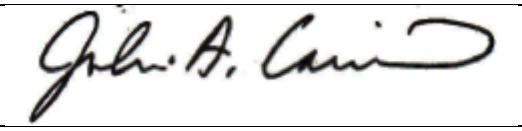
WEILL CORNELL MEDICAL COLLEGE

CURRICULUM VITAE

Name:	John A Carrino M.D., M.P.H., F.A.C.R.
Signature (required):	
Date of Preparation:	May 22, 2023

A. GENERAL INFORMATION

Required Information:

Office address:	535 E. 70th Street, 3E-012, New York, NY 10021
Office telephone:	646-797-8431
Office fax:	212-734-7475
Home address:	515 East 72nd Street Apt 4A New York, NY 10021
Home telephone:	347-721-1718
Cell phone:	347-721-1718
Work Email: Personal Email:	carrinoj@hss.edu rhinorad@gmail.com
Citizenship:	USA

Optional Information:

Birth date:	September 15, 1964
Birthplace:	Hackensack, New Jersey, USA
Marital status:	Married
Race/Ethnicity:	Caucasian

B. EDUCATIONAL BACKGROUND

1. Academic Degrees:

Degree (abbreviation)	Institution Name and Location	Dates attended	Year Awarded
BS, Zoology	George Washington University, Washington, DC	1982 – 1986	1986
MD	George Washington University, Washington, DC	1986 – 1990	1990
MPH, Clinical Effectiveness	Harvard School of Public Health, Boston, MA	1999 – 2002	2002

2. Post-doctoral training:

Title	Institution name and location	Dates held
Internship, Internal Medicine	California Pacific Medical Center, Presbyterian Medical Center, San Francisco, CA	1990 – 1991
Residency, Diagnostic Radiology	Yale School of Medicine, Yale University, New Haven, CT	1991 – 1995
Focused Residency, Musculoskeletal Radiology	Yale School of Medicine, Yale University, New Haven, CT	1994 – 1995

C. LICENSURE, BOARD CERTIFICATION, MALPRACTICE

1. Licensure:

State	Number	Date of issue	Date of last registration
Iowa, Medical License	30856	10/03/1995	09/01/2004
Massachusetts, Medical License	157522	08/05/1998	09/15/2009
Pennsylvania, Medical License	MD-071216-L	06/29/2000	12/31/2008
New Jersey, Medical License	25MA71831	01/26/2001	06/30/2023
Arizona, Medical License	30931	11/08/2002	01/15/2009
Rhode Island, Medical License	MD11856	06/08/2005	06/30/2008
Maryland, Medical License	D0064640	05/26/2006	09/30/2014
New York, Medical License	249969	08/12/2008	08/31/2023
Connecticut, Medical License	53653	11/05/2014	09/30/2023
Florida, Medical License	ME 142653	09/25/2019	01/31/2024
c. DEA number (optional):	FC1558052		
d. NPI number (optional):	1942297767		

2. Board Certification

Full Name of Board	Certificate #	Dates of Certification Start and End Dates
National Board of Medical Examiners	390227	7/1/1991 – present
American Board of Radiology, Diagnostic Radiology	9833	6/7/1995 – present

3. **Malpractice Insurance**

Do you have Malpractice Insurance?	Yes
Name of Provider: New Hampshire Insurance Company, Medical Indemnity Assurance Company, Ltd. Policy # 679359E (6/15/16-6/15/17) Excess of $2MM/$3MM – New Hampshire Insurance Group Primary Policy	
Premiums paid by: Employer Institution: Hospital for Special Surgery	

D. PROFESSIONAL POSITIONS AND EMPLOYMENT

1. **Academic positions (teaching and research)**

Title	Institution name and location	Dates held
Clinical Assistant Professor, Radiology	Uniformed Services University of the Health Sciences, Bethesda, MD	1996 – 1998
Clinical Assistant Professor, Radiology	University of Texas, San Antonio, San Antonio, TX	1996 – 1998
Instructor, Radiology	Harvard Medical School, Boston, MA	1998 – 2000
Assistant Professor, Radiology	Jefferson Medical College, Philadelphia, PA	2000 – 2002
Assistant Professor, Radiology	Harvard Medical School, Boston, MA	2002 – 2006
Associate Professor, Radiology	Johns Hopkins University School of Medicine, Baltimore, MD	2006 – 2014
Associate Professor, Orthopaedic Surgery (Secondary Appointment)	Johns Hopkins University School of Medicine, Baltimore, MD	2006 – 2014

Adjunct Associate Professor, Biomedical Engineering	Johns Hopkins University School of Medicine, Baltimore, MD	2013 – 2014
Professor of Radiology	Weill Cornell Medicine, New York, NY	2014 – present

2. **Hospital positions**

Title	Institution name and location	Dates held
Staff Radiologist	Wilford Hall Medical Center, San Antonio, TX	09/01/95 – 09/30/98
Staff Radiologist	Brigham and Women's Hospital, Boston, MA	10/01/98 – 08/31/00
Staff Radiologist	Nantucket Cottage Hospital, Nantucket, MA	12/11/99 – 12/19/99
Staff Radiologist	Newton-Wellesley Hospital, Newton, MA	12/04/98 – 01/13/00
Staff Radiologist	Jefferson University Hospital, Philadelphia, PA	09/01/00 – 10/31/02
Staff Radiologist	Brigham and Women's Hospital, Boston, MA	11/01/02 – 06/30/06
Staff Radiologist	Cape Cod Hospital, Hyannis, MA	06/20/06 – 07/01/06
Staff Radiologist	Johns Hopkins Hospital, Baltimore, MD	07/01/06 – 03/30/14
Section Chief, Musculoskeletal Radiology	Johns Hopkins Hospital, Baltimore, MD	07/01/06 – 03/30/14
Vice Chairman, Radiology and Imaging	Hospital for Special Surgery, New York, NY	04/01/14 – present

E. EMPLOYMENT STATUS (current or anticipated)

Name of Employer: Hospital for Special Surgery
Employment Status: Full-time salaried by Cornell-affiliated hospital

F. INSTITUTIONAL/HOSPITAL AFFILIATION

Primary Hospital Affiliation:	Hospital for Special Surgery

G. PERCENT EFFORT AND INSTITUTIONAL RESPONSIBILITIES

CURRENT % EFFORT	(%)	Does the activity involve WCMC students/researchers? (Yes/No)
TEACHING	10%	Y
CLINICAL	70%	N
ADMINISTRATIVE	10%	N
RESEARCH	10%	Y
TOTAL	100%	

H. INSTITUTIONAL RESPONSIBILITIES

1. Teaching:

Didactic teaching:	
	Dates
Musculoskeletal Imaging Mini-Course Curriculum, Harvard Medical School, Boston, MA, Lecture: Musculoskeletal Imaging Mini-Course Curriculum	1998 – 2005
Harvard Combined Orthopedic Residency Program Core Curriculum, Harvard Medical School, Boston, MA	1999 – 2004
Musculoskeletal Radiology Residency Curriculum, The Russell H. Morgan Department of Radiology and Radiological Science, Johns Hopkins Hospital, Baltimore, MD	2006 – 2007
Radiology Medical Student Curriculum, Johns Hopkins University School of Medicine, Baltimore, MD	2006 – 2007
Cross-sectional Fellowship Didactic Curriculum, Johns Hopkins Hospital, Baltimore, MD, Lecture: "Spine," "Shoulder," "Elbow/Wrist," "Hip," "Knee, "Ankle MRI"	2006 – 2009
MRI Conferences, Department of Radiology, Hospital for Special Surgery, New York, NY	2014 – 2017
Resident/Fellow Conferences, Department of Radiology, Hospital for Special Surgery, New York, NY	2014 – 2022

Mentorship:	
Mentee	Dates
Sanjay Mudigonda, M.D.; Chief of Musculoskeletal Imaging Section, Newton Wellesley Hospital, Wellesley Hills, MA	2004 – 2006
Mylinh Huynh, M.D.; Staff radiologist, Kaiser Permanente, San Francisco, CA	2004 – 2006
Roberto Blanco, M.D., Ph.D.; Chairman and Professor of Radiology at Turku University Hospital	2004 – 2006
Jan Fritz, M.D.; Section Chief, Musculoskeletal Imaging, NYU Langone, Associate Professor of Radiology, NYU, New York, NY	2007 – 2011
Qian Dong, M.D.; Professor, Department of Mechanical Engineering, University of Texas at Dallas	2007 – 2008
Rick Obray, M.D.; Staff Radiologist, Dixie Regional Medical Center, Saint George, UT	2008

Shrey Thawait, M.D.; Diagnostic Radiology, Vascular and Interventional, Northwest Radiologists, Indianapolis, IN	2008 – 2009
Laura Fayad, M.D., **M.S.**; Chief of Musculoskeletal Radiology, Associate Professor of Radiology and Radiological Science, Johns Hopkins Medical Center, Baltimore, MD	2008 – 2010
Ken Wang, M.D., **Ph.D.**; Radiologist, Baltimore VA Medical Center, Baltimore, MD; Adjunct Assistant Professor, University of Maryland School of Medicine, Baltimore, MD	2009 – 2010
Ty Subawong, M.D.; Associate Professor of Clinical Radiology, University of Miami Health System, Miami, FL	2009 – 2010
Majid Chalian, M.D.; Radiology Resident, University Hospitals – Case Western Reserve University, Cleveland, OH	2010 – 2011
Pearlene P. Lee, M.D.; Radiology Resident, Gundersen Lutheran Medical Center, La Crosse, WI	2010 – 2011
Avneesh Chaabra, M.D.; Associate Professor of Radiology, Chief of Musculoskeletal Radiology, UT Southwestern Medical Center, Dallas, TX	2010 – 2012
Doris Leung, M.D., **Ph.D.**; Clinical/Research Staff, Center for Genetic Muscle Disorders, Kennedy Krieger Institute, Baltimore, MD; Assistant Professor, Department of Neurology, Johns Hopkins School of Medicine, Baltimore, MD	2010 – 2014
Dan Durand, M.D.; Chairman of Radiology, LifeBridge Health, Baltimore, MD	2011 – 2012
Christopher Myers, M.D., **Ph.D.**; Staff Radiologist, Anne Arundel Medical Center, Annapolis, MD	2011 – 2012
Shadpour Demehri, M.D.; Associate Professor of Radiology and Radiological Science, Johns Hopkins Medicine	2012 – 2014
Filippo Del Grande, M.D.; Chairman, Ente Ospedaliero Cantonale (EOC) University of Basel Switzerland, Lugano, SZ.	2013 – 2017
Nima Hafezi Nejad, M.D.; Fellow, Department of Radiology, Johns Hopkins University, Baltimore, MD	2014 – 2016
Ville Valdemar Armio, M.D.; Doctoral Candidate, Diagnostic Radiology, University of Turku, Turku, Finland	2015
Milja Hostila, M.D.; Radiologist, Turku University Hospital, Turku, Finland	2016
Lim Chee Yeong, M.D.; Consultant, Department of Diagnostic Radiology, Singapore General Hospital, Singapore	2017
Vibhor Wadhwa, M.D.; Resident, Diagnostic Radiology, University of Arkansas for Medical Sciences	2017
Arya Haj Mirzaian, M.D.; Resident, Diagnostic Radiology, Brigham and Women's Hospital, Harvard Medical School	2019 – 2020
Farhad Pishgar, M.D.; Resident, Diagnostic Radiology, Johns Hopkins Hospital	2021 – 2022
Bahram Mohajer, M.D.; Resident, Diagnostic Radiology, Johns Hopkins Hospital	2022 – 2023
Sumedha Singh, M.B.B.S., M.D., Diagnostic Radiology, Research Volunteer, Hospital for Special Surgery.	2022 – 2023

2. Clinical care:

Clinical Activity; Clinical Program Development	**Dates**

Musculoskeletal, Thoracic, Pediatric, Abdominal and Emergency Imaging Image-Guided Percutaneous Intervention, Wilford Hall Medical Center	1995 – 1998
Musculoskeletal and Emergency Imaging Image-Guided Percutaneous Intervention, Brigham and Women's Hospital	1998 – 2000
Musculoskeletal and Emergency Imaging Image-Guided Percutaneous Intervention, Thomas Jefferson University Hospital	2002 – 2006
Musculoskeletal Imaging Image-Guided Percutaneous Intervention Magnetic Resonance Therapy, Brigham and Women's Hospital	2002 – 2006
Diagnostic Imaging Division Musculoskeletal Radiology Section, Johns Hopkins Hospital	2006 – 2014
Section Chief, Musculoskeletal Radiology. Responsible for the clinical Musculoskeletal imaging and image-guided interventional service and its day to day interactions with Johns Hopkins Hospital, Johns Hopkins Bayview Medical Center, and Johns Hopkins Imaging within the Department of Radiology	2006 – 2014
Director of Interventional Radiology, Hospital for Special Surgery	2014 – 2020
Vice Chairman, Informatics and IT, Radiology and Imaging, Hospital for Special Surgery	2014 – present

3. Research:

Research Activity / Key Contributions	Dates
Radiology Informatics Picture archiving and communications systems (PACS) are rapidly becoming the paradigm used to transmit, store, retrieve and view large amounts of medical imaging data. The transition from the "lightbox paradigm" to the "workstation paradigm" provides an opportunity to explore the significant determinants of image interpretation, develop optimal workflow patterns and create an ideal "person-machine" interface. This program is to study the impact of this new organizational structure the delivery, quality, cost, and access to health care resources. This includes assessing experiences with process re-design, planning methodologies and the effect of systems integration on workflow. There is research in the development of Ontology based on standardized lexicon and nomenclature. I was a collaborator or PI on these studies.	1995 - present
Interventional Magnetic Resonance Imaging (iMRI) The imaging modality of MRI that has provided so much insight into the diagnoses of musculoskeletal conditions can also be used for image guided procedures. While there are many challenges for performing interventional procedures in the MRI environment, we have identified a role for iMRI provoking a paradigm shift for increased utilization of this exquisite high contrast resolution modality extending from diagnostic to therapeutic realm.	1998-2014

In several studies, we furthered technical innovation in the emerging field of interventional MRI. We have described procedures that can be enabled or improved with MRI guidance. We helped develop devices that are MRI-compatible driving commercially availability. As part of these studies, we also pioneered research into using an augmented reality system (Image-Overlay) for targeting. These studies contributed to defining the field of musculoskeletal interventional MRI in the conjunction with the National Center for Image Guided Therapy (NCIGT). This body of work has significantly contributed to refining how iMRI would fit in the practice of interventional radiology. I was a collaborator or PI on these studies.	
Musculoskeletal Radiology Research Enterprise, Johns Hopkins University Investigative efforts predominantly emphasized are in the following areas: developing and testing technological improvements in imaging methods; developing new clinical applications of existing modalities; ascertaining the value of specific diagnostic criteria for certain diseases; conducting inquiries into morphologic, pathophysiologic and biochemical bases for imaging abnormalities. This encompasses descriptions of musculoskeletal diseases with novel imaging techniques/modalities and comparing them with established imaging techniques, surgery, pathological specimens, clinical symptomatology or biomechanical tests. Performing technology assessment of minimally invasive diagnostic and therapeutic procedures encompasses determining feasibility, safety, and efficacy. While determining technical and diagnostic accuracy efficacy are important, the goal is to extend the analyses of these procedures into the diagnostic thinking and therapeutic efficacy domains. I was a collaborator or senior imaging investigator on these studies.	2006 – 2014
Laboratory for Imaging in Surgery, Therapy, and Radiology (I-STAR), Johns Hopkins University. The I-STAR Lab (www.jhu.edu/istar) is Dr. Jeff Siewerdsen's laboratory at the Department of Biomedical Engineering, Johns Hopkins University. It is a translational and collaborative research program across departments in the School of Engineering (Biomedical Engineering, Computer Science, Physics, and Electrical and Computer Engineering) and the School of Medicine (Radiology, Surgery, and Radiation Oncology). Research support is a combination of academic-industry partnership and grants from the National Institutes of Health. I was a collaborator or senior imaging investigator on these studies.	2009 – present
Magnetic Resonance Neurography (MRN) MRN is the imaging of peripheral nerves based on magnetic resonance imaging techniques. Modern imaging techniques such as MRN can contribute to the diagnosis, localization, and characterization of peripheral nerve disorders, which traditionally relied on clinical exam and	2008 -present

electrophysiology. We pioneered the use of high field 3T MRI for MRN and leveraged this platform for refining advanced applications such as diffusion weighted/tensor imaging. In addition to determining technical and diagnostic accuracy efficacy, we have extended analyses of MR neurography into the diagnostic thinking and therapeutic efficacy domains. I was the senior imaging investigator on these studies.	
Volumetric 3D cone beam computed tomography (CT) extremity imaging In collaboration with Johns Hopkins biomedical engineering (Jeff Siewerdsen, Ph.D.) and an industrial partner (Carestream Health), we were at the forefront of efforts that led to the development of cone-beam CT to a clinical extremity scanner that acquires 3D volumetric data in the load-bearing state and have significantly contributed to defining their commercial specifications. While CT has been available for a while in medical imaging, the whole-body embodiments acquire images in the non-load bearing state. We have developed multiple projects to translate pre-clinical studies into humans and have successfully characterized image quality and observer tasks. These studies have provoked a fundamental evidence basis for how this new modality fits within the framework with other imaging modalities for musculoskeletal applications. I was a collaborator or PI on all of these studies.	2010 - 2020

4. Administrative Activities:

Administrative Activity	Date
Johns Hopkins Radiology Education Committee	2008 – 2014
Johns Hopkins Radiology Website Committee	2007 – 2009
Johns Hopkins Radiology Faculty Information Technology (IT) Advisory Committee	2006 – 2014
Johns Hopkins Radiology Practice Committee	2006 – 2014
Johns Hopkins Radiology Executive Committee	2006 – 2014
Hospital for Special Surgery, Education Committee	2014 – 2017
Hospital for Special Surgery, CME Committee	2014 – 2017
Hospital for Special Surgery, eAcademy Committee	2014 – 2020
Hospital for Special Surgery, Hospital Clinician Advisory Committee	2015 – present
Hospital for Special Surgery, Education Modalities Council	2015 – present
Hospital for Special Surgery, Professional Safety Committee (PSC)	2014 – present
Hospital for Special Surgery, Clinical Content Board (CCB)	2015 – present
Hospital for Special Surgery, Multispecialty Peer Review Committee (MSPRC)	2014 – 2017
Hospital for Special Surgery, Quality Coordinating Committee	2014 – 2019
Hospital for Special Surgery, LifeWings MD Champion	2018 – 2020
Hospital for Special Surgery, Enterprise Imaging Committee	2021 – present
Hospital for Special Surgery, Center for Analytics, Modelling and Performance	2022 – present

I. RESEARCH SUPPORT

Past Research Support:

ID: N/A	*Development of Instrumentation for Interventional MRI*
Source	HCMIS (Harvard Center for Minimally Invasive Surgery)
Amount	$20,000
Duration	07/01/1999 – 06/30/2000
Principal Investigator	Ferenc A. Jolesz, M.D.
Role in Project	Consultant, 5%
Notes	To achieve better imaging and to develop MR compatible needles for spine procedures.

ID: 1 P60 AR048093-01	*Multidisciplinary Clinical Research Center in Upper Extremity and Spinal Disorders devoted to the study of spine and upper extremity disorders. (Project 1. Carpal Tunnel Syndrome: Diagnosis and Treatment Trial)*
Source	
Amount	$3,975,000
Duration	02/15/2002 – 12/03/2007
Principal Investigator	Jeffrey G. Jarvik M.D., M.P.H. (Project 1)/Richard A. Deyo (MCRC)
Role in Project	Consultant, 5%
Notes	To determine if MR neurographic imaging (MRNI) can identify patients for whom early surgery might be more efficacious than conservative therapy

ID: P60 AR048094-01A1	*Multidisciplinary Clinical Research Center in Musculoskeletal Diseases. (Prognostic Value of Lumbar Spine MRI)*
Source	NIH/NIAMS
Amount	$4,270,000
Duration	04/01/2003 – 12/03/2008
Principal Investigator	Anna N Tosteson, Ph.D.
Role in Project	Consultant, 5%
Notes	The goals of this project were to determine if enhanced MRI classification systems can be used as indicators of possible success in surgical and non-surgical treatments for low back pain in intervertebral disc herniation and spinal stenosis patients

ID: N/A	*The Development, Testing, and Implementation of a Prediction Model for Distinguishing Benign from Malignant Vertebral Fractures by Magnetic Resonance Imaging Feature Analysis*.
Source	GERRAF GE-AUR (General Electric Association of University Radiologists)
Amount	$120,000
Duration	07/01/2003 – 06/30/2005
Principal Investigator	John A. Carrino, M.D., M.P.H.
Role in Project	PI, 50%
Notes	To develop and test a prediction rule (model) based on MRI feature analysis that can consistently and precisely differentiate benign

	from malignant aetiologies of vertebral fractures and to incorporate this into an Expert System

ID: N/A	*Development of MR Guided Percutaneous Spine Procedures*
Source	CIMIT (Center for Integration of Medicine and Innovative Technology)
Amount	$100,000
Duration	07/01/2003 – 06/30/2005
Principal Investigator	John A. Carrino, M.D. M.P.H.
Role in Project	PI, 10%
Notes	To test the feasibility and safety of performing MR guided vertebral ablation and augmentation

ID: 5R25CA089017-10	*Multidisciplinary Training in Image Guided Therapy*
Source	NIH/NCI
Amount	$539,399
Duration	07/01/2004 – 06/30/2006
Principal Investigator	Ferenc Jolesz, M.D.
Role in Project	Co-Investigator, Fellowship Director, 10%
Notes	To provide combined multidisciplinary postgraduate training for physicians and scientists within the field of image-guided-therapy

ID: JHU-2011-MR-108-01-38802	*High Resolution MR Neurography with Diffusion Tensor Imaging for the Evaluation of Patients with Radiculopathy*
Source	Siemens Medical Systems
Amount	$106,755
Duration	03/01/2005 – 01/01/2014
Principal Investigator	PI: Avneesh Chhabra, M.D. (3/1/05-6/30/13), John A. Carrino, M.D. M.P.H. (7/1/13-1/1/14)
Role in Project	Role: Co-Investigator, 3% effort; PI, 3% effort)
Notes	Development MRN protocols through academic industrial collaboration

ID: N01AR22250	*Clinical Centers for Osteoarthritis Arthritis Initiative (OAI)*
Source	NIH/NIAMS
Amount	$207,221
Duration	01/01/2007 – 07/01/2008
Principal Investigator	Joan Bathon, M.D.
Role in Project	Consultant, 1%
Notes	Observational study over 5 years of 5000 subjects with mild to moderate osteoarthritis of the knee, or one or more risk factors for development of osteoarthritis, to identify biomarkers for predicting incident disease and progressive disease.

ID: 1406-04-07-CT-66469	*The RSNA-NIBIB RadLex Ontology Pilot Project*
Source	NIH (NIBIB)/ RSNA
Amount	$250,00.00
Duration	01/01/2007 – 12/31/2008

Principal Investigator	Curt Langlotz, M.D., Ph.D.
Role in Project	Co-Investigator, 5%
Notes	The goal of this project was to transform RadLex from a lexicon (a linear list of terms) to an ontology (richly connected knowledge base of concepts) in the specific domains of musculoskeletal and cardiovascular imaging.

ID: R01 CA118371	*Image Overlay for MRI-Guided Needle Insertions*
Source	NIH/NCI
Amount	$906,657
Duration	09/01/2007 – 08/30/2012
Principal Investigator	John A. Carrino, M.D., M.P.H.
Role in Project	PI, 30%
Notes	The goals of this project are to make diagnostic closed high-field MRI scanners available for guiding needle placement with 2D Image Overlay technique

ID:	*Musculoskeletal Phenotype of Marfan Patients*
Source	National Marfan Foundation
Amount	
Duration	07/01/2008 – 06/01/2012
Principal Investigator	Julie Hoover-Fong, M.D., Ph.D.
Role in Project	Co-Investigator, 5%
Notes	In conjunction with the Pediatric Heart Network's proposed multi-Institutional, randomized clinical trial to compare the effect of angiotensin II receptor blocker (ARB) therapy with traditional beta blockade (BB) on the rate of aortic root growth and other cardiovascular outcomes, this study proposes to quantify muscle strength, endurance, mass and quality, and bone mineral content and density at baseline and throughout this trial to assess interval change which may be attributable to the drug intervention.

ID: JHU-2006-MR 31-01	*3D High Resolution MRI of the Extremities: Wrist*
Source	Siemens Medical Systems
Amount	$18,750
Duration	07/01/2008 – 06/30/2014
Principal Investigator	John A. Carrino, M.D., M.P.H.
Role in Project	PI, (no salary support)
Notes	The goals of this project are to compare 3D-SPACE pulse sequences to traditional 2D pulse sequences and to perform reproducibility measurements on cartilage mapping using an 8 channel receive only commercial coil using an open-bore 3 Tesla MRI

ID:	*3D High Resolution MRI of the extremities: Ankle*
Source	Siemens Medical Systems
Amount	$18,750
Duration	07/01/2008 – 06/30/2014

Principal Investigator	John A. Carrino, M.D., M.P.H.
Role in Project	PI, (no salary support)
Notes	The goals of this project are to compare 3D-SPACE pulse sequences to traditional 2D pulse sequences and to perform reproducibility measurements on cartilage mapping using an 8 channel receive only commercial coil using an open-bore 3 Tesla MRI.

ID:	*High – Performance 3D Imaging for Musculoskeletal Radiology and Orthopaedic Surgery (renewal)*
Source	Carestream Health Inc.
Amount	$764,000 (total + Capital equipment in the amount ~$300,000
Duration	11/01/2009 – 10/31/2013
Principal Investigator	Jeffrey H. Siewerdsen, PhD
Role in Project	Co-Investigator, 5%
Notes	The major goal of this project is related to design, construction, evaluation, and preclinical testing of a novel, dedicated cone-beam CT scanner for imaging of extremities – e.g., knees and hands. Development of knee surgery sports traumatology arthroscopy advanced 3D reconstruction algorithms. Preclinical evaluation and identification of key clinical applications.

ID:	*High-Performance Dual-Energy Imaging with a Portable X-Ray Image Science for the New X-ray: Taking Dual-Energy CT to Task PI:*
Source	Radiography System Carestream Health
Amount	$165,000
Duration	12/01/2009 – 11/30/2010
Principal Investigator	Jeffrey H. Siewerdsen, Ph.D.
Role in Project	Co-Investigator, 3%
Notes	The major goal of this project is to develop and optimize the acquisition and decomposition techniques for dual-energy imaging using a portable x-ray detector (DRX-1) in bedside and ICU applications.

ID:	*Development of Human Torso Models and Analysing Target Data for Injury*
Source	Assessment in a Blast Environment US Army (JHU Applied Physics Laboratory)
Amount	$100,000
Duration	01/01/2010 – 12/31/2012
Principal Investigator	Andrew Merkle, Ph.D.
Role in Project	Co-Investigator, 5%
Notes	The major goals of this project are to identify existing data sets, determine gaps and formulate an approach to discern the influence of organ size on injury response. The subcontract project will collect and segment suitable specimen data to generate a library of statistical anthropomorphic atlases.

ID: R01-EB009367	*TK-Based Infection Imaging*
Source	NIH/NIBIB
Amount	$1,347,776
Duration	05/15/2010 – 04/30/2014
Principal Investigator	Martin Pomper, M.D., PhD
Role in Project	Co-Investigator, 3%
Notes:	The major goal of this project is to study further musculoskeletal infection, comparing a newly developed method in infection imaging to the current clinical standard of tagged white blood cell (WBC) and attempting to determine the sensitivity and specificity of our technique.

ID:	*Characterization of Changes in Patellofemoral Loading with Dynamic Three-Dimensional CT Imaging*
Source	Toshiba Medical System
Amount	$152,781
Duration	07/01/2010 – 06/30/2013
Principal Investigator	Shadpour Demehri, M.D.
Role in Project	PI, 3%
Notes	The goal of this project is to provide an initial assessment of the influence of patellofemoral realignment on knew biomechanics for unstable knees, as well as demonstrate the value of using Dynamic Kinetic Computed Tomography Imaging (DKCTI) for computational characterization of knee function.

ID: JHU-2010-MR-78-01	*High Resolution MR Neurography (MRN) in a prospective cohort of patients with injured peripheral nerves treated with surgery*
Source	Siemens Medical Systems
Amount	$61,730.00
Duration	09/01/2010 – 09/30/2012
Principal Investigator	Avneesh Chaabra, M.D.
Role in Project	Co-Investigator, 1%
Notes	The goals of this project are to define the pre- and post-operative appear of nerves

ID:	*Measuring the Vascular Burden in Scleroderma Associated Raynaud's Phenomenon*
Source	MedImmune
Amount	$99,356
Duration	10/01/2010 – 09/30/2011
Principal Investigator	Ami Shah, M.D.
Role in Project	Co-Investigator, 5%

Notes	The major goal of this project is to examine the utility of 2 unique measurement tools, magnetic resonance angiography (MRA) and laser Doppler imaging of the hand to assess the vascular anatomy and digital blood flow simultaneously for validity, reproducibility and reliability toward creating a vascular burden score.

ID: 2-R01-CA112163-05	*Image Science for the New X-ray: Taking Dual-Energy CT to Task*
Source	NIH/NIBIB
Amount	$1,000,000
Duration	09/08/2006 – 06/30/2015
Principal Investigator	Jeffrey H. Siewerdsen, Ph.D.
Role in Project	Co-Investigator, 5%, 2011-2013; Consultant, 2014-2015
Notes	The goal of the proposed research is to develop a task-based approach to imaging performance in Dual Energy Cone Bean Computed Tomography (DE-CBCT) to provide a foundation for optimization of acquisition techniques, detector technologies, and reconstruction / decomposition techniques in order to maximize task performance and minimize radiation dose.

ID: JHU-2011-CT-1010139307C	*Dual Energy CT imaging of Gout: Assessment of Disease Burden and Association with Functional Impairment*
Source	Siemens Medical Systems
Amount	$107,733
Duration	08/01/2011 – 06/29/2016
Principal Investigator	John A. Carrino, M.D., M.P.H.
Role in Project	PI, 5%, 2011-2014; Co-Investigator 2014-2016
Notes	Our underlying premise is the use of DECT imaging in a large, diverse group of men and women with gout, in the clinical setting, will improve gout assessment and management.

ID: 1-R01-AI093520-01	*Aging and Fracture Risk among HIV-infected and HIV-uninfected Men*
Source	NIH/NIAID
Amount	$2,283,705
Duration	10/01/2011 – 06/30/2014
Principal Investigator	Todd T. Brown, M.D., Ph.D.
Role in Project	Co-Investigator, 10%
Notes	The goal of the proposed research is to understand the contribution of aging, chronic HIV infection, and antiretroviral therapy to both skeletal and non-skeletal fracture risk among older men

ID: R21-AR-062293	*Dual-Energy Imaging of Bone Marrow Edema on a Dedicated Multi-Source Cone-Beam CT System for the Extremities*
Source	NIH/NIAMS
Amount	$275,000
Duration	04/01/2013 – 03/31/2015
Principal Investigator	Jeffery Siewerdsen, PhD

Role in Project	Co-Investigator, 6%
Notes	Development of optimal dual-energy cone-beam CT techniques for contrast-enhanced visualization of the synovium, cartilage, and other involved tissues in rheumatoid arthritis. Quantitative image-based metrics of treatment response related to fully 3D joint space morphology and trabecular architecture. Pilot study in 21 patients using a prototype CBCT scanner for extremity imaging.

ID: N/A	*Precision Measurement in Rheumatoid Arthritis*
Source	Sibley Memorial Hospital (Mackley Funds)
Amount	$1,194,746
Duration	11/01/2011 – 10/31/2014
Principal Investigator	Antony Rosen, MD, PhD
Role in Project	Subproject (Advanced Imaging of RA) PI, 2011-2014, Salary Support
Notes	The major goals of this project are to identify precision tools for diagnosis, prognosis, and monitoring treatment response for patients with Rheumatoid Arthritis (RA). The subproject will compare standardized scoring of 3T Hand MRI with/without contrast and 3D/2D using a specialized Transmit/Receive whole hand coil.

ID: N/A	*Evaluation of WARP MRI pulse sequences for hip and knee arthroplasties*
Source	Siemens Medical Systems
Amount	$87,978
Duration	03/01/2012 – 12/31/2014
Principal Investigator	PI
Role in Project	PI, 3/1/12-3/31/14, 10
Notes	To determine which SMS WARP metal implant imaging WIP (work in progress) MRI pulse sequences are best at reducing artifact and improving visualization around the various types of orthopaedic hip/knee implants at 1.5T and 3T MRI.

ID: N/A	*Understanding mechanisms of response and resistance to abiraterone and enzalutamide in men with metastatic prostate cancer, by interrogation of tumour biopsies for androgen receptor splice variants*
Source	Prostate Cancer Foundation
Amount	$225,000
Duration	05/20/2013 – 05/20/2016
Principal Investigator	Emmanuel Antonarakis, MD
Role in Project	Co- Investigator
Notes	MR image guided biopsy of prostate cancer bone metastases

ID: N/A	*Hybrid 3D SPACE Imaging for Musculoskeletal and Orthopedic Applications*
Source	Siemens Medical Systems
Amount	$50,000

Duration	09/01/2013 – 08/31/2015
Principal Investigator	Daniel Herzka, Ph.D.
Role in Project	Co-Investigator (no salary support)
Notes	This proposal aims to make MSK imaging more efficient by shortening overall examination duration without compromising diagnostic value.

ID: N/A	*3D Volumetric X-ray Based Imaging for Musculoskeletal Radiology*
Source	Carestream Health
Amount	$144,962
Duration	11/01/2013 – 10/31/2015
Principal Investigator	PI: Shadpour Demehri
Role in Project	10%; Consultant
Notes	This project aims to continue the development of high-performance 3D imaging for musculoskeletal radiology and orthopaedics based upon a dedicated cone-beam CT scanner

ID: 1R21EB014964-01A1	*Incorporating prior knowledge of surgical devices in CBCT-guided interventions*
Source	NIH/ NIBIB
Amount	$243,000
Duration	01/01/2014 – 12/31/2014
Principal Investigator	PI: J. Webster Stayman, PhD
Role in Project	Consultant
Notes	Integrate specific knowledge about surgical devices, implants, etc. into tomographic reconstruction to improve the dose-image quality trade-off and to assess delivery with respect to pre-operative plan.

ID: 1R01EB018896-01	*Quantitative high-resolution cone beam CT for assessment of bone and joint health*
Source	NIH/NIBIB
Amount	$469,554
Duration	01/09/2014-08/31/2020
Principal Investigator	Wojciech Zbijewski
Role in Project	Consultant
Notes	This project develops an ultra-high-resolution cone-beam CT with spatial resolution and quantitative accuracy sufficient to assess subchondral bone health in-vivo, yielding an innovative technology with major relevance to human health in advancing the studies of OA pathogenesis and treatment

ID: HSS 2014-235	*The Association of Pre-operative Radiographic Severity and Total Hip Replacement Outcome.*
Source	Weill Cornell CTSC
Amount	$10,000
Duration	09/22/2014- 09/03/2020
Principal Investigator	Susan Goodman, M.D.
Role in Project	Co-Investigator

Notes	This study aims to determine which x-ray findings are associated with poor 2-year pain and function outcomes after total hip replacement. Using the Legacy registry, this research study will look at multiple aspect of pre-operative x-rays of the operative and non-operative hips and will use multivariate logistic regression to determine which findings are associated with poor outcomes.

ID: N/A	*A Study of Novel Immune Modulating Biomarkers in Patients with Spondyloarthritis with Axial Involvement*
Source	Existing Approved Registry
Amount	Non-funded
Duration	05/30/2014 – 05/31/2020
Principal Investigator	Vivian Bykerk, M.D.
Role in Project	Co-Investigator
Notes	MR imaging of SpA

ID: 1UH2AR067691-01R	*Molecular Pathways in Treatment Response and Flare in RA*
Source	NIH/NIAMS/NIAID
Amount	$350,000
Duration	09/24/14- 05/31/2020
Principal Investigator	Bykerk, Darnel, Ivashkiv, Pernis
Role in Project	Collaborator
Notes	These studies will provide essential information enabling a more accurate subsetting of RA patients and leading to the development of "cellular/molecular signatures" that can predict the responses of RA patients to therapy and guide personalized therapeutic regimens.

ID: HSS 2014-111	*Trends, Complications and Radiographic Analysis of rhBMP-2 Utilization in Orthopedic Surgery*
Source	Expedited Retrospective Chart Reviews
Amount	Non-funded
Duration	06/12/2014 – 07/16/2022
Principal Investigator	Darren Lebl, M.D.
Your Role in Project	Co-Investigator, 1%
Notes	Post operative spine imaging appearance of fusion

ID: HSS 2018-1945	*MRI Assessment of Sacroilitis with High Resolution Protocol*
Source	(Retrospective Chart Review)
Amount	Non-funded
Duration	10/24/2018 – 10/23/2019
Principal Investigator	John A. Carrino, M.D., M.P.H.
Role in Project	PI (no salary support)
Notes	We will retrospectively be correlating clinical and MRI indices of sacroiliitis activity in order to evaluate the diagnostic utility of MRI spondyloarthropathy

ID: HSS 2019-0310	*Eosinophilic Fasciitis Following Nivolumab Therapy in Two Patients*

Source	Expedited Retrospective Chart Review
Amount	Non-funded
Duration	02/25/2019 – 03/03/2022
Principal Investigator	Kamala Chan, M.D.
Role in Project	Co-investigator (no salary support)
Notes	Case report of two patients who develop a rare complication from cancer immunotherapy

ID: HSS 2015-491	*Imaging Biomarkers in Crohn's Associated Spondyloarthritis*
Source	Clinical & Translational Research Center (CTSC) Pilot Seed Grant
Amount	$10,000
Duration	09/08/2015 – 01/17/2023
Principal Investigator	Lisa Mandl, M.D.
Role in Project	Co-investigator
Notes	This study is designed to study distribution of spinal inflammatory changes in Crohn's disease patients on whole spine MRI and evaluate the relationship between MRI evidence of axial inflammation in Crohn's patients and patient reported outcomes, such as- BASDAI, SF-12, PROMIS-29 and Harvey-Bradshaw Index (HBI). As secondary outcomes, we will also investigate the relationship between MRI evidence of axial inflammation and pattern of intestinal dysbiosis.

ID: HSS 2018-0715	*Investigation of Novel Contrast Enhanced Vascular Suppression Techniques in MR Neurography*
Source	International Skeletal Society (ISS)
Amount	$25,000
Duration	05/07/2018 – 06/06/2021
Principal Investigator	Darryl Sneag, M.D.
Role in Project	Co-Investigator
Notes	The aims of this study are to compare nerve-to-muscle contrast-to-noise ratio, arterial signal suppression, venous signal suppression, and nerve conspicuity between three-dimensional T2-weighted STIR magnetic resonance neurography images of the plexi obtained using: 1) Ferumoxytol (contrast agent) versus flow-saturation preparation pulse (non-contrast technique) in chronic anemia patients. 2) Gadolinium (contrast agent) versus flow-saturation preparation pulse (non-contrast technique) in patients with brachial plexus or lumbosacral plexus conditions.

ID: 2014-111 (HSS)	*Trends, Complications and Radiographic Analysis of rhBMP-2 Utilization in Orthopaedic Surgery*
Source	Medical Record Chart Review
Amount	Non-funded
Duration	06/12/2014– 07/16/2022
Principal Investigator	Darren Lebl, MD
Role in Project	Co-Investigator

Notes	Retrospective review of 5993 patients who received rhBMP-2 during their surgery at Hospital for Special Surgery (HSS) in the past 5 years [2009-2013].

ID: 2017-1840 (HSS)	*Incidence of Osteoporosis in Patients Being Evaluated for Lumbar Spine Surgery*
Source	Medical Record Chart Review
Amount	Non-funded
Duration	01/2/2018 – 12/27/2022
Principal Investigator	Chad Craig, M.D., Linda Russell. M.D.
Role in Project	Co-investigator
Notes	In this study, we aim to 1.) Determine the incidence of osteoporosis in patients undergoing preoperative lumbar CT scans through use of QCT software, and 2.) Evaluate correlations between QCT and DEXA scan scores in the subset of patients who have undergone both DEXA and lumbar CT scans.

ID: 2019-1586 (HSS)	*Evaluation of Vertebral Endplate Degenerative Changes and Bone Quality: A Pilot Study*
Source	Medical Record Chart Review
Amount	Non-funded
Duration	10/27/2020 – 12/16/2022
Principal Investigator	Alexander Hughes, M.D.
Role in Project	Co-investigator
Notes	Vertebral body endplate damage and pathologic processes such as fibrosis, inflammation, and marrow ischemia are represented by Modic changes (MC) on magnetic resonance imaging (MRI). While MCs are associated with degenerative discs, information about the etiology and pathobiology of MCs is limited. The different MC types represent various phases of the degenerative and bone remodelling process. Hypothetically, MCs could be markers for increased bone density and quality at the micro-structural level. This is a pilot study with the following specific aims to determine how MCs impact bone quality and quantity: 1. To analyze the relationship between Modic type 1 and 2 changes and bone quality markers in the lumbar spine, including: a. collagen cross-linking b. structural and functional bone measures of the endplate measured using Fourier transform infrared spectroscopic imaging (FTIRI) and micro-computed tomography (micro-CT) FTIR is a method to provide a chemical fingerprint that helps characterize the material properties of a sample. FTIR measures the differences in light absorbed in the infrared region (non-visible light) of the electromagnetic spectrum. This study uses FTIR to characterize the collagen properties in bone specimens. Micro-CT is an imaging technique similar to a CT scan that involves x-ray imaging in 3D, but at higher resolution. It allows for visualization and analysis of the internal structure of materials such as bones in a non-destructive manner.

	2. To analyze the relationship between Modic type 1 and 2 changes and bone quantity markers evaluated on other imaging modalities and labs, including: a. tissue mineral density and apparent density on micro-CT b. volumetric bone mineral density (vBMD) measured using quantitative computed tomography (QCT) c. bone lab markers, including Vitamin D, parathyroid hormone, N-Telopeptide, creatinine, bone alakaline phosphatase, and inorganic phosphorous d. advanced glycation end products (AGEs)

Current Research Support:

ID: 2014-084 (HSS)	*A Prospective Analysis of Connective Tissue Factors and Outcomes in Lumbar Spinal Fusion*
Source	Hospital for Special Surgery Spine Service
Amount	$ 390,202
Duration	05/12/2014 –12/16/2023
Principal Investigator	Alexander Hughes, M.D.
Role in Project	Co-investigator
Notes	The objective of this clinical study is to evaluate the relationship between collagen and connective tissue factors in patients. This study will also determine if US measurements of dermal layer thickness can be used as a non-invasive modality in the assessment of the aforementioned parameters. Furthermore, the study will determine any relationships in bone and connective tissue parameters that may affect lumbar fusion surgical outcomes.

ID: 1UH2AR067691-01R 2014-317 (HSS)	*(Synovial Tissues) Rheumatoid Arthritis (RA) & Early Rheumatoid Arthritis (ERA) tissue study – Recruitment of patients undergoing synovectomy or upper extremity surgery (UES) or synovial biopsies*
Source	NIH (NIAMS), HSS
Amount	$457,467
Duration	09/24/2014 – 03/23/2024
Principal Investigator	Vivian Bykerk, M.D.
Role in Project	Co-investigator
Notes	Patients with early or established RA will be asked to provide their synovial tissue for research acquired from a scheduled synovectomy or a voluntary synovial biopsy. They will also be asked to provide a paired blood sample and complete patient reported outcome (PRO) questionnaires. Patients with ERA or established RA with a sufficiently swollen joint will be invited to undergo an ultrasound guided synovial biopsy performed by a trained radiologist. The tissue obtained will undergo routine histologic examination and scoring for level of inflammation. Any tissue remnants will be processed by the Ivashkiv and Pernis laboratories at HSS. Some will also be sent for further analytics to the Accelerating Medicines Partnership (AMP) collaborating labs at Harvard and Stanford. Tissue and blood will undergo cell

	staining, genetic, and epigenetic/transcriptonic examination using techniques such as Flow cytometry, CyTOF, RNA sequencing, ATACseq, or highly similar technologies. The tissue provided for these studies will be completely de-identified. Results from these procedures are part of preliminary studies examining the utility of novel technologies to understand states of immune activation.

ID: HSS 2015-237	*Predicting Clinical and Patient-Centred Outcomes after Surgery for Degenerative Spondylolisthesis*
Source	HSS Spine Service
Amount	$15,000
Duration	04/17/2020 - 10/26/2025
Principal Investigator	Carol Mancuso, M.D.
Role in Project	Co-investigator
Notes	Lumbar degenerative spondylolisthesis (LDS) is an acquired condition characterized by slippage of vertebrae and possible instability and stenosis of the spinal canal. Patients with LDS can present with back pain, radicular leg pain, neurogenic claudication, and motor and sensory dysfunction. Lateral radiographs are the cornerstone for evaluating LDS and MRI and CT are appropriate for imaging accompanying stenosis. Translation (i.e. movement) of 3 mm or more or angulation (i.e. rotation) of 11 degrees or 8% of the vertebra in dynamic flexion-extension radiographs has been the classic guideline for instability. Patients with this amount of instability on preop radiographs required decompression and fusion. For other patients the disease will have progressed such that ligament thickening and folding, disc collapse and joint enlargement have occurred, and the spine has stabilized and ankylosed; these patients require decompression only. For most patients, however, lack of instability defined by the above criteria may not be confirmed by preop imaging because protective muscle contractions in response to pain may not allow full flexion and extension of the spine. Thus, imaging done under anaesthesia may provide additional information about the amount of instability. For all patients, regardless of the extent of instability, relevant outcomes of surgery are improvement in pain and disability, radiographic evidence of stability, and repeat surgery in those with recurrent symptoms who had compression only (i.e. no fusion).

ID: HSS 2016-0580	*Rapid Diagnosis of Joint Infection Via Next Generation Sequencing*
Source	Price Family Foundation / Feldstein Medical Foundation / CJRC / ARJR
Amount	$ 200,000 / $75,000 / $50,000 / $20,000
Duration	07/24/2017 – 07/16/2023
Principal Investigator	Laura Donlin, Ph.D.
Role in Project	Co-investigator
Notes	Researchers at Hospital for Special Surgery are trying to improve the diagnosis and treatment of patients with presumed joint infections. After total joint replacement surgery, infections can arise

	in or around the affected joint. While the occurrence rate is low (<1% of patients) and treatments can have good outcomes, more rapid and specific identification of infectious microbes hold promise in improving treatment. Currently, culture-based assays used to support a diagnosis and treatment strategy, take several days to complete. The purpose of this study is to assess whether recent advances in genetic sequencing techniques can speed up the process of microbial identification and thus improve treatment.

ID: 2016-0662	*Prediction of Poor Bone Quality Prior to Spinal Fusion: A Pilot Study*
Source	HSS Chief of Service Grant/Cornell Core Lab Support
Amount	$40,000
Duration	11/16/2016 – 05/25/2023
Principal Investigator	Emily Stein, M.D.
Role in Project	Co-Investigator
Notes	The goals of this pilot study are to evaluate the utility of different modalities for pre-operative assessment of the bone quality in patients undergoing spinal fusion surgery and to determine the relationship between these measures with intra-operative vertebral strength. In an exploratory analysis we will also relate these measures to 2-year post-operative outcomes.

ID: 2017-0076 (HSS)	*The Effects of Epidural Steroid Injections on Bone Metabolism and Skeletal Structure: A Pilot Study*
Source	Spine Service (HSS)
Amount	$22,750
Duration	01/16/217 – 07/26/2023
Principal Investigator	Emily Stein, MD
Role in Project	Co-investigator
Notes	Epidural steroid injections (ESI) are a commonly used and effective treatment for lower back pain and sciatica. While the overall incidence of adverse effects of ESI is low [1], the skeletal complications of this therapy are poorly understood. This study will be the first to assess the acute changes in bone formation and resorption in response to ESI. Further, we will prospectively evaluate changes in skeletal structure over one year after ESI. Skeletal structure will be assessed using DXA measurements of areal BMD (aBMD) and trabecular bone score (TBS), a measure of microarchitectural abnormalities, and CT measurements of volumetric BMD (vBMD) at the spine. We are focusing on postmenopausal women in this study, the group at greatest risk for adverse skeletal consequences of ESI because of underlying bone loss due to estrogenic deficiency and aging.

ID: 2017-1061 (HSS)	*Can Body Composition Help Us Better Understand Outcomes in People with Lupus?*

Source	Barbara Volcker Center for Rheumatic Disease Fellowship Award, HSS/Scientist Development Award, Rheumatology Research Foundation
Amount	$275,000
Duration	07/24/2017 – 07/26/2023
Principal Investigator	Lisa Mandl, M.D., Sara Lieber, M.D.
Role in Project	Co-Investigator
Notes	The aims of this study are to determine the prevalence of frailty in a prospective cohort of patients with SLE, as well as to evaluate the cross-sectional association of frailty with imaging and metabolic biomarkers, PROMs, and sarcopenia (as determined by dual-energy x-ray absorptiometry scan). In addition, this study will determine the longitudinal association of frailty with disease activity, damage, and PROMs. We hypothesize that the prevalence of frailty in this cohort of SLE patients will be comparable to the prevalence of frailty in community-dwelling elderly. We also hypothesize that frailty will be significantly associated with inflammatory and imaging biomarkers, as well as worse disease activity and damage, after controlling for potential confounders, both cross-sectionally and longitudinally.

ID: 2018-0287 (HSS)	*Phase II Trial of Abaloparticle vs. Placebo in Post-Menopausal Women Receiving Initial Spinal Fusion Surgery*
Source	Radius Pharmaceuticals
Amount	$600,000
Duration	12/19/2018 – 10/25/2023
Principal Investigator	Emily Stein, M.D.
Role in Project	Co-Investigator
Notes	In this pilot study we will evaluate surgical outcomes at one year (enhanced bone union, reduced pedicle screw loosening, adjacent segment fracture and proximal junctional kyphosis) and compare the impact of 6 months of abaloparatide vs. placebo on surgical success. Secondary outcomes for surgical success will be evidence of pedicle screw loosening, adjacent segment fracture, and proximal junctional kyphosis. These data will be used to determine effect sizes and variance to power the next larger clinical trial.

ID: 2018-0733 (HSS)	*Development of a Surface Topography & Spinal Alignment Registry for Assessing Spinal Deformity*
Source	Leon Root, M.D. Paediatric Orthopaedic Chair Fund/ Spinal Deformity Registry
Amount	$240,000/ $500,000
Duration	01/23/2021 – 01/23/2024
Principal Investigator	Howard Hillstrom, Ph.D.
Role in Project	Co-investigator
Notes	A registry is proposed to collect a comprehensive dataset of 3D topographic imaging files, stereo radiography files, patient reported outcome measures (PROMS), and clinical assessment data from patients with spinal deformity. The goal is to characterize external

	body shape as well as skeletal structure on a large dataset (n~2000 minimum) and conduct robust statistical modelling of scoliotic deformity. Surface imaging will be performed with a full body optical scanner (3dMD) in a variety of clinically relevant poses. Weight bearing skeletal structure will be measured from low dose biplanar EOS radiographs (standard of care) in the form of spinal alignment measures, leg length, and pelvic pose. Additionally, simultaneous with EOS scanning, surface scanning will be performed with optical depth cameras to generate the first ever comprehensive dataset of surface topography and skeletal alignment. Relevant PROMs will also be obtained. Using the data collected in this registry it will be possible to build analysis plans to investigate the epidemiology of scoliosis, find correlations between surface and spine shapes as a non-ionizing radiation alternative for determining spinal alignment, measure clinical outcomes pre and post treatment, assess patient self-image, and an unknown range of future investigations.

ID: 2018-1059 (HSS)	*TCR sequencing and transcriptional profiling in HLA-B27 associated diseases*
Source	Regeneron
Amount	$250,000
Duration	06/25/2020 – 05/23/2023
Principal Investigator	Lisa Mandl, M.D.
Role in Project	Co-investigator
Notes	We propose a cross-sectional study of synovial tissue, enthesial tissue, and peripheral blood of patients with HLA-B27-associated arthritis to help understand the relationship between HLA-B27 status, T cell clonality and the transcriptional profile in HLA-B27 positive subjects. After successful completion of the original proposal, in discussion with the sponsor, we have decided to recruit an additional 5 control patients with osteoarthritis.

ID: 2018-1305 (HSS)	*A Prospective Evaluation of the 4WEB Medical Lateral Spine Truss System*
Source	4WEB Medical
Amount	$50,000
Duration	10/07/2020 – 05/04/2023
Principal Investigator	Alexander Hughes, M.D.
Role in Project	Co-investigator
Notes	The objective of this study is to prospectively evaluate the radiological and clinical outcomes of patients undergoing standalone lateral lumbar interbody fusion with the 4WEB® Medical Lateral Lumbar Interbody Fusion Spine Truss System (LSTS, 4WEB® Medical, Frisco, TX). The 3D printed implant has a novel open architecture and surface roughness design that resists subsidence and improves fixation. This is an investigator-initiated, industry funded descriptive study.

ID: 2019-0126 (HSS)	*Predicting Failure of Reconstruction of the Stage II Adult-Acquired Flatfoot Deformity based on Preoperative Subtalar Valgus and Subfibular Impingement*
Source	HSS Surgeon-in-Chief
Amount	$10,000
Duration	10/20/2020 – 09/26/2023
Principal Investigator	Scott Ellis, M.D.
Role in Project	Co-investigator
Notes	This study is investigating whether preoperative alignment of the subtalar joint or severity of subfibular impingement on weightbearing CT scans predicts failure of a flatfoot reconstruction as measured by patient-reported clinical outcomes. A secondary goal is to determine whether current adult flatfoot reconstructive techniques correct the abnormal subtalar joint alignment or improve subfibular impingement.

ID: 2019-2313 (HSS) R21 TR003033-01A1	*Magnetic resonance and ultrasound imaging as biomarkers for detection and monitoring of Parsonage-Turner Syndrome (PTS)*
Source	NIH (NCAT)
Amount	$275,000
Duration	04/01/2020 – 01/23/2024
Principal Investigator	Darryl Sneag, M.D.
Role in Project	Co-Investigator
Notes	This study aims to understand the natural course of imaging and serologic findings in PTS and to determine if they can serve as reliable, non-invasive markers of motor and overall functional recovery.

ID: 2020-0477 (HSS)	*Is Geniculate Artery Embolization an Acceptable Option for Patients with Knee Osteoarthritis?*
Source	HSS Surgeon-in-Chief
Amount	$20,000
Duration	06/01/2020 – 5/31/2023
Principal Investigator	Lisa Mandl, M.D.
Role in Project	Co-investigator
Notes	This is a survey given to patients with painful knee osteoarthritis to see if a novel procedure, called Geniculate Artery Embolization, would be an acceptable option. This treatment is not currently available.

ID: Outside Study	*Classification of Axial Spondyloarthritis Inception Cohort Study*
Source	Spondyloarthritis Research and Treatment Network
Amount	$3,200,000.00
Duration	07/2021 – 07/2023
Principal Investigator	Walter Maksymowych, MD
Role in Project	Central Imaging Reviewer
Notes	The ASAS group has developed classification criteria for axial spondyloarthritis (axSpA) that allow the inclusion of patients with

	an early form of disease that is not yet clearly visible on plain radiography1. These criteria include both an imaging 'arm', that incorporates either radiographic sacroiliitis or magnetic resonance imaging (MRI) features of active inflammation in the sacroiliac joints (SIJ) plus one clinical feature of spondyloarthritis (SpA), and a clinical 'arm' that requires the presence of HLA B27 plus 2 clinical features of SpA. The sensitivity and specificity of these criteria for axSpA were 83% and 84%, respectively, when assessed in a prospective cohort of patients referred to a rheumatologist with undiagnosed chronic back pain and suspicion of SpA.

ID: 2019-1402 (HSS)	*Evaluation of Robotics in Spinal Surgery*
Source	Medtronic Research Support
Amount	$100,000
Duration	12/13/2019 – 12/12/2025
Principal Investigator	Darren R. Lebl, .MD
Role in Project	Co-Investigator
Notes	In this study, Medtronic Mazor X robotic guidance will be integrated in spinal surgeries. Surgical workflow and outcomes will be evaluated when examining the learning curve to measure proficiency of robotics during spine surgery.

ID: R01-EB-029446	*Quantitative Bone Radiomics using Ultra-High Resolution CT*
Source	NIH – R01
Amount	$1,698,307
Duration	07/01/2021 - 03/31/2025
Principal Investigator	Wojciech Zbijewski PhD
Role in Project	Co-Investigator
Notes	A high-resolution cone-beam CT (CBCT) system for extremity imaging has been developed using a custom complementary metal-oxide-semiconductor (CMOS) x-ray detector. The system has spatial resolution capability beyond that of recently introduced clinical orthopaedic CBCT. We evaluate performance of this new scanner in quantifying trabecular microstructure in subchondral bone of the knee.

ID: 2015-092	*Prospective Evaluation of the Clinical and Economic Outcomes of Total Joint Replacement: The HSS Hip Arthroplasty Cohort*
Source	"Legacy" Arthroplasty Registry (ARJR)
Amount	N/A
Duration	3/23/2020 – 12/31/2025
Principal Investigator	Steven Lyman, Ph.D.
Role in Project	Co-investigator
Notes	Legacy analysis of anonymized patient reported outcomes

ID: 2015-093	*Prospective Evaluation of the Clinical and Economic Outcomes of Total Joint Replacement: The HSS Knee Arthroplasty Cohort*
Source	"Legacy" Arthroplasty Registry (ARJR)

Amount	N/A
Duration	8/11/2020 – 12/21/2023
Principal Investigator	Steven Lyman, Ph.D.
Role in Project	Co-investigator
Notes	Legacy analysis of anonymized patient reported outcomes

ID: 2016-055 (HSS)	*Magnetic Resonance Imaging of Nerves Around Metal Implants*
Source	Medical Record Chart Review
Amount	Non-funded
Duration	01/13/2016 – 01/17/2023
Principal Investigator	Darryl Sneag, M.D.
Role in Project	Co-Investigator
Notes	The review study features capabilities and limitations of nerve imaging around metal implants in magnetic resonance imaging using metal artifact reduction protocols. Retrospective chart review with subjects obtained from MONTAGE Search & Analytic data mining; correlated with patient history, clinical findings and electrodiagnostic studies.

ID: 2016-0022 (HSS)	*The Association of Intra-Operative Synovitis and Clinical Outcomes 2-years after TKR: A Pilot Study*
Source	Medical Record Chart Review
Amount	Non-funded
Duration	07/27/2016 – 12/21/2025
Principal Investigator	Lisa Mandl, MD
Role in Project	Co-investigator
Notes	The primary aim of this retrospective study is to review MRIs available at the time of surgery of patients who completed Total Knee Replacements between 2007 and 2012. The patients enrolled are primary unilateral TKR patients from the Legacy Database. Baseline and 2-year legacy self-reported data, pre-operative knee radiographs available for review, and intra-operative histopathologic specimens have been previously obtained under IRB protocol # 2015-135 of the same name. We are currently interested in reviewing MRIs taken at the time of surgery for those patients.

ID: 2016-0658 (HSS)	*The Skeletal Effects of Epidural Steroid Injections*
Source	Medical Record Chart Review
Amount	N/A
Duration	12/16/2016 – 12/15/2025
Principal Investigator	Emily Stein, M.D.
Role in Project	Co-investigator
Notes	Epidural steroid injections are a very common treatment for back pain. The effects of these injections on bone are not known. This is a question of concern because of the well-established harmful effects of other forms of steroids on the skeleton. In this retrospective study, we aim to investigate whether patients who were treated with epidural steroids have lower bone density

	measured by CT scan than those who were not. We also plan to look at the effects of the total doses that patients received prior to the scan to see whether larger doses are associated with more harm.

ID: 2016-0751 (HSS)	*Assessing Spine Bone Quality Utilizing Quantitative Computed Tomography (QCT)*
Source	Medical Record Chart Review
Amount	Non-funded
Duration	12/06/2016 – 02/12/2026
Principal Investigator	Alexander Hughes, M.D.
Role in Project	Co-investigator
Notes	Study investigators will perform a retrospective review of spine patients seen at HSS from 2001 to July 30, 2020 with available CT imaging. Quantitative computed tomography (QCT) will be utilized to examine the occipital region, cervical, thoracic, and lumbar vertebrae as well as the sacral ala to get local and regional bone density measurements. Comparisons to other imaging modalities such as x-ray and MRI may be made as well to assess the utility and value of QCT in comparison. Results will aid stratifying patients by bone quality and aid in surgical considerations.

ID: 2019-2137 (HSS)	*MRI Analysis of Spine Musculature*
Source	Medical Record Chart Review
Amount	Non-funded
Duration	12/20/2019 – 11/12/2025
Principal Investigator	Alexander Hughes, M.D.
Role in Project	Co-investigator
Notes	The objective of this study is to retrospectively review available MRI measurement methods to evaluate spine musculature quality. Lumbar spine MRIs from 1/1/2008 to 12/31/2020 will be utilized to assess muscle size and fatty infiltration.

ID: 2019-1402-MS2 (HSS)	*Evaluation of Robotics in Spinal Surgery: Medtronic Mazor Xrobotic Guidance*
Source	Medical Record Chart Review
Amount	Non-funded
Duration	06/01/2019 – 12/12/2025
Principal Investigator	Darren Lebl, MD
Role in Project	Co-investigator
Notes	In this study, Medtronic Mazor X robotic guidance will be integrated in spinal surgeries. Surgical workflow and outcomes will be evaluated when examining the learning curve to measure proficiency of robotics during spine surgery.

ID: 2019-1402-MS2 (HSS)	*Evaluation of Robotics in Spinal Surgery: Medtronic Mazor Xrobotic Guidance*
Source	Medical Record Chart Review
Amount	Non-funded

Duration	06/01/2019 – 12/12/2025
Principal Investigator	Darren Lebl, MD
Role in Project	Co-investigator
Notes	In this study, Medtronic Mazor X robotic guidance will be integrated in spinal surgeries. Surgical workflow and outcomes will be evaluated when examining the learning curve to measure proficiency of robotics during spine surgery.

J. EXTRAMURAL PROFESSIONAL RESPONSIBILITIES

Activity / Responsibility	**Dates**
DICOM Standards Committee (American College of Radiology/National Electronics Manufacturing Association)	1996-present
Study Section: RSNA (Radiology Society of North America) Research and Education Foundation	2006, 2007, 2009, 2010, 2011, 2013, 2014, 2015, 2016, 2017
Study Section: SIIM (Society for Imaging Informatics in Medicine Research Grant Review Group	2004, 2005
Advisory Committee: Arthritis Foundation Advisory Board member for Arthritis Foundation Grant, 09/2006-09/2009	2006 – 2009
Advisory Committee: Federal Drug Administration (FDA) Radiological Devices Panel, Computer Aided Diagnosis (CAD) 3/4/08-3/5/08, 11/17/09-11/18/09, 11/17/10-11/18/10 Role: temporary voting member, Special Government Employee (SGE) status	2008, 2009, 2010
System Innovation and Quality Improvement: RSNA Structured Reporting Templates: "Best Practices" (Internet) https://rsna.org/Reporting_Initiative.aspx	2008 – present
Study Section: Italian Ministry of Health (MOH) - in association with NIH Young Investigator Innovation grants 2009	2009
Review Group: Center for Integration of Medicine and Innovative Technology (CIMIT)	2011 – 2012
Editorial Board: Associate Editor (Imaging), Arthritis & Rheumatism, ACR (American College of Rheumatology)	2010 – 2015 r01
Study Section: VA MERIT REVIEW	2012
Lumbar Spinal Stenosis Outcome Study (LSOS) Mamisch N, Brumann M, Hodler J, Held U, Brunner F, Steurer J; Lumbar Spinal Stenosis Outcome Study Working Group Zurich. Radiologic criteria for the diagnosis of spinal stenosis: results of a Delphi survey. Radiology. 2012 Jul;264(1):174-9. doi: 10.1148/radiol.12111930. Epub 2012 May 1. PubMed PMID: 22550311.	2011 – 2012
NIH Pain Consortium; Chronic Low Back Pain (cLBP) Research Task Force	2012 – present
OARSI (Osteoarthritis Research Society International), Ankle Atlas	2013 – present
NASS (North American Spine Society)	2016 – present

RAND Expert Panel on Appropriateness of Manipulation/Mobilization for Chronic Low Back Pain	2017
Editorial Board: Associate Editor, Arthritis and Rheumatology, ACR (American College of Rheumatology)	2020 – 2025
Editorial Board: Deputy Editor, Musculoskeletal Imaging, Radiology, RSNA (Radiological Society of North America)	2020 – present
Advisory Committee: Federal Drug Administration (FDA) Radiological Devices Panel Role: Chairman, Special Government Employee (SGE) status	2022 – 2023

K. INVITATIONS TO SPEAK/PRESENT

1. CME Instruction

04/97 The 5th Scientific meeting and exhibition of the international Society for Magnetic Resonance In Medicine, "MR Imaging of the foot and ankle: Bone Marrow Edema patterns" (Lecturer), Vancouver, BC, Canada

10/97 University of Texas Health Science Center at San Antonio Center for Distance Learning Medical Informatics Curriculum, "Picture Archiving and Communicating Systems (Lecturer)," San Antonio, TX

04/98 University of Texas Health Science Center at San Antonio Center for Distance Learning Medical Informatics Curriculum, "Picture Archiving and Communicating Systems (Lecturer)," San Antonio, TX

02/98 The 28th Annual Meeting for Current Concepts in Imaging: Sponsored by the office of the Surgeon General, Coronado Island, "Current concepts in MR Imaging of the Knee" (Lecturer), San Diego, CA

05/98 The 4th Annual Armed Forces Institute of Pathology Musculoskeletal Imaging Weekend, "Cases in Musculoskeletal Radiology" (Lecturer), San Antonio, TX

03/99 Society of skeletal Radiology 1999 Annual Meeting, "Practical Aspects of picture archiving and communications systems implementation" (Lecturer), Phoenix, AZ

04/99 The Annual MGH/BWH Radiology Review Course, "Arthritis Imaging" (Lecturer), Boston, MA

09/99 New England Roentgen Ray Society, "An Introduction to picture archiving and communication systems" (Lecturer), Cambridge, MA

09/99 DICOM, "Radiology into the 21st Century: The Digital Department" (Lecturer), Cambridge, MA

09/99 Radiology into the 21st Century: The Digital Department, "PACS Implementation" (Lecturer),
Cambridge, MA

10/99 Brigham Women's Hospital MRI/CT Update, "Foot and Ankle MR Imaging" (Lecturer), "Knee MR Imaging" (Lecturer) Boston, MA

03/00 Brigham Women's Hospital Orthopedic Radiology, "Discography" (Lecturer), Boston, MA

04/00 The Annual MGH/BWH Radiology Review Course, "Arthritis Imaging" (Lecturer), Boston, MA

05/00 Brigham Women's Hospital Radiology Management in a New Era, "PACS: Overview" (Lecturer), Boston, MA

06/00 The 17th Symposium for Computer Applications in Radiology, "Compression for diagnostic Imaging: Point-Counterpoint" (Lecturer), Philadelphia, PA

06/00 The 72nd American Society of Radiology Technologists Annual Conference, "PACS: The New Paradigm" (Lecturer), "Introduction to the DICOM Standard" (Lecturer), Albuquerque, NM

10/00 Society for Health Services Research in Radiology 2000 Annual Meeting, "Imaging information management: Impact on workflow and productivity" (Lecturer), Washington, DC

02/01 The 5th annual CR & PACS: An Educational forum, Fuji Medical Systems, "Image quality issues in PACS" (Lecturer), Savannah, GA

03/01 Joint conference by Johns Hopkins Medicine, the Society of Nuclear Medicine, the office of high-performance computing and communications at the National Library of Medicine and the National Institutes of Health, "DICOM for Dummies (Lecturer)," Bethesda, MD

04/01 The 9th Scientific Meeting and Exhibition of the International Society for Magnetic Resonance in Medicine, "MR of Marrow – Miscellaneous" (Lecturer), Glasgow, Scotland, UK

05/01 The 18th Symposium for Computer Applications in Radiology, "Image Quality: Overview (Lecturer)," "Clinical Perspectives in Teleradiology (Lecturer)," Salt Lake City, UT

05/01 Brigham's Women's Hospital Emergency Radiology: Pearls and Perils, "Spine and Musculoskeletal Imaging" (Lecturer), Pinehurst, NC

06/01 Brigham Women's Hospital Radiology Management in a New Era, "PACS" (Lecturer), "Use of Technology to Improve Workflow" (Lecturer), Boston, MA

12/01 Emergency Radiology: Pearls and Perils, "Spine and Musculoskeletal Imaging" (Lecturer), New York, NY

04/02 Philadelphia Roentgen Ray Society, "Imaging of Degenerative Disc Disease and Related Syndromes (Lecturer)," Philadelphia, PA

05/02 International Society for Magnetic Resonance in Medicine 10th Scientific Meeting and Exhibition, "Shoulder Injuries (Lecturer)," "Positional Imaging of the spine (Lecturer)," Honolulu, HI

07/02 American Association of Physicists in Medicine 44th Annual Meeting Invited Presenter, "PACS Image Quality – A Gestalt View (Lecturer)," "The Role of a Physicist in PACS (Lecturer)," Montreal, Canada

08/02 Emergency Radiology: Pearls and Perils, "Spine and Musculoskeletal Imaging" (Lecturer), Hyannis, MA

12/02 The 88th Scientific assembly and annual meeting of the radiological society of North America, "Medical Imaging Displays: CRTs and LCDs" (Lecturer), Chicago, IL

02/03 Emergency Radiology: Pearls and Perils, "Spine and Musculoskeletal Imaging" (Lecturer), Maui, HI

02/03 MRI Clinical Update and Practical Applications, "Minimally Invasive MSK Interventions" (Lecturer), "MRI Hip" (Lecturer), "MR Imaging of Shoulder Instability" (Lecturer), Maui, HI

04/03 The Annual MGH/BWH Radiology Review Course, "The Spectrum of Bone Disease" (Lecturer), Boston, MA

06/03 The 18th Symposium for Computer Applications in Radiology, "How NOT to give a Scientific Talk (Lecturer)," "Radiology Lexicon and the Radlex Project (Lecturer)," Boston, MA

07/03 The 11th Scientific Meeting and Exhibition of the International Society for magnetic Resonance in Medicine, "Interventional MRI: Percutaneous Procedures (Lecturer)," "Interventional MRI: Clinical Issues (Lecturer)," Toronto Ontario, Canada

10/03 Brigham Women's Hospital MRI/CT Update, "Wrist and Elbow MRI" (Lecturer),

Boston, MA

03/04 Society of Interventional Radiology, “Discography (Lecturer)”

03/04 Brigham Women’s Hospital Practical Applications of New Imaging Techniques, “MR Imaging of the Knee” (Lecturer), “MR Imaging of the Wrist” (Lecturer), Boston, MA

04/04 The Annual MGH/BWH Radiology Review Course, “The Spectrum of Bone Disease” (Lecturer), Boston, MA

04/04 Brigham Women’s Hospital Practical Applications of New Imaging Techniques, “MR Imaging of the Shoulder” (Lecturer), Boston, MA

05/04 The 12th Scientific Meeting and Exhibition of the International Society for Magnetic Resonance in Medicine, “Fat Suppression Techniques in Musculoskeletal MRI (Lecturer),” Kyoto, Japan

06/04 Association for the Advancement of Medical Instrumentation, “Advances in Image-Guided Surgery (Lecturer)”

09/04 International Spinal Injection Society Annual Meeting, “Imaging of the Lumbar Intervertebral Disc (Lecturer),” Maui, HI

10/04 Brigham Women’s Hospital Orthopedic Radiology, “MDCT for the Non-PhD” (Lecturer), “Spine Injection Procedures” (Lecturer), “Open MRI of the Musculoskeletal System” (Lecturer), Boston, MA

10/04 Brigham Women’s Hospital MRI/CT Update, “Diagnostic Approach to Bone Marrow Edema Patterns” (Lecturer), Boston, MA

11/04 Brigham Women’s Hospital Orthopedic Radiology, “MRI for the Clinical Guy” (Lecturer), Boston, MA

02/05 Brigham Women’s Hospital MRI Clinical Update and Practical Applications, “Essential Cartilage Evaluation” (Lecturer), “Sports Medicine Imaging of the Elbow” (Lecturer), “Bone and Soft Tissue Tumors” (Lecturer), “Post Op Knee – MRI Clinical Update and Practical Applications” (Lecturer), Kauai, HI

04/05 The Annual MGH/BWH Radiology Review Course, “Imaging Soft Tissue Pathology” (Lecturer), Boston, MA

04/05 Society of Interventional Radiology, “All that you learned in residency but forgot: Spinal Imaging” (Lecturer), New Orleans, LA

04/05 Practical Applications of New Imaging Techniques, “Musculoskeletal Applications of Multidetector CT Imaging: New Dog, Old Tricks” (Lecturer), “Musculoskeletal Soft Tissue Lesions: The Good, the Bad, and the Ugly” (Lecturer), “Differential Diagnosis of Bone Marrow Edema Patterns: The Contusion Confusion” (Lecturer), Brigham Women’s Hospital, Boston, MA

10/05 Congress of Neurological Surgeons, “Musculoskeletal Imaging: New Technologies for Spine Surgery (Lecturer)”

11/05 Harvard Orthopedic Radiology, “Post-Operative Spine” (Lecturer), “Radiculopathy and Spine Degeneration,” Boston, MA

02/06 NEPA’s 2006 Annual Winter Conference on Pain Management, “Radiologic Imaging for Neck and back Pain” (Lecturer), Woodstock, VT

06/06 Johns Hopkins University Advances in the Diagnosis and Treatment of Rheumatic Diseases, “Advances in Musculoskeletal Imaging” (Lecturer), Baltimore, MD

10/06 Harvard Orthopedic Radiology, “Spine MRI” (Lecturer), “MRI of the Adult Hip” (Lecturer),
“CT Update” (Lecturer), Boston, MA

02/07 American Academy of Pain Medicine, “Roentgen's Curse - The Dangers of Exposure to X-Rays in Any Shape or Form” (Lecturer), “Pain Generator - A Radiologist's Input to the Complex Puzzle” (Lecturer), New Orleans, LA

02/07 Johns Hopkins University Hot Topics in MR Imaging for the Technologist, “MR

Neurography" (Lecturer), "MR Arthrography: Applications" (Lecturer), "MRI of the Knee" (Lecturer), Baltimore, MD

02/07 American Society of Spine Radiology, "Socioeconomic Implications of Back Pain" (Lecturer), Marco Island, FL

04/07 Harvard Practical Applications of New Imaging Techniques, "MRI Infection and Inflammatory Arthropathies" (Lecturer), "Differential Diagnosis of Bone Marrow Edema Patterns" (Lecturer), "MDCT Musculoskeletal Applications 'New Dog, Old Tricks'" (Lecturer), Paris, France

06/07 The Jefferson Musculoskeletal Imaging Spring Conference, "MR of the Rotator Cuff and Impingement" (Lecturer), "MR Imaging of the Post Operative Cartilage" (Lecturer), June 23-24, 2007

07/07 Maryland Society for Rheumatic Diseases Summer Rheumatology Symposium, "Update on Rheumatologic Imaging Modalities" (Lecturer), Cambridge, MD

07/07 International Spinal Intervention Society, "State of the Art: Axial Lumbar Pain - Imaging (CT, MRI)" (Lecturer), "State of the Art: Axial Cervical Pain - Imaging (CT, MRI)" (Lecturer), Baltimore, MD

10/07 General Electric Healthcare Meeting, "Image Guided Spine Procedures (Lecturer)," Budapest, Hungary

10/07 MR-CT Update, "Update on Image Guided Spinal Procedures" (Lecturer), "Vertebral Augmentation: Past, Present and Future" (Lecturer), Boston, MA

01/08 NAON (National Association of Orthopaedic Nurses) – Baltimore Chapter, "Shoulder Imaging: Radiography (Lecturer)," Baltimore, MD

02/08 Hot Topics in MR Imaging for the Technologist, "MR Neurography" (Lecturer), "MR Arthrography: Applications" (Lecturer), "MRI of the Knee" (Lecturer), Johns Hopkins University, Baltimore, MD

03/08 33rd Annual Scientific Meeting of the Society of Interventional Radiology, "Disc Disease Intervention: Epidural Steroids, RF, IDET, Chymopapine and Ozone Therapy" (Lecturer), "Musculoskeletal Interventions: Expanding the Scope of IR" (Lecturer), Washington, D.C.

04/08 Radiology Review, "MRI of the Shoulder" (Lecturer), "MRI of the Foot and Ankle" (Lecturer), Harvard Medical School, Boston, MA

5/08 6th MAGNETOM World Summit, "MRI in Sports Medicine (Lecturer)," "Orthopaedics with 3T and Open Bore (Lecturer)," Munich, Germany, May 31, 2008

07/08 MedChi & Arthritis Foundation, Topics in Clinic Rheumatology, "Musculoskeletal Imaging – Current Concepts" (Lecturer), Baltimore, MD

09/08 The 4th Chinese Conference of Minimally Invasive Therapy in Oncology, "MRI-Guided Minimally Invasive Therapy and Its Development (Lecturer)," China, September 21, 2008

10/08 7th Annual Symposium on High Field MRI: The Impact on Clinical Practice, "High Field MR of Spinal Disease" (Lecturer), Las Vegas, NV

10/08 International Skeletal Society (ISS) Refresher Course, "MR Neurography" (Lecturer), New Delhi, India

01/09 NAON (National Association of Orthopaedic Nurses) – Baltimore Chapter, "Shoulder Imaging: MRI (Lecturer)," Baltimore, MD, January 14, 2009

02/09 Hot Topics in MR Imaging for the Technologist, "MRI of Joints" (Lecturer), Johns Hopkins University, Baltimore, MD

02/09 Harvard MRI Clinical Update and Practical Applications, "MRI of Inflammatory Arthropathies" (Lecturer), "MR techniques for Cartilage Imaging 1.5T versus 3T" (Lecturer), "Hip MRI and Femoroacetabular Impingement" (Lecturer), "High Resolution MRI of the knee and menisci using 3T" (Lecturer), Cancun, Mexico

05/09 Johns Hopkins Medicine International Meeting, "Imaging of Musculoskeletal Neoplasms and Tumor-Like Conditions (Lecturer)," Al Ain, United Arab Emirates, May 12, 2009

05/09 "Updates in Imaging of the Knee – Primary Care Approach to Treating the Injured Athlete" (Lecturer), Towson Orthopaedic Associates, Towson, MD

09/09 International Skeletal Society 36th Annual Imaging Update Courses, "Multichannel coils: Theory and Use in MSK Imaging" (Lecturer), Washington, DC

12/09 RSNA 95th Scientific Assembly and Annual Meeting, "Upper extremity nerve entrapment: Brachial plexus and Shoulder" (Lecturer), Chicago, IL

01/10 Musculoskeletal Imaging Symposium, "MR Neurography: Introduction and Applications" (Lecturer), "State of the Art Musculoskeletal MRI at 3T" (Lecturer), Jefferson Medical College, Philadelphia, PA, January 23, 2010

01/10 Hot Topics in MR Imaging for the Technologist, "MRI of Joints" (Lecturer), "MR Neurography" (Lecturer), Johns Hopkins University, Baltimore, MD

02/10 Radiological Society of New Jersey 2010 Musculoskeletal MRI Symposium, "Functional Joint Imaging" (Lecturer), "3T of the Musculoskeletal System" (Lecturer), "MR Neurography" (Lecturer), February 27-28, 2010, Iselin, NJ

03/10 Mixing Sun, Sand and Knowledge: Hot Topics and Burning Issues by the Beach, "MSK CT" (Lecturer), "Bone Contusion" (Lecturer), "Functional MSK Imaging" (Lecturer), "Neoplasms" (Lecturer), "3T MRI" (Lecturer), "Spine" (Lecturer), "MR neurography" (Lecturer), March 18-21, 2010

05/10 The Second Annual Ben Anderson Lectureship in Radiology, Scott &White, Texas A&M Health Science Center, College of Medicine, "3T MRI of the Musculoskeletal System (Lecturer)," Temple, TX, May 12, 2010

05/10 7th MAGNETOM World Summit, "Imaging of menisci and cartilage – 2D versus 3D (Lecturer)," "Imaging of rheumatoid arthritis (Lecturer)," Shenzhen, China, May 27-30, 2010

01/11 Hot Topics in MR Imaging for the Technologist, "3T MRI of the MSK System" (Lecturer), "MRI of Rheumatoid Arthritis" (Lecturer), "MR Neurography" (Lecturer), Johns Hopkins University, Baltimore, MD

01/12 Hot Topics in MR Imaging for the Technologist, "Update on Cartilage Imaging – Morphological and Biochemical" (Lecturer), "Making the most of 3Tesla MRI for Sports Medicine" (Lecturer), "MRI of Rheumatologic Conditions" (Lecturer), Johns Hopkins University, Baltimore, MD

07/12 ISIS 20th Annual Scientific Meeting, (Lecturer), "What MRI Findings are Relevant?" (Lecturer), "Biochemical Imaging" (Lecturer), Las Vegas, NV

08/12 6th Annual Joint Course: New Technology for the Treatment of Adult Hip and Knee Disorders, "FAI Imaging Studies: Current State of the Art" (Lecturer), "New Technologies for MRI Evaluation of Metal-on-Metal Hips" (Lecturer), Baltimore MD

08/12 21st Annual Current Issues of Magnetic Resonance Imaging in Orthopaedics and Sports Medicine, "Pardon the Interruption" MR Protocol Panel Discussion (Lecturer)," San Francisco, CA, August 28, 2012

09/12 International Skeletal Society's Refresher Course, "Percutaneous intervention using MR guidance" (Lecturer), Rome, Italy

10/12 University of Zurich Symposium: Chronic Low Back Pain in People Older than 50, "Interventional Radiology in Patients with Chronic Low Back Pain" (Lecturer), Zurich, Switzerland

10/12 Management in Radiology Annual Scientific Meeting, "Radiology in Emergency Cases: How to decide between CT, US and MR (Lecturer)," Milan, Italy, October 12, 2012

11/12 International Spine Intervention Society (ISIS) Clinical Anatomy and Imaging (CAI) of the Spine (co-director, lecturer), Cambridge Massachusetts

11/12 American College of Rheumatology Annual Meeting State of the Art Symposium, "Musculoskeletal Radiology – A Critical Examination of Key Findings in the Rheumatic Diseases"(Lecturer), Washington, D.C.

01/13 Hot Topics in MR Imaging for the Technologist, "Metal Artifact Reduction techniques for MRI" (Lecturer), "Musculoskeletal 3D MRI" (Lecturer), Baltimore, MD

01/13 Baseball Medicine Conference: Injury, Treatment and Prevention Techniques, "MRI Shoulder & Elbow Anatomy (Lecturer)," Baltimore, MD, January 4, 2013

02/13 International Spine Intervention Society Cervical Procedures Bio-Skills Lab, (Instructor), Long Beach, CA

03/13 AAOS Annual Meeting Instructional Course Lecture, "MRI of the Spine: Essentials for the Orthopaedic Surgeon" (Lecturer), Chicago, IL

03/13 29th Annual Conference of Indian Radiological & Imaging Association, Karnataka State Chapter, "The Musculoskeletal Manifestations of Cardiothoracic Disorders (Lecturer)," Bangalore, India, March 17, 2013

04/13 ISMRM Annual Meeting, Challenges in Musculoskeletal Imaging, "Diagnosing Hip Labral Tear: Impingement & Dysplasia" (Lecturer), Salt Lake City, UT

04/13 9th Annual Advances in the Diagnosis and Treatment of the Rheumatic Diseases, "Imaging- MRI and Diagnoses of Rheumatic Diseases" (Lecturer), Baltimore, MD

07/14 3rd Heidelberg Summer School, Musculoskeletal Cross-Sectional Imaging 2014, "What a MSK radiologist should know about MR Neurography," Heidelberg, Germany, July 26, 2014

05/14 SMRT 23rd Annual Meeting, "Bone Marrow Abnormalities (Lecturer)," "Peripheral Nerve Imaging (Lecturer)," Milan, Italy, May 12, 2014

05/14 2014 Musculoskeletal MR meeting in Lugano: Hand and Wrist MRI, "Hand and wrist MR in Rheumatology. The radiologist (Lecturer)," Lugano, Switzerland, May 17, 2014

05/14 ISPNI 3rd International Conference and Course on Neuromuscular Ultrasound, "How to perform MR-guided interventions (Lecturer)," Vienna, Austria, May 22-24, 2014

07/14 7th International Workshop on Osteoarthritis Imaging (2014 IWOAI), "MRI advances and application in OA assessment (2D vs 3D, high field strength MRI, ultrashort echo (UTE) MRI) (Lecturer)," Reykjavik, Iceland, July 9-12, 2014

08/14 North American Spine Society 29th Annual Meeting, Section on Radiology: Imaging of the Spine: Spectrum of Disease and Live/Interactive Case Reviews, "MRI Essentials: Physics and Pulse Secquences (Lecturer)," "Advanced Techniques in Spinal Imaging (Lecturer)," San Francisco, CA, November 11, 2014

08/14 North American Spine Society 29th Annual Meeting, Section on Radiology: Controversies in Spine Imaging, "Verterbral Lesions: Benign Hemangiomas versus Malignancy," and "Postoperative Collection: Infection versus Seroma," San Francisco, CA, November 12, 2014

09/14 Ploga-Sachsse Lecture, Baystate Medical Center, "Musculoskeletal Multimodality Imaging and the role of Radiography: Yesterday, Today and Tomorrow (Lecturer)," Springfield, MA, September 11, 2014

09/14 Pudendal Neuralgia Conference, Universidad Central del Caribe and Pudendal Neuralgia Association, Inc., "Magnetic Resonance Neurography (Lecturer)," Waltham, MA, September 27, 2014

10/14 ISIS Lumber Procedures Bio-Skills Lab (Lecturer), Memphis, TN, October 11-12, 2014

10/14 ISIS Society Clinical Anatomy & Imaging of the Spine Course (Lecturer), Chicago, IL, October 25-26, 2014

10/14 New York Roentgen Society Annual Meeting (Moderator), New York, NY, October 24, 2014

10/14 ISMRM 10th Interventional MRI Symposium, "3 Tesla MR-guided interventions in chronic pelvic pain syndromes: Initial clinical experiences (Lecturer)," "3 Tesla MR-guided injections in patient with neurogenic thoracic outlet syndrome: Initial Clinical Experience (Lecturer)," "Technical feasibility of MR-guided vertebral cryoablation: Assessment in a procine model (Lecturer)," Liepzig, Germany, October 10-11, 2014

01/15 ISIS Lumbar Procedures Bio-Skills Lab (Lecturer), Phoenix, AZ, January 9-11, 2015

01/15 ISIS, "Evidence-Based Spine Interventions: A Seminar for Residents and Fellows (Lecturer)," San Francisco, CA, January 17-18, 2015

02/15 American Society of Spine Radiology (ASSR) 2015 Annual Symposium, "Spine Potpourri: MR Neurography (Lecturer)," Las Vegas, NV, February 5-8, 2015

05/15 American College of Radiology, "Primer of Personalized Medicine for Radiology Practices (Lecturer)," Washington, DC, May 21, 2015

05/15 International Skeletal Society Regional Outreach Program, Special Musculoskeletal Workshop for Young Radiologists, "Sports-related Injuries of the Spine (Lecturer)," "Benign vs. Malignant Vertebral Compression Fractures (Lecturer)," "Multiparametric MRI of MSK Tumors (Lecturer)," "Imaging Spectrum of Muscle Injuries (Lecturer)," Quito, Ecuador, May 29-30, 2015

10/15 ISIS Cervical Procedures Bio-Skills Lab (Lecturer), New Orleans, LA, October 9-11, 2015

10/15 SIS CAI, "Imaging Techniques (Lecturer)," "Vertebral Enumeration (Lecturer)," "Sacrum Pathology, Sacroiliac Joint (Lecturer)," "Thoracic Pathology (Lecturer)," Fort Worth, TX, October 24-25, 2015

11/15 ASRA 14th Annual Pain Meeting, "Image Overlay Systems to Help Guide Interventional Procedures (Lecturer)," "Can Radiologic Findings Suggest a Pathophysiology of Lumbar Spinal Stenosis and Guide Treatment (Lecturer)," Miami, FL, November 19-21, 2015

11/15 ASRA Annual Pain Meeting, "Imaging Safety and Anatomic Correlations: Assimilating the Information and Limiting Patient Risk: Image Overlay Systems to Help Guide Interventional Procedures (Lecturer)," "Imaging Safety and Anatomic Correlations: Panel Discussion and Open Forum (Lecturer)," "Lumbar Spinal Stenosis and Epidural Steroids: Can Radiologic Findings Suggest a Pathophysiology of Lumbar Spinal Stenosis and Guide Treatment? (Lecturer)," "Lumbar Spinal Stenosis and Epidural Steroids: Panel Discussion and Open Forum (Moderator), Miami, FL, November 21, 2015

11/15 RSNA, "Magnetic Resonance Neurography as an Adjunct for Back Pain and Extraspinal Sciatica (Lecturer)," Chicago, IL, November 30, 2015

02/16 2016 ASSR Symposium, "MR Neurography including Bracial Plexus (Lecturer)," Bonita Springs, FL, February 18-21, 2016

03/16 2016 AAOS Monthly Meeting, "MRI of the Spine, Essentials for the Orthopaedic Surgeon (Moderator)," Orlando, FL, March 1, 2016

03/16 SIS Cervical Course, "Anatomy and Imaging Techniques (Instructor)," Amsterdam, Netherlands, March 11-13, 2016

04/16 3rd Musculoskeletal MRI Meeting 2016: Shoulder MRI, "MR Imaging of acromio-clavicular and sternoclavicular joint (Lecturer)," "MR imaging of shoulder injuries in

overhead athletes (Lecturer)," Lugano, Switzerland, April 23, 2016

04/16 JPR 2016 RSNA, "Patellofemoral Imaging (Lecturer)," "Applying Literature Based Deductions into your Radiology Research (Lecturer)," "MR Neurography (Lecturer)," "CT for Bone Health (Lecturer)," "Radiation Dose and Safety in MSK Imaging (Lecturer)," Sao Paolo, Brazil, April 27 – May 1, 2016

05/16 Spine Intervention Society, "Advanced Lumbar (Instructor)," Cumberland, RI, May 13-15, 2016

05/16 ASNR Self-Assessment Module Session, "MR Neurography: Plexus and Peripheral Neurography (Lecturer)," Washington, DC, May 25, 2016

08/16 26th Annual Baltimore Limb Deformity Pre-Course, Masters of Disaster: Managing Osteomyelitis in the 21st Century, "Best Diagnostic Studies: Evaluation with Radiography, Magnetic Resonance Imaging, and Nuclear Medicine (Lecturer)," Baltimore, MD, August 25, 2016

09/16 ISS Annual Meeting, "Proximal Hamstring Attachment Complex Anatomy and Pathology (Lecturer)," Paris, France, September 9, 2016

09/16 SIS Cervical Course, "Spinal Imaging (Instructor)," "Cervical Transforaminal (Instructor)," "Transforaminal Epidural (Instructor)," "Case Presentations (Instructor)," Tampa, FL, September 23-24, 2016

11/16 Spine Interventional Society (SIS) Advanced Cervical Course, "Didactic Lectures: Contrast Patterns (Instructor)," Long Beach, CA, November 11-12, 2016

11/16 American Society of Regional Anesthesia (ASRA), "Basic Neuroimaging (Lecturer)," "Imaging in Pain/Making Rational Choices when Selecting the best Images (Lecturer)," "Ask the Expert: Reading and Interpretation of Spinal Imaging: MRI, CT, SPECT, Myelogram (Lecturer)," "How to Best Choose Your Imaging Test in Patients with Pain (Lecturer)," San Diego, CA, November 18, 2016

12/16 2016 RSNA DICOM Session, "Muscle Imaging: Beyond the Basics – Advanced MRI Techniques; Myositis, Myopathy and More (Lecturer)," Chicago, IL, December 1-2, 2016

01/17 NANS, "Radiological Findings in Pain of Spinal Origin (Lecturer)," Las Vegas, NV, January 20, 2017

01/17 10th French-Israeli Course in Radiology, "What Lumbar MRI findings are relevant? (Lecturer)," Tel Aviv, Israel, January 30, 2017

02/17 19th Annual Cleveland Clinic Pain Management Symposium, "Anatomic Imaging for Pain Evaluation (Lecturer)," "Choosing the Best Imaging Study (Lecturer)," "Imaging the Cervical Spine (Lecturer)," Orlando, FL, February 3-6, 2017

02/17 ASSR 2017 Annual Symposium, "MRI Guided Spinal Interventions (SAMs), (Lecturer)," San Diego, CA, February 23-24, 2017

03/17 NERRS Annual Meeting, "Post-Op Knee and Hip Arthroplasties (Lecturer)," Boston, MA, March 10, 2017

03/17 AAOS Annual Meeting, "MRI of the Spine: Essentials of the Orthopaedic Surgeon (Moderator)," San Diego, CA, March 14, 2017

03/17 Society of Skeletal Radiology SAMs Course, "Peripheral Nerve Imaging (Lecturer)," Santa Barbara, CA, March 19, 2017

04/17 2017 OARSI World Congress on Osteoarthritis, "Imaging (Lecturer)," Las Vegas, NV, April 27-30, 2017

05/17 Global Spine Course, "Mismatches between imaging and clinical findings (Lecturer)," "Clinical relevance of degenerative manifestation of the lumbar spine (Lecturer)," Milan, Italy, May 5, 2017

05/17 SSSR 4th Annual MRI Meeting: Spine MRI, "Clinical relevance of degenerative manifestation of the lumbar spine (Lecturer)," "Infectious Spine and its Mimics (Lecturer)," Lugano, Switzerland, May 6, 2017

06/17 SIS Bio Skills Lecture Course, "Complications Case Review – A Discussion of Correlative Anatomy (Lecturer)," "Imaging of the Cervical Spine (Lecturer)," "Imaging of the Lumbar Spine (Lecturer)," Biddeford, ME, June 2-4, 2017

06/17 Annual ORP Meeting, "Sports Injuries of the Spine (Lecturer)," "MRI of Shoulder Injuries in Overhead Athletes (Lecturer)," "Magnetic Resonance Neurography (Lecturer)," Montevideo, Uruguay, June 7-12, 2017

11/17 SIS Imaging Anatomy for the Spine Interventionalist, "Basics of Imaging Techniques: MRI (Lecturer)," "A Confounder in the Differential Diagnosis of Lumbar Radicular Pain: Basic Hip Imaging (Lecturer)," "Anatomy: Rib Articulations, Costovertebral and Costotransverse Joints (Lecturer)," "Thoracic Outlet Syndrome and the Brachial Plexus (Lecturer)," "The Lumbosacral Plexus and Piriformis Syndrome (Lecturer)," Washington, DC, November 4-5, 2017

11/17 SIS Cervical Procedures Bio-Skills Lab, "Spinal Imaging (Lecturer)," November 11, 2017, Tempe, AZ

01/18 NASS Science Care Course, "Fluoroscopic Anatomy and Radiation Safety (Lecturer)," Phoenix, AZ, January 26, 2018

02/18 14th Danish Annual Congress of Sports Medicine, "The Use of MRI in Diagnosis of Nerve Impingement in Sports (Lecturer)," Copenhagen, Denmark, February 3, 2018

03/18 Carestream OnSight 3d Extremity System – Point of Care CBCT, "Evolution of CBCT (Lecturer)," Vienna, Austria, March 2, 2018

04/18 ASRA 2018 World Congress, "Advances in Imaging to Improve Clinical Diagnosis Capabilities", New York, NY, April 20, 2018

04/18 ASRA 2018 World Congress, "Pathologic Findings on Radiographic Imaging", New York, NY, April 21, 2018

04/18 ARRS 2018, "MRI of the Knee", Washington, DC, April 22, 2018

04/18 ARRS 2018, "Peripheral Nerves: Imaging and Interventions", Washington, DC, April 27, 2018

05/18 JPR 48th Annual Meeting, "MR Neurography: State of Art", Sao Paulo, Brazil, May 3, 2018

05/18 JPR 48th Annual Meeting "Imaging in Bone Health", Sao Paulo, Brazil, May 3, 2018

05/18 JPR 48th Annual Meeting "Applying Literature Based Deduction into your Radiology Research", Sao Paulo, Brazil, May 4, 2018

05/18 JPR 48th Annual Meeting, "Spine Pathology: From Infection to Fracture", May 4, 2018

07/18 IWOAI 11th Annual Meeting, "The Role of Extremity CT Imaging in OA (Technical, Clinical, Research), Menton, France, July 6, 2018

07/18 AAPM 2018, "Structural and Functional Imaging Techniques Across Body Systems", Nashville, TN, July 30, 2018

09/18 ISS 2018, "MR Neurography of Extra-Spinal Sciatica", Berlin, Germany, September 28, 2018

11/18 SIS Imaging Anatomy for the Spine Interventionalist, "Contrast Media: Safety and Utility", San Francisco, CA, November 3, 2018

11/18 SIS Imaging Anatomy for the Spine Interventionalist, "Basics of Imaging Technique: MRI", San Francisco, CA, November 3, 2018

11/18 SIS Imaging Anatomy for the Spine Interventionalist, "Sacroiliac Joint Anatomy, Function, and Normal Imaging", San Francisco, CA, November 3, 2018

11/18 SIS Imaging Anatomy for the Spine Interventionalist, “Spondyloarthropathies”, San Francisco, CA, November 3, 2018

11/18 SIS Imaging Anatomy for the Spine Interventionalist, “Brachial Plexus and Thoracic Outlet Syndrome”, San Francisco, CA, November 4, 2018

11/18 SIS Imaging Anatomy for the Spine Interventionalist, “Lumbosacral Plexus and Piriformis Syndrome (Extraspinal Sciatica)”, San Francisco, CA, November 4, 2018

11/18 ASRA 17th Annual Pain Medicine Meeting, “Future of Imaging: Ultrasound and MRI in Pain Medicine/MR Neurography: Clinical Applications”, San Antonio, TX, November 17, 2018

01/19 SIS Disc Access Bio-Skills Lab, “Disc Anatomy and Imaging”, Long Beach, CA, January 12, 2019

01/19 NASS Hands on Course, “Lumbar Spine Injection”, Phoenix, AZ, January 26, 2019

03/19 AHRA Spring Conference, “Challenges and Opportunities for Radiology to Prove Value in Alternative Payment Models", San Antonio, TX, March 8, 2019

05/19 SSSR 6th International Musculoskeletal MRI Meeting 2019, “Sterno Clavicular Joint”, Milan, Italy, May 25, 2019

05/19 SSSR 6th International Musculoskeletal MRI Meeting 2019, “MRI of the elbow in throwing athletes”, Milan, Italy, May 25, 2019

06/19 NASS Injection Course, “Fluoroscopic Anatomy & Radiation Safety”, Burr Ridge, IL, June 21,2019

07/19 AHRA Annual Meeting 2019, "Challenges and Opportunities for Radiology to Prove Value in Alternative Payment Models", Denver, CO, July 21, 2019

08/19 SIS Annual Meeting 2019, “Frontiers in Fluoroscopy: Digital 3-D X-ray Imaging", New York, NY, August 15, 2019

08/19 SIS Annual Meeting 2019, “Magnetic Resonance Neurography", New York, NY, August 17,2019

09/19 International Skeletal Society Annual Meeting 2019, "MRI of Peripheral Nerves: Influence on Medical Decision Making", Vancouver, BC, September 13, 2019

07/21 American Society of Spine Radiology, Adult Diagnostic Section, Spine Saturday School. “Basic and Advanced Neurography”. Webinar. July 31, 2021.

09/21 Spine Intervention Society Lumbar Procedures Bio Skills Lab. “Spine Imaging” Aurora, Colorado. September 11, 2021.

08/21 Musculoskeletal CORE Lecture. New York Presbyterian. “Arthritis”. August 27, 2021.

10/21 Spine Intervention Society Lumbar Procedures Bio Skills Lab. “Spine Imaging”. Dallas, Texas. October 23, 2021

01/22 Imaging and Anatomy Course instructor. Spine Intervention Society (SIS). Baltimore, Maryland. January 29-30, 2022

03/22 Musculoskeletal Diseases: Sport Related Injuries of the Paediatric Musculoskeletal System. 52nd International Diagnostic Course (IDKD). Davos, Switzerland March 27 - 31, 2022.

04/22 Cervical Spine: Imaging and Anatomy. Spine Intervention Society (SIS) Phoenix, AZ. April 23-24, 2022.

04/22 Synthetic CT; Scientific Session: Imaging. SPARTAN 20th Annual Meeting. Madison, WI. April 29th, 2022

06/22 Intensive Anatomy. Spine Intervention Society (SIS). Biddeford, Maine. June 10-11, 2022.

08/22 Musculoskeletal CORE Lecture. New York Presbyterian. “Arthritis”. August 22, 2022.

09/22 MR Neurography: How to Implement in Clinical Practice. MR neurography-Techniques and Clinical Application. AOCR 2022 & KCR 2022 Annual Conference. Seoul, Korea. September 29, 2022.

10/22 Economics of Artificial Intelligence for Radiology. HSS 104 Annual Alumni Association Meeting. New York, NY. October 21, 2022.

10/22 Musculoskeletal Radiology. 3rd Annual University of Arizona College of Medicine-Phoenix Virtual Medical Student Radiology Symposium. Virtual. October 22, 2022.

11/22 Levin D, **Carrino JA**, Buly R, Christensen A, Ripley B. 3D Printing for Cardiac and Musculoskeletal Applications with Interactive Clinical Perspectives. RSNA 108th Scientific Assembly and Annual Meeting. Chicago, IL. November 28, 2022.

11/22 **Carrino JA**, Cotton A, Mandell JC, Omoumi P, Pfirrmann CWA. Spine Degeneration and Inflammation: Misses that Matter. RSNA 108th Scientific Assembly and Annual Meeting. Chicago, IL. November 29, 2022.

02/23 'What MRI Findings are Relevant?'. ASSR Annual Meeting. Charleston, SC. February 11, 2023.

02/23 Shi G, Quevedo Gonzalez FJ, Breighner RE, **Carrino JA**, Siewerdsen JH, Zbijewski W. Effects of non-stationary blur on texture biomarkers of bone using Ultra-High-Resolution CT. SPIE Medical Imaging Coference 2023. San Diego, California. February 19 - 23, 2023.

2. Grand Rounds

04/96 Department of Radiology Resident Conference, "Imaging of osseous and soft tissue Tumours (Lecturer)," Thomas Jefferson Hospital, Philadelphia, PA

09/97 University of Texas Health Science Center at San Antonio MRI Visiting Fellowship Curriculum, "MR Imaging of the Shoulder (Lecturer)," "Differential Diagnosis of Marrow Disease (Lecturer)," San Antonio, TX

11/97 University of Texas Health Science Center at San Antonio MRI Visiting Fellowship Curriculum, "MR Imaging of the Shoulder (Lecturer)," "Differential Diagnosis of Marrow Disease (Lecturer)," San Antonio, TX

02/98 University of Texas Health Science Center at San Antonio MRI Visiting Fellowship Curriculum, "MR Imaging of the Shoulder (Lecturer)," "Differential Diagnosis of Marrow Disease (Lecturer)," San Antonio, TX

08/99 Harvard Medical School, Imaging Physics Mini-Course Curriculum, Boston, MA

11/00 Department of Radiology, Christiana Hospital, "Arthritis Imaging (Lecturer)," Wilmington, DE

11/00 Department of Orthopedics at the Rothman Institute, Thomas Jefferson University Hospital, "Imaging of Degenerative disc disease and related syndromes (Lecturer)," Philadelphia, PA

03/01 Thomas Jefferson University Hospital, Department of Rheumatology Clinical Rounds, "Imaging of Degenerative Disc Disease and Related Syndromes (Lecturer)," Philadelphia, PA

09/01 Thomas Jefferson University Hospital, Department of Rheumatology Clinical Rounds, "Overview of Arthritis Imaging (Lecturer)," Philadelphia, PA

12/01 Thomas Jefferson University Hospital, Department of Radiology, "Spine Injections: Indications and Techniques (Lecturer)," Philadelphia, PA

12/01 Thomas Jefferson University Hospital, "Imaging Quality in the Electronic Environment (Lecturer)," Philadelphia, PA

01/02 Wilford Hall Medical Center, USAF, Department of Radiology, "Overview of Image Guided Spine Procedures: Indications and Techniques (Lecturer),"

	"MR Imaging of the Wrist: Normal Anatomy and Common Pathological Conditions (Lecturer)," San Antonio, TX
01/02	The University of Texas Health Science Center at San Antonio Musculoskeletal Imaging Curriculum, "MR Imaging of the Wrist, Overview," San Antonio, TX
03/02	Thomas Jefferson University Hospital Department of Rehabilitation Medicine, "Musculoskeletal Anatomy (Lecturer)," "Musculoskeletal Procedures (Lecturer)," Philadelphia, PA
03/02	Thomas Jefferson University Hospital, Department of Radiology, "The Use of Technology to Improve Workflow: The 7 habits of highly effective PACS (Lecturer)," Philadelphia, PA
05/02	Boston University Medical Center Department of Radiology, "Update on imaging of Degenerative Disc disease (Lecturer)," "MR Imaging of the shoulder labrum: Normal Anatomy, Variants and Pathology (Lecturer)," Boston, MA
04/03	Cape Cod Hospital Cancer Committee, "Percutaneous Image Guided Bone Augmentation Procedures (Lecturer)," Hyannis, MA
04/03	Boston Medical Center Musculoskeletal Imaging Curriculum, **"**Differential diagnosis of lower extremity MR imaging bone marrow edema patterns (Lecturer)," "Upper Extremity Trauma (Lecturer)," "Lower Extremity Trauma (Lecturer)," "Pelvis (Lecturer)," "Spine Pain: Beyond the usual suspects (Lecturer)," "Thoracolumbar Spine Trauma (Lecturer)," Boston, MA
06/03	Brigham Women's Hospital Orthopaedic Radiology, "Sacrum, SI Joints, Sacral Plexus" (Lecturer), "Imaging of the Post-Operative Spine" (Lecturer), "Low Back Pain and Radiculopathy" (Lecturer), Boston, MA\
07/03	Boston Medical Center Musculoskeletal Imaging Curriculum, **"**Differential diagnosis of lower extremity MR imaging bone marrow edema patterns (Lecturer)," "Upper Extremity Trauma (Lecturer)," "Lower Extremity Trauma (Lecturer)," "Pelvis (Lecturer)," "Spine Pain: Beyond the usual suspects (Lecturer)," "Thoracolumbar Spine Trauma (Lecturer)," Boston, MA
10/03	Boston Medical Center Musculoskeletal Imaging Curriculum, **"**Differential diagnosis of lower extremity MR imaging bone marrow edema patterns (Lecturer)," "Upper Extremity Trauma (Lecturer)," "Lower Extremity Trauma (Lecturer)," "Pelvis (Lecturer)," "Spine Pain: Beyond the usual suspects (Lecturer)," "Thoracolumbar Spine Trauma (Lecturer)," Boston, MA
12/03	Hospital of St. Raphael Department of Radiology, "Overview of Spine MR Imaging (Lecturer)," New Haven, CT
12/03	Yale New Haven Hospital Department of Radiology, "Musculoskeletal Radiology Frontiers: Interventional MRI (Lecturer)," New Haven, CT
09/04	Baystate Medical Center Grand Rounds, "Vertebral Compression Fracture Imaging (Lecturer)," "Musculoskeletal Interventional MRI (Lecturer)," Springfield, MA
06/05	Harvard Combined Orthopaedic Training Program, "New Horizons in Musculoskeletal Imaging (Lecturer)," Boston, MA
12/06	Johns Hopkins University Rheumatology Grand Rounds, "Advances in MRI for Rheumatology," Baltimore, MD
03/07	Georgetown University Radiology Grand Rounds, "New Musculoskeletal Imaging Techniques (Lecturer)," Washington, DC
11/07	Johns Hopkins University Computer Integrated Surgery Whiting School of Engineering, "Image Guided Therapy (Lecturer)," Baltimore, MD

06/08 E.F. Shaw Wilgis Lectureship in Hand Surgery, Union Memorial Hospital, "High Resolution MRI of the Wrist (Lecturer)," Baltimore, MD, June 21, 2008

12/08 University of Maryland School of Medicine Department of Diagnostic Radiology and Nuclear Medicine Grand Rounds, "3T Musculoskeletal Imaging (Lecturer)," December 17, 2008

03/11 Mallinckrodt Institute of Radiology, University of Washington Grand Rounds, "MR Neurography (Lecturer)," St. Louis, MO, March 2, 2011

03/11 Yale Radiology Centennial Anniversary Grand Rounds, "3T MRI of the Musculoskeletal System (Lecturer)," New Haven, CT, March 31, 2011

04/11 Hospital of Saint Raphael Grand Rounds, "MR Neurography (Lecturer)," New Haven, CT, April 1, 2011

09/12 Johns Hopkins Department of Physical Medicine and Rehabilitation Residency Program, "MSK Radiology with a Focus on Hip and Knee MRI (Lecturer)," Baltimore, MD

10/12 University of Basel Visiting Professor, "MR Neurography (Lecturer)," Basel, Switzerland, October 26, 2012

01/13 Baptist Health South Radiology Grand Rounds, "Magnetic Resonance Neurography (Lecturer)," Miami, FL, January 14, 2013

02/13 George Washington University Resident Rounds, "MR imaging of Rheumatic Conditions (Lecturer)," Washington, DC, February 20, 2013

05/13 Johns Hopkins Rheumatology Rounds Case Conference, Baltimore, MD

08/13 Baxter Regional Medical Center Radiology Grand Rounds "3T MRI (Lecturer)," Mountain Home, AR, August 10, 2013

06/14 Hospital for Special Surgery Metabolic Bone Disease Grand Rounds, "Advanced Computed Tomography Imaging for Bone Health (Lecturer)," New York, NY, June 9, 2014

06/15 Hospital for Special Surgery Metabolic Bone Disease Service Grand Rounds Lecture, "What Everyone Should Know About Osteoporosis and How it Affects our Patient Population (Lecturer)," New York, NY, June 12, 2015

12/15 Hospital for Special Surgery RCA: Spine InService, "Vertebral Enumeration Variability and Implications for Procedures and Surgeries (Lecturer)," New York, NY, December 10, 2015

12/15 Hospital for Special Surgery Spine Research Staff, "Spine Radiology Covering Various Modalities (Lecturer)," New York, NY, December 16, 2015

01/16 Hospital for Special Surgery Metabolic Bone Disease Journal Club (Lecturer), New York, NY, January 25, 2016

04/16 Hospital for Special Surgery Physiatry Grand Rounds, "Vertebral Enumeration Variability (Lecturer)," New York, NY, April 19, 2016

08/16 "Peripheral Nerve Imaging with MRI and US (Lecturer)," Butterworth Hospital, Grand Rapids, MI, August 5, 201

09/16 NYPH Resident Conference, "Metabolic Bone (Lecturer)," New York, NY, September 29, 2016

11/16 Brachial Plexus Conference, "Sharon Darko (Instructor)," Hospital for Special Surgery, New York, NY, November 16, 2016

04/17 BIDMC Grand Rounds, "Challenges and Opportunities for MSK Radiology to Prove Value in Alternative Payment Models (Lecturer)," Boston, MA, April 7, 2017

09/17 Neurology Grand Rounds, "Advanced Neuromuscular Imaging (Lecturer)," Hospital for Special Surgery, New York, NY, September 8, 2017

01/18 Rheumatology Fellows' Talk, "MRI Primer for Rheumatologists (Lecturer)," Hospital for Special Surgery, New York, NY, January 24, 2018

01/18 Copenhagen University, Bispebjerg and Frederiksberg Hospital, Department of Radiology, "MR Neurography – What a Musculoskeletal Radiologist Should Know (Lecturer)," Copenhagen, Denmark, January 31, 2018

02/18 NYPH Resident Conference, "Spine MRI (Lecturer)," New York, NY, February 27, 2018

10/20 Diagnosis and Intervention, MSK Radiology, Invited Lecture, Johns Hopkins. October 13, 2020.

02/22 Musculoskeletal Grand Rounds. Albert Einstein College of Medicine-Montefiore Medical Center, Jacobi Medical Center. New York, NY. February 8, 2022.

03/22 Rheumatology Grand Rounds, Hospital for Special Surgery. New York, NY. March 16, 2022.

07/22 Spine Grand Rounds. Hospital for Special Surgery. New York, NY. July 25, 2022.

08/22 Athlete Spine Multidisciplinary Journal Club. Hospital for Special Surgery. New York, NY. August 18, 2022.

08/22 Spine Grand Rounds. Hospital for Special Surgery. New York, NY. August 22, 2022.

09/22 Spine Grand Rounds. Hospital for Special Surgery. New York, NY. September 26, 2022.

10/22 Athletes Spine Grand Round. Hospital for Special Surgery. New York, NY. October 17, 2022.

10/22 Spine Grand Rounds. Hospital for Special Surgery. New York, NY. October 24, 2022.

L. PROFESSIONAL MEMBERSHIPS

Member/Officer/Fellow/Role	Organization	Dates
Member	American Medical Informatics Association (AMIA)	1987 – present
Member	American Roentgen Ray Society (ARRS) ARRS, Scientific Program Subcommittee,	1991 – present 2006 – 2007
Member	Radiological Society of North American (RSNA) RSNA Scientific Exhibit Committee RSNA RadLex Committee RSNA Research Study Review Section RSNA Template Library Advisory Panel (TLAP)	1991 – present 2004 – 2007 2005 – present 2006 – 2007 2014 – present
Member	Society for Computer Applications (SCAR)/ Society for Imaging Informatics in Medicine (SIIM) Research and Development Committee Board of Directors Scientific Symposium Committee	1992 – present 2001 – 2005 2002 – 2005 2002 – 2005

Member	American Society of Emergency Medicine (ASER)	1995 – 1998
Member	Society of Skeletal Radiology (SSR)	1996 – 2010
Member	International Spinal Intervention Society (ISIS) ISIS Instructor	1996 – present 2003 – present
Member President Secretary	International Society for Magnetic Resonance in Medicine (ISMRM) ISMRM Interventional MRI Study Group ISMRM Musculoskeletal Study Group	1996 – present 2003 – present 2004 – present 2005 – 2006 2006 – 2007
Member	American Society for Bone and Mineral Research (ASBMR)	1997 – 1999
Member	American College of Radiology (ACR) DICOM committee ITIC	1997 – present 1997 – present 2008 – present
Member	American Society of Musculoskeletal Radiology (ASMR)	1998 – 1999
Member	Association of University Radiologist (AUR)	2001 – present
Member	Society for Pain Practice Management Instructor	2002 – present 2006 – present
Member	American Society of Spine Radiology (ASSR)	2003 – present
Member	American Pain Society (APS) Low Back Pain Clinical Algorithm Committee	2005 – present
Member	North American Spine Society (NASS)	2010 – present
Member	Medical Image Perception Society	2013 – present
Member	European Society of Radiology	2014 – present
Member	Quantitative Imaging Biomarkers Association (QIBA)	2016 – present
Member	HANYS HIT Strategy Group	2017 – present
Fellow	American College of Radiology	2022 – present

M. HONORS AND AWARDS

Name of award	Date awarded
Phi Eta Sigma (Undergraduate Freshman Honor Society), George Washington University	1983
Alpha Epsilon Delta (Pre-Medical Honor Society), George Washington University	1985

Phi Beta Kappa (National Honor Society), George Washington University	1985
Omicron Delta Kappa (National Leadership Honor Society), George Washington University	1986
Alpha Omega Alpha (National Medical Honor Society), George Washington University	1989
Kane King Dodek Honor Society (Obstetrics - Gynecology), George Washington University	1990
Wilford Hall Medical Center Service Award (teaching, research, and evolution of a filmless department), USAF	1998
George Marina Teaching Award (Radiology Teacher of the Year), BWH Radiology Department, Harvard Medical School	1999
GE Radiology Research Academic Fellowship (GERRAF) Award (Career Development Grant), AUR/GE	2004
Distinguished Faculty Award (Educational Effectiveness), Society of Interventional Radiology	2005
Best Paper ("Does discography cause accelerated progression of degeneration changes in the lumbar disc: a ten-year matched cohort study"), The International Society for the Study of the Lumbar Spine (ISSLS)	2009
Eyler Editorial Fellowship Award (Radiology/Radiographics Journals), RSNA	2011
Baltimore Magazine Top Doctors	2010
Certificate of Merit, Education Exhibit, "High Resolution Magnetic Resonance Imaging of the Patellar Retinaculum: Normal anatomy, common injury patterns and pathologies" ECR (European Congress of Radiology)	2011
Cum Laude Electronic Poster Award ("MR neurography-guided injection procedures for the diagnosis and treatment of pelvic pain syndromes"), CIRSE (Cardiovascular and Interventional Radiological Society of Europe)	2012
Certificate of Merit, Education Exhibit ("Spectrum of Superficial Nerve Related Tumor and Tumor-like Lesions - MR Imaging Features"), 98th Scientific Assembly and Annual Meeting of the Radiological Society of North America	2012
Patent, Siewerdsen JH, Muhit A, Carrino JA. Integration of Calibration and Imaging for Quantitative CT. Report of Invention, Johns Hopkins University (C11925)	2012
RSNA Honored Educator Award, Radiological Society of North America	2013
Arthroscopy Association of North America/Patellofemoral Foundation 2014 Patellofemoral Surgical Anatomy Excellence Award. "Correlation between Changes in Tibial Tuberosity—Trochlear Groove Distance and Patellar Position during Active Knee Extension on Dynamic Kinematic Computed Tomography Imaging." Tanaka MJ, Elias JJ, Williams AA, Carrino JA, Cosgarea AJ.	2014

RSNA Honored Educator Award, Radiological Society of North America	2015
Outstanding oral presentation, "Does provocative discography cause clinically important injury to the lumbar intervertebral disc? A ten-year matched cohort study", International Society for the Study of the Lumbar Spine, ISSLS Annual Meeting, San Francisco, CA	2015
"Best Doctors in America 2015-2016 Database", Best Doctors	2015
"Certificate of Merit" for *3D CT Analysis of the Femoral Head and Acetabulum in Hip Impingement Syndromes: What the Surgeon Wants to Know*, 101st Scientific Assembly and Annual Meeting of the Radiological Society of North America, November 29-December 4, 2015, McCormick Place, Chicago, Illinois	2015
"Top Doctors," Castle Connolly	2016
Minnie Award: Best New Radiology Device *Onsight 3D extremity imaging CT scanner, Carestream Health*	2016
AUR Trainee Prize, 2nd Place for Scientific Paper, 2016	2016
Moses Greenfield Award for Best Paper, "Cascaded systems analysis of photon counting detectors," Medical Physics, 41, 101907 (2014), June 2016	2016
Certificate of Merit, "Myositis, Myopathy, and More: Advanced MRI Techniques for Muscle Imaging,"*103rd Scientific Assembly and Annual Meeting of the Radiological Society of North America*	2017
HIMSS, Stage 7 Institution, Radiology IT Director	2017
"Top Doctors," Castle Connolly	2017
Best Paper Award, "Dos Lumbar Spine Pathology Affect Bone Mineral Density Measurement by Quantitative Computed Tomography (QCT)?" *11th Annual Meeting of the Lumbar Spine Research Society*, April 2018	2018
"Top Doctors," Castle Connolly	2018
"Top Doctors," Castle Connolly	2019
"Top Doctors," Castle Connolly	2020
RSNA Trainee Research Prize (Musculoskeletal Category) for "Evaluation of Deep-Learning Reconstructed High-Resolution 3D Lumbar Spine MRI to Improve Image Quality"	2021
Charles Christian Award for Excellence in Musculoskeletal Research for "Evaluation of Deep-Learning Reconstructed High-Resolution 3D Lumbar Spine MRI to Improve Image Quality" at HSS Clinical Fellow Research Day	2021
"Top Doctors" New York Metro Area, Castle Connolly	2021
New York Magazine: Top Doctors	2021
Fellowship, American College of Radiology (FACR)	2022

"Top Doctors" New York Metro Area, Castle Connolly	2022
New York Magazine: Top Doctors	2022
"Top Doctors," Castle Connolly	2023

N. BIBLIOGRAPHY

Articles in professional peer-reviewed journals

1. **Carrino JA**, McCauley TR, Katz LD, Smith RC, Lange RC. Rotator Cuff: Evaluation with Fast Spin-Echo versus Conventional Spin-Echo Magnetic Resonance Imaging. *Radiology* 1997; 202: 533-539.
2. Brenner ML, Morrison WB, **Carrino JA**, Nusser CA, Howard RF, Meier PA. Direct MR Arthrography of the Shoulder: Is Exercise Prior to Imaging Beneficial or Detrimental? *Radiology* 2000 May; 215(2): 491-496.
3. **Carrino JA**, Khorasani R, Hanlon WB, Seltzer SE. Modality interfacing: the impact of a relay station. *Journal of Digital Imaging* 2000 May;13(2 Suppl 1):88-92.
4. **Carrino JA**, Mitchell DB, Chananni VP, Choi-Chinn KA, Deberardino T., Miller, MD. Pectoralis Major Muscle and Tendon Tears: Diagnosis and Grading using Magnetic Resonance Imaging. *Skeletal Radiology* 2000 Jun; 29(6): 305-13
5. **Carrino JA**, Morrison WB, Zou KH, Steffen RT, Snearly WN, Murray PM. Lateral ulnar collateral ligament of the elbow: optimization of evaluation with two-dimensional MR imaging. *Radiology* 2001 Jan; 218:118–125.
6. Morrison WB, **Carrino JA,** Schweitzer ME, Sanders TG, Raiken DP, Johnson CE. Subtendinous Bone Marrow edema Patterns on MR Images of the Ankle: Association with Symptoms and Tendinopathy. *American Journal of Roentgenology* 2001 May;176(5):1149-54.
7. **Carrino JA**, Morrison WB, Zou KH, Steffen RT, Snearly WN, Murray PM. Non-Contrast MR Imaging and MR Arthrography of the Ulnar Collateral Ligament of the Elbow: Prospective Evaluation of 2-D Pulse Sequences of Detection of Complete Tears. *Skeletal Radiology 2001; 30: 625-632.*
8. Zou KH, **Carrino JA.** A Comparison of the Accuracy and Interreader Agreement in Side-by-Side versus Independent Evaluations of MR Imaging of the Medial Collateral Ligament of the Elbow. *Academic Radiology 2002; 9:520-525.*
9. Vaccaro AR, Venger BH, Kelleher PM, Singh K, **Carrino JA**, Albert T, Hilibrand A. Use of a bioabsorbable anterior cervical plate in the treatment of cervical degenerative and traumatic disk disruption. *Orthopedics. 2002 Oct;25(10 Suppl):s1191-1199; discussion s1199.*
10. Wagner SC, Morrison WB, **Carrino JA,** Schweitzer ME, Nothnagel H. Effect of PACS on Reporting of Incidental Findings. *Radiology. 2002 Nov;225(2):500-505.*
11. Vaccaro AR, **Carrino JA**, Venger BH, Albert T, Kelleher PM, Hilibrand A, Singh K. Use of a bioabsorbable anterior cervical plate in the treatment of cervical degenerative and traumatic disc disruption. *J Neurosurg. 2002 Nov;97(4 Suppl):473-480.*
12. **Carrino JA**, Morrison WB, Parker L, Schweitzer ME, Levin DC. Spinal Injection Procedures: Utilization, Provider Distribution and Reimbursement in United States Medicare Population from 1993 to 1999. *Radiology. 2002 Dec;225(3).*
13. Reiner BI, Siegel EL, **Carrino JA,** McElveny C. SCAR Radiologic Technologist Survey: analysis of technologist workforce and staffing. *J Digit Imaging 2002* Sep;15(3):121-31.
14. Reiner BI, Siegel EL, **Carrino JA,** Goldburgh MM. SCAR Radiologic Technologist Survey:

analysis of the impact of digital technologies on productivity. *J Digit Imaging 2002* Sep;15(3):132-40.

15. Reiner BI, Siegel EL, **Carrino JA.** Workflow optimization: Current Trends and Future Directions. *Journal of Digital Imaging 2002* Sep;15(3):141-52.
16. Shi H. Schweitzer ME, **Carrino JA,** Parker L. MR Imaging of the lumbar spine: relation of posterior soft tissue edema like signal and body weight. *American Journal of Roentgenolog.* 2003 Jan;180(1):81-86.
17. Solomon DH, Katz JN, **Carrino JA**, Schaffer JL, Bohn RL, Mogun H, Avorn J. Trends in Knee Magnetic Resonance Imaging. *Medical Care* 2003 May; 41(5):687-692.
18. Ledermann HP, Schweitzer ME, Morrison WB, **Carrino JA.** MR Imaging Findings in Spinal Infections: Rules or Myths? *Radiology* 2003; 228(2):506-514.
19. Costa CR, Morrison WB, **Carrino JA**, Raiken SM. MRI of an intratendinous ganglion cyst of the peroneus brevis tendon. *American Journal of Roentgenology*. 2003 Sep;181(3):890-891.
20. Costa CR, Morrison WB, **Carrino JA.** MR imaging of the Intersection Syndrome. *American Journal of Roentgenology.* 2003 Nov;181(5):1245-1249.
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    Radiology 2005 Nov;237(2):590-596.
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