). Miami, FL. May 7, 2016

- "Back Pain and the Injured Worker" Annual meeting for the Workers Compensation Claims Adjusters. Newark, DE. May 3, 2016
- "Back Pain and the Injured Worker" Annual meeting for the Delaware Association for Occupational Health Nurses. Newark, DE. March 16, 2016
- "Common Cervical Disorders; What the Internist Needs to Know" Grand Rounds lecture for Department of Internal Medicine, Christiana Hospital. Newark, DE. Jan 28, 2016
- "Cranio-cervical anatomy and instrumentation" Served as faculty for lecture and cadaveric instruction at DuPuy-Synthes Future Leader's Course. West Chester, PA. May 16, 2015
- "Degenerative Thoracolumbar Scoliosis: Traditional Open is Best" Spine A-Z Current Controversies, Spine Study Group. Turnberry Island, FL. May 14, 2015.
- "Current Concepts in Spinal Fusion" In-training lecture for Union Memorial OR Staff as part of The Joint Commission (TJC) Gold-Seal of approval certification. Nov 7, 2014
- "Lumbar Spinal Disorders Made Easy". Grand Rounds, Department of Internal Medicine, Union Memorial Hospital, Baltimore, MD. Sept 11, 2014
- "Physical Examination of the Lumbar and Cervical Spine" Lecture given to the internal medicine residency program at Union Memorial Hospital, Baltimore, MD. June 20, 2014
- "Management of Complex Spine Patients" In-service lecture given to nursing and rehabilitation staff of Union Memorial Hospital, Baltimore, MD. May 30, 2014
- "New Concepts In Spine Surgery" Lecture given to members of the National Rehabilitation Network of the Maryland-DC-Virginia region, Ellicott City, MD. March 25, 2014
- "Back Pain Basics" Public lecture at the Columbia Double Tree Hotel Conference Center, Columbia, Maryland. March 22, 2014
- "Common Cervical Spine Conditions, What Does the Internist Need to Know". Grand Rounds, Department of Internal Medicine, Union Memorial Hospital, Baltimore, MD. Feb 6, 2014
- "Relationship Advice For Your Spine". Public lecture at the Bain Community Center, Columbia, Maryland. January 16th, 2014
- "Keeping your spine inline" Public lecture at Westminster Public Library. Westminster, Maryland. October 10, 2013

“Cervical Radiculopathy and Axial Neck Pain” Chairman’s conference- Emory University Department of Orthopaedic Surgery. May 8th, 2013

“Physical Examination of the Spine” Lecture given to M3 medical students at the Northwestern- Feinberg School of Medicine. March 28, 2012

“Spondylolysis and Spondylolisthesis” Lecture given to Northwestern Memorial Hospital nursing staff in preparation for Orthopaedic Nursing Certification. March 28, 2012

“Post-operative Infection Prevention: The Northwestern Experience” Lecture given to the executive board of Sage Products, Cary, IL. September 6, 2011

“Percutaneous Management of Vertebral Compression Fractures”. Chairman’s conference- Northwestern Memorial Hospital. April 16, 2011

“Basics in Thoracolumbar Spine Pathology”. Lecture given to the students in the Department of Physical Therapy and Human Movement Sciences at Northwestern University as part of the course “Clinical Management of Musculoskeletal Dysfunction III”. March 21, 2011

“The Top 100 Papers in Spine Surgery”. Multidisciplinary spine conference at Northwestern Memorial Hospital. Feb 9, 2011

Television and Radio:

“Ask the Expert- Spine Surgery” WBAL-TV. Television interview as segment on 6PM CBS Local News Affiliate. Baltimore, MD. Feb 6, 2014

Radio appearance on WTTR radio station on the topic of spine health. Westminster, Maryland. October 14, 2013

CONSULTING/INNOVATION:

Viper Prime Minimally Invasive Fusion System- Johnson and Johnson, Raynam, MA. 2016.

EXPERIENCE:

Spine Surgeon at Christiana Spine Center – Sept 2015 – July 2017. Newark, Delaware.

Attending Surgeon and Clinical Instructor of Spine Surgery- Sept 2013- August 2015 Union Memorial Hospital, Baltimore, Maryland.

Clinical Instructor of Orthopaedic Surgery- August 2012-July 2013, Emory University, Atlanta Georgia

Research Associate, August 2002-July 2003, Baxter Healthcare, Round Lake, IL

-Designed experiments, collected data, created reports and prepared drug solutions for double-blind Phase III clinical trial for red blood cell pathogen inactivation (Intercept project)

Research Assistant, August 1999-June 2001, University of Illinois, Champaign, IL

-Independently conducted experiments and collected data for pain genetics research (QTL mapping)