

CURRICULUM VITAE

MICHAEL A. BRUNO, M.D., M.S., F.A.C.R.

Professor of Radiology and Medicine
Vice Chair for Quality and Safety
Chief, Division of Emergency Radiology
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PERSONAL DATA

Date of Birth: November 15, 1960

Place of Birth: Walnut Creek, California

Marital Status: Married – 31 years.

EDUCATION

Undergraduate The Johns Hopkins University
Baltimore, Maryland
A.B., Biology, 1982

Graduate Studies Graduate School of Biological Sciences
University of California, Irvine
Irvine, California
M.S., Physiology and Biophysics, 1987

Medical School: University of California, Irvine
California College of Medicine
Irvine, California
M.D., 1987

Executive Education: “Leading Transformation for Value-Based Healthcare”
Certificate Program of Johns Hopkins University Inter-professional
Executive Education, co-sponsored by The Johns Hopkins School of
Medicine, The Johns Hopkins Bloomberg School of Public Health,
and The Johns Hopkins Cary Business School, Baltimore, Maryland,
January – June, 2015

INTERNSHIP

Internal Medicine (Preliminary)
Saint Mary Medical Center (UCLA Affiliated Program)
Long Beach, California
June 24, 1987 to June 23, 1988

RESIDENCY

Diagnostic Radiology
University of California, Irvine Medical Center
and Affiliated Hospitals, Orange, California
July 1988 to July 1992

**FELLOWSHIP
TRAINING**

Clinical Fellowship in Nuclear Medicine
Vanderbilt University Medical Center
September to December, 1996

**ABMS
CERTIFICATION**

Diplomate, American Board of Radiology, June 4, 1992
Board Certified in Diagnostic Radiology
Special Competence in Nuclear Radiology, November 3, 1997
(Lifetime certifications – Also enrolled and current for M.O.C.)

**MEDICAL
LICENSURE**

Pennsylvania Medical License
License Number: MD-052865-L

North Carolina Medical License
License Number: 35286

Arizona Medical License
License Number: 31272 (inactive status)

California Physicians and Surgeons Certificate
License Number: G-063632 (retired status)

Tennessee Medical License
License Number: MD-028261 (retired status)

OCCUPATIONAL RECORD

July, 2015 – present

Professor of Radiology & Medicine
Vice Chair for Quality & Patient Safety
Chief, Division of Emergency Radiology
Penn State University College of Medicine
The Milton S. Hershey Medical Center, Hershey, PA

July, 2010 – June, 2015

Professor of Radiology & Medicine
Nuclear Medicine and Molecular Imaging
Director of Radiology Quality and Patient Safety
Penn State University College of Medicine
The Milton S. Hershey Medical Center, Hershey, PA

- July 2005 – June 2010** Associate Professor of Radiology and Medicine
Musculoskeletal and Emergency Radiology
Director of Radiology Quality and Patient Safety
Pennsylvania State University College of Medicine
The Milton S. Hershey Medical Center, Hershey, PA
- March 2003 – June 2005** Chairman, Department of Radiology
Maricopa Medical Center & Maricopa Integrated Health System
(Affiliated with the University of Arizona School of Medicine)
Chairman, Department of Radiology
Phoenix Memorial Hospital, Phoenix, AZ
Chairman, Division of Radiology
Medical Professional Associates of Arizona, Phoenix, AZ
- July 1999 – March 2003** Assistant Professor of Radiology and Orthopedics
Musculoskeletal and Emergency Radiology
Pennsylvania State University College of Medicine
The Milton S. Hershey Medical Center, Hershey, PA
Program Director, Musculoskeletal Radiology Fellowship Program
Section Chief, Lebanon VA Faculty Practice, Dept. of Radiology
- July 1996 – July 1999** Assistant Professor of Radiology and Emergency Medicine
Clinical Director of Emergency & Outpatient Radiology
Department of Radiology & Radiological Sciences
Vanderbilt University School of Medicine, Nashville, Tennessee
Vanderbilt University Medical Center and Clinic, Nashville, TN
- July 1994 - July 1996** Staff Radiologist (Private Multispecialty Group Practice)
General Medical Services Corporation
Wilkes-Barre General Hospital
Wilkes-Barre, Pennsylvania
- July 1992 – July 1994** Staff Radiologist (Private Single-specialty Group Practice)
Burlington Radiological Associates
Alamance Regional Medical Center
Burlington, North Carolina

HONORS & AWARDS

American College of Radiology

Awarded ACR Fellowship, April, 2012

Penn State University

Provost's Award for Outstanding Contributions to Continuous Improvement and Innovation,
February, 2013

American Board of Radiology

Distinguished Service Awards, March, 2010 and April, 2015

Association of University Radiologists:

Picker/AUR Faculty Development Program Scholarship, 1998

Vanderbilt University School of Medicine:

Department of Radiology and Radiological Sciences nominee for
Vice Chancellor's Faculty Scholar Award, 1996-97 and 1997-98

University of California, Irvine (Residency):

"Resident of the Year" Award for Outstanding Medical Student Teaching, 1991
Departmental Award for Outstanding Service & Resident Teaching, 1992

University of California, Irvine (Medical School):

Lange Book Award for Excellence in Clinical Disciplines, 1986
UC Regents' Fellowship (overall academic excellence), 1982 and 1983

The Johns Hopkins University:

Stephen Don Award for Achievement in Science Writing, 1982
Dean's List Honors, 1980, 1981, and 1982
Alpha Epsilon Delta Honor Society, 1981

MEMBERSHIP IN PROFESSIONAL SOCIETIES

American College of Radiology, 1992 – present; elected to fellowship April, 2012
American Roentgen Ray Society, 1998 – present
Radiological Society of North America, 1992 – present
Senior (Full) Member, Society of Skeletal Radiology, 1996 – present
Society to Improve Diagnosis in Medicine, 2014 – present
American Society of Emergency Radiology, 2015 – present
Pennsylvania Medical Society, 2009 – present
Pennsylvania Radiological Society (ACR Chapter), 1999 – 2003; 2005 – present

SERVICE

I. Service to The University and The Medical Center

1. Penn State University and the Milton S. Hershey Medical Center

Penn State College of Medicine Fixed Term Promotion Committee; 2017-20
Penn State Hershey College of Medicine Awards & Recognition Council, 2018 - 2022
Penn State University Faculty Senator, elected 2015 (4 year term)
Member, Senate Committee for Faculty Affairs
Member, Senate Subcommittee for Faculty Development
*Coauthored Senate Committee Report on fixed-term faculty rank and title structure for use
across the entire Penn State University System, 2016*
Coauthored Senate Committee Report on Promotion of Fixed-term faculty, 2015
Coauthored Senate Committee Report on Fixed-term Faculty Promotion Procedures, 2017

Penn State Hershey Medical Center Clinical Indicators Committee, 2016 – present
 Hershey Medical Center Quality Executive Committee, 2015 – present
 Faculty, Health Systems Science Academy, Penn State Hershey, 2016 – present
 On-Boarding Mentor for Dr. Carissa White, Musculoskeletal Faculty Member, 2019
 On-Boarding Mentor for Dr. Alex Mamourian, Neuroradiology Faculty Member, 2018
 On-Boarding Mentor for Dr. Jay Agarwal, Neuroradiology Faculty Member, 2018
 On-Boarding Mentor for Dr. Esther Choi, Nuclear Medicine Faculty Member, 2017
 On-Boarding Mentor for Dr. Marco Huesch, Radiology Vice Chair for Research, 2016
 Member, Search Committee for Radiology Vice Chair for Research, Fall, 2015
 Hershey Medical Center Clinical Effectiveness Committee, 2014 – present
 Hershey Medical Center Performance Improvement Committee, 2013 – present
 Team Leader, Radiology Department “Failsafe” Initiative, 2012 – present
 Radiology Department Administrative Team Member, 2011 – present
 Radiology Department MRI Safety Committee, 2012 – present
 Radiology Residency Program Education Committee, 2008 – present
 Radiology Dept. Liaison to PSCOM Faculty Development & Mentoring, 2010 – present
 Hershey Medical Center Quality Physician Leaders’ (QPL) Group, 2010 – 2014
 Hershey Medical Center National Patient Safety Goals Team, 2007 – 2009
 Hershey Medical Center Clinical Improvement Committee, 2005 – 2013
 Chairman, Quality and Safety Committee, Dept. of Radiology, 2005 – present
 Hershey Medical Center CLUE Committee, 2005 – 2008
 Penn State College of Medicine Admissions Interviewer, 1999 – 2003, 2005 – present
 Hershey Medical Center Infection Control Committee 2001 – 2004
 Chief of Service for Radiology, Lebanon VA Medical Center (Contract), 1999 – 2003

2. *Maricopa Medical Center, Phoenix AZ (Affil. with The University of Arizona)*

Chairman, Department of Radiology, 2003 – 2005
 Chairman, Radiation Safety Committee, 2003 – 2005
 Radiation Safety Officer, Maricopa Medical Center, 2003 – 2005
 Chairman, Anesthesiology Chair Search Committee, 2004 – 2005
 Member, Medical Staff Executive Council, 2003 – 2005
 Member, Maricopa Medical Staff CME Committee, 2004 – 2005

3. *Phoenix Memorial Hospital*

Chairman, Department of Radiology, 2004 – 2005
 Chairman, Radiation Safety Committee, 2004 – 2005
 Member, Medical Staff Executive Committee, 2004 – 2005
 Radiation Safety Officer, Phoenix Memorial Hospital, 2004 – 2005

4. *Vanderbilt University Medical Center and Vanderbilt School of Medicine*

Radiology Strategic Long-Range Planning Committee, 1998 – 1999
 Radiology Research Task Force, 1998 – 1999
 Member, Committee for Clinical Quality Assurance, 1997 – 1999
 School of Medicine Student Promotions and Honors Committee, 1998 – 1999
 School of Medicine Faculty Curriculum Advisor, 1997 – 1999

5. *University California, Irvine, California College of Medicine*

Chair, Medical Scientist Students' Committee (MD/PhD and MD/MS Students), 1984 – 1985
Member, Graduate Council of the UC Irvine Campus-Wide Academic Senate, 1984 – 1986

6. *The Johns Hopkins University:*

Editor, "Sourcebook for the Premedical Student at The Johns Hopkins University," 3rd ed.,
© 1982. Published by the JHU Office of Advising and Counseling from 1982 to 1986

II. Service to Professional Societies and to the Profession

1. American College of Radiology (ACR)

ACR Councilor, representing the American Roentgen Ray Society, 2016 - 2020

Vice Chairman, Committee on Quality & Safety of the ACR General, Emergency, Small
and/or Rural practice (GSER) Commission, 2018 – 2020

Member, RadPeer Committee, 2019 - 2021

Chair, Emergency Radiology Committee of the ACR General, Emergency, Small and/or Rural
practice (GSER) Commission, 2016 – 2018

The Emergency Radiology committee represents the interests of all radiologists practicing in the Emergency Setting, and is charged with the development of Relevant ACR Policy, National Practice Standards and Guidelines in Emergency Radiology, as well outreach and liaison to professional societies in Emergency Medicine (ACEP) and Emergency Radiology (ASER), including providing leadership to the CMS-funded Transforming Clinical Practice Initiative (TCPI), a collaboration between ACR and ACEP focused on improving the appropriateness of imaging utilization in the emergency setting. During my term as Chair I oversaw the revision/update of the ACR Practice Parameter for Radiologist Coverage of Imaging Performed in Hospital Emergency Departments, which was formally adopted at the 2018 ACR Council Meeting, as Resolution No. 37. Also was liaison to the American College of Emergency Physicians (ACEP) in revising their imaging policies.

Member, General Radiology Improvement Database (GRID) Committee, 2018 - 2022

Member, ACR Commission on General, Small, Emergency and/or Rural Practice, 2016 - 2020

Member, Outreach Committee of the ACR Patient and Family-Centered Care (PFCC)

Commission, 2016 – 2018

Member, Committee on Education of the ACR Patient and Family-Centered Care (PFCC)
Commission, 2015 – 2019

This ACR commission focuses on development of tools, metrics, policies and national practice guidelines that can enhance the quality of experience of patients and their families with diagnostic and interventional radiology services

Chair, ACR/ACEP Committee on Communication of Critical Radiology Findings, 2016

Member, ACR Advisory Group Task force on Artificial Intelligence (AI), 2017 - 2019

Member, ACR Expert Panel on Musculoskeletal Imaging, 2009 – 2014

This ACR Panel creates, reviews and updates ACR Appropriateness Criteria (MSK)

Member, ACR Commission on Nuclear Medicine and Molecular Imaging Collaborative
Committee for Revision of Parathyroid Scintigraphy Guidelines, 2013 – 2014

2. *American Board of Radiology (ABR)*

Chair, Core Examination Quality & Safety Exam Development Committee, 2013 – 2015
Chaired a committee of 9 radiologists across all subspecialties charged with producing all of the quality & safety item (question) content for the ABR “Core” examination leading to ABR-ABMS Certification in Diagnostic Radiology. Also revised the ABR Core Exam “Blueprint” and co-authored the 40-page core exam study guide (revised in 2015).

Member, Core Examination Musculoskeletal Exam Development Committee, 2009 – 2014
Committee produces item content for the musculoskeletal section of the ABR Core examination in Diagnostic Radiology

Member, ABR Core Exam Assembly Team, 2008 – 2015

Member, ABR Written Exam Assembly team, 2005 – 2006 and 2014

ABR Oral Board Examiner, Musculoskeletal Section, 2002 – 2013

ABR Written Examination Item Writer, Musculoskeletal Section, 2003 – 2009

3. *American Roentgen Ray Society (ARRS)*

Member, ARRS Programs Committee, 2019 – 2023 (Liaison to e-Learning Committee)

Member, ARRS e-Learning Committee, 2011 – 2023 (Liaison to Programs Committee)

Member, ARRS Goldminer *Ad-Hoc* Advisory Committee, 2008 – 2013

Member, ARRS Outcomes and Quality Improvement Subcommittee, 2011 – 2018

Chairman, ARRS “PQI Connect” Website Project Task Force, 2008 – 2011

Member, ARRS Scientific Program Subcommittee, 2006 – 2009

Chairman, ARRS Scientific Program MSK Subspecialty Section, 2008 – 2009

Member, ARRS Research Committee, 2000 – 2005

Member, ARRS Educational Evaluation Subcommittee, 1999 – 2002

Member, ARRS Scientific Exhibits Committee, 1998 – 2001

ARRS Liaison to ACR (ARRS-ACR Councilor), 2016 – 2020

ARRS Liaison *ex-officio* to the Society to Improve Diagnosis in Medicine, 2015 (ongoing)

4. *Pennsylvania Radiological Society (PRS):*

Member, PRS Commission on the Science of Radiology, 2000 – 2003

Member, PRS Committee on Diagnostic Radiology, 2000 – 2003

5. *Society of Skeletal Radiology (SSR):*

Member, Society of Skeletal Radiology Research Committee (2005-2009)

Member, Musculoskeletal Ultrasound Research Group (2006 – 2010)

6. *Radiological Society of North America (RSNA):*

Member, RSNA Policy & Practice Program Subcommittee, 2009 – 2014

Member, Education Exhibits Committee, 2010 – 2015

Member, Distinguished Roster of Scientific Advisors, RSNA Research
And Education Foundation, 1999 – 2008 (*Reviewed research grant applications to the RSNA’s R&E Foundation and advised on foundation research priorities*)

7. *Society to Improve Diagnosis in Medicine (SIDM)*

Member, Research Committee, 2014 – present

Member, Practice Improvement Committee, 2015 – present

Liaison *ex-officio* to the American College of Radiology and the American Roentgen Ray Societies, since 2015 (ongoing)

III. Community Service

Member, Board of Directors, *High Hopes for Haiti* Charitable Foundation, Hershey, PA.

Term: December 2018 – December, 2021

TEACHING

I. New / Innovative Courses, Curricula and New Educational Programs Developed

1. Penn State Milton S. Hershey Medical Center and College of Medicine:

Co-Developed Penn State Resident/Fellow Health Systems Core-Education Curriculum on Value-Based Care (sessions 1A and 1B) and Population Health (Sessions 2A and 2B) along with Drs. April Armstrong, Jed Gonzalo, Barbara Ostrov, Tim Riley, Ryan Munyon and Heide Wolf, Penn State Graduate Medical Education Department, 2017-18

Co-Developed/Co-presented (along with Dr. Christopher DeFlicht) a unit on Technology Quality Improvement and Innovation in Health Systems Science for Penn State Health Systems Science Academy, 2016-18

Co-Developed / Co-presented (along with Dr. L. Scott Winner) an ongoing 2-year, 24-lecture curriculum entitled “The Business of Radiology.” First cycle completed July 2008 – June 2010; a seventh 2-year cycle is currently in-progress (along with Dr. Frank Luke).

Developed / Co-presented (along with Dr. Jonelle Thomas) an ongoing, annual workshop on improving written report-writing for radiology residents. Presented annually since 2007; most recently presented on October 26, 2017.

Co-developed / Co-presented (along with Dr. Alison Chetlen) a 2-session “verbal report clarity workshop” presented to Radiology and Emergency Department residents, 2016-18.

Department of Radiology Musculoskeletal Radiology Fellowship Program:

Created a new Musculoskeletal Radiology Fellowship Program at PSHMC, including curriculum development, implementation, securing funding, and recruitment of the first two fellows for the program, beginning in July, 2002. This program currently trains up to two fellows per year. Served as initial Program Director, from 2001 – 2003

Radiology “Acting Internship” Course Director, Penn State College of Medicine, 1999 – 2003. Developed and supervised a College of Medicine 4th Year Elective in Radiology

2. *Vanderbilt University School of Medicine:*

- A. Developed new, innovative and intensive 2nd-year medical student course entitled “Radiology/Pathology Correlation,” combining the existing required “Introduction to Radiology,” with the existing Pathology lecture & laboratory 2nd year required course for one semester of combined instruction. Radiological correlation to organ-systems based pathology curriculum was given in lecture and laboratory/small-group discussion format. Developed radiology content, including a new and rigorous essay-based examination 1998 – 1999.
- B. As course director for the required “Introduction to Radiology” 2nd-year medical student course, I reorganized lecture format into organ-systems approach and instituted small group lab / discussions. Developed new examination format & content, 1997-1998 academic year.
- C. Created a new Musculoskeletal Radiology Subspecialty Fellowship Program at VUMC, including curriculum development, implementation and extensive preparations for ACGME Accreditation of the new program. Served as Fellowship Program Director 1998 – 1999.
- D. Faculty lead for Emergency Imaging in the VUMS-IV Emergency Department Required Clerkship, 1996 – 1999; created new lecture-based curriculum for imaging within an existing medical student course including evaluation materials, and delivered all-new content.

3. *Maricopa Medical Center, Phoenix Arizona:*

As Radiology Department Chairman, I instituted a new residency program in Diagnostic Radiology and obtained its initial ACGME accreditation. This was a multi-year project, which included: (1) recruitment of five subspecialist academic faculty members in Chest Radiology, Neuroradiology, GI/GU Radiology, Abdominal Imaging and Nuclear Radiology as well as an academically-qualified program director, (2) leadership and oversight for the development of the entire residency curriculum along with the PD, (3) developing ongoing funding streams for resident and program support, and (4) directly supervising the process of obtaining ACGME accreditation at a time when the ACGME was actively reducing the number and size of existing radiology residency programs. The inaugural group of 4 residents was recruited in July 2004. The program received a full ACGME accreditation that same year, and has maintained full accreditation since that time. All graduates to date have all achieved ABR Certification and several have entered academic radiology.

II. Invited Speaking Engagements

1. *National, Regional and state-level academic & professional meetings (20):*

The Radiological Society of North America (RSNA) Annual Meeting, presentation entitled: “*How to Teach Yourself to be a Quality & Safety Expert*” Chicago, IL, November 27, 2018

The Society to Improve Diagnosis in Medicine 11th Annual International Conference. Presentation entitled: “*How did I not see that? Impact of Work Environment on Perception Errors in Radiology*” (Along with Drs. Timothy Mosher and Elizabeth Krupinksi) New Orleans, LA, November 6, 2018

The American College of Radiology (ACR) Annual Conference on Quality & Safety. Two presentations: “*Tips for Succeeding as a Quality Chief*,” (along with Dr. Neville Irani) and “*Disclosing errors to patients and referrers - are we ready?*” (Along with Dr. Stephen Brown) Boston, MA, October 26-28, 2018

The American Society of Emergency Radiology (ASER) 30th Anniversary Annual Scientific Meeting and Postgraduate Course in Emergency and Trauma Radiology. Plenary Speaker, Founder’s Session. Presentation entitled: “*Our Errors and How We Deal with Them*.” McLean Virginia, September 27, 2018

The American College of Radiology 2018 Annual Meeting CME Session: “Current Challenges in Emergency Radiology.” Presentation entitled: “*Quality & Safety in Emergency Radiology*.” May 21, 2018

The Pennsylvania Patient Safety Summit (P₂S₂) of the Pennsylvania Patient Safety Authority. Presentation Entitled “*Diagnostic Error*” (along with Dr. Timothy J. Mosher) State College, PA, April 5, 2018

The Radiological Society of America (RSNA) Annual Meeting, Presented two CME / SAM sessions: (1) *24 Hour Attending Coverage: Has the Time Come?* (Along with Drs. Hani H. Abujudeh, J. Mezrich and H. Foreman) and (2) *Training in Process Quality Improvement: Just do it!* (Presented along with Dr. K. Applegate). Chicago, IL, November 27 – December 1, 2017.

ACR Annual Quality and Safety Conference 2017. Presented two CME / SAM sessions: (1) *How to Start a Quality Improvement Program from Scratch*, presented along with Dr. Neville Irani, and (2) *The Challenges Associated with Adding and Changing Radiology Reports*, given in the plenary session. October 13-14, 2017, Boston, MA.

ACR Annual Meeting CME Session: *Sealing the Cracks: Monitoring Patients Who Need Follow-up Based on Radiology Examinations*. Presentation entitled “Penn State Radiology’s Failsafe Program, Version 4.0.” Presented at the ACR2017 Annual Meeting in Washington, DC, May 21, 2017

Society of Nuclear Medicine & Molecular Imaging 30th Annual Northeast Regional Scientific Meeting. Lecture title: “Quality and Safety in Nuclear Medicine.” Stamford, CT, November 4, 2016.

Pennsylvania Radiological Society – Invited Plenary-Session Address at the 101st Annual Meeting, Philadelphia, PA. Lecture title: “256 Shades of Gray: Error and Uncertainty in Radiology.” September 17, 2016

American College of Radiology 2016 Annual Meeting, Washington, DC, May 16 and May 19, 2016. Radiology Quality Officer Series. Lecture titles: “Basics of an Effective Patient Safety Program in Radiology” (May 16) and “Developing a Culture of Safety” (May 19)

Pennsylvania Radiological Society – Plenary-Session Address at the 100th Annual Meeting, Philadelphia, PA, October 3, 2015. Lecture title: “Communication, Failsafe and the Challenge of Patient Engagement for Radiology”

American Roentgen Ray Society – Invited Keynote Address
115th Annual Meeting Scientific Session, Toronto, ON, Canada April 10, 2015
Lecture title: “The Quality & Safety Toolkit for Nuclear Medicine and Radiology”

Association of University Radiologists (AUR) Invited Speaker; program entitled “Romancing the Milestones: Essentials of Radiology Quality & Safety: What Your Residents Need to Know.” Co-Presented with Dr. Hani Abujdeh on April 14, 2015 to the Society of Academic Program Directors in Radiology (APDR) at the 63rd Annual Meeting of the Association of University Radiologists, New Orleans, Louisiana.

American Roentgen Ray Society – Invited Keynote Address
111th Annual Meeting Scientific Session, Chicago, IL May 4, 2011
Lecture Title: "A Failsafe Strategy to Enhance Communication and Patient Follow-up"

American Roentgen Ray Society – Invited Keynote Address
110th Annual Meeting Scientific Session, San Diego, CA May 5, 2010
Lecture Title: “Radiation Safety and the Modern Emergency Department”

Philadelphia Roentgen Ray Society 2009 – 2010 Academic Session Invited Speaker
Title: “Basics of Quality Improvement in Radiology” Presented October 1, 2009 at The Philadelphia College of Physicians, Philadelphia PA

American Roentgen Ray Society – Invited Keynote Address
108th Annual Meeting Scientific Session, Washington, DC, April 14, 2008
“Patient Safety in Emergency Radiology”

American Roentgen Ray Society – Invited Keynote Address
101st Annual Meeting Scientific Session, Seattle Washington, May 3, 2001
“Imaging the Spine: Issues and Challenges for the 21st Century”

2. *Visiting Professorships (16):*

Emory University Visiting Professor & Distinguished Scholar, Atlanta, GA October 9-10, 2018
University of Vermont Medical Center, Burlington, VT, September 28, 2018
Uniformed Services Health Education Consortium, San Antonio, TX April 16-17, 2018
Cleveland Clinic Imaging Institute, Cleveland, OH, August 24 – 25, 2016
The Johns Hopkins Hospital, Dept. of Radiology, Baltimore, MD, June 15, 2015
University Hospitals / Case Western Reserve, Cleveland, OH, October 28, 2014
The Johns Hopkins Hospital, Quality Fellows Program of the Johns Hopkins Armstrong Institute for Patient Safety and Quality, Baltimore, MD., January 30, 2014
The University of New Mexico Dept. of Radiology, Albuquerque, NM, May, 2013
The University of Kansas Radiology Residency Program, Wichita, KS, August, 2011
The Massachusetts General Hospital, Boston, MA, August 21 – 22, 2008
St. Joseph’s Hospital and Medical Center, Phoenix, AZ, May 2004
University of North Carolina, Chapel Hill, NC, February 8-9, 1999
University of Pittsburgh Medical Center, Pittsburgh, PA, June 22, 2000
University of Arizona Dept. of Radiology, Tucson, AZ, November 11 – 13, 1998
University of Leeds, Leeds UK, Rheumatology Division, Leeds Infirmary, October 6 – 9, 1998
University of Utah Dept. of Radiology, Salt Lake City, UT, May 16-16, 1998

Topics Presented: Quality and Safety in Radiology; Understanding and Management of Radiologists' Mistakes in practice; Diagnostic Error and Uncertainty, Improving the Quality of Radiologists' Written and Verbal Communications; Clinical Decision Support to Improve Imaging Utilization; Advanced Imaging of Inflammatory Arthritis; Musculoskeletal Ultrasound; also presented unknown case conferences for radiology residents and Fellows

3. *Grand Rounds Presentations (10)*

Emory University Distinguished Scholar Grand Rounds, Atlanta GA, scheduled for October 10, 2018. Title: "Dealing with Our Mistakes in Practice."

University of Vermont Medical Center Radiology Grand Rounds, Burlington, VT, scheduled for September 28, 2018. Title: "Radiologist Errors, Quality & Safety in Radiology"

UPMC Susquehanna Medical Staff Grand Rounds, Williamsport, PA, June 29, 2018. Title: "256 Shades of Gray: Dealing with Error and Uncertainty in Diagnosis."

Penn State Hershey Medical Center Provider Education "Lunch and Learn" Program November 14, 2017. Title: "Overuse of Medical Imaging: An Issue of Patient Safety?"

Cleveland Clinic Imaging Institute Grand Rounds, Cleveland, Ohio, August 24, 2016. Lecture Title: "256 Shades of Gray: Error and Uncertainty in Diagnostic Radiology"

Department of Radiology Grand Rounds, University Hospitals / Case Medical Center, Cleveland, Ohio, October 28, 2014. Lecture Title: "Our Mistakes—and how we deal with them"

Department of Physical Medicine & Rehabilitation Grand Rounds Penn State Hershey Rehabilitation Hospital, Hershey, PA, June 13, 2014. Lecture Title: "Musculoskeletal Ultrasound: Overview & Clinical Applications"

The Massachusetts General Hospital Dept. of Radiology Grand Rounds Boston, MA, August 22, 2008. Lecture Title: "Nurturing a Culture of Safety"

Maricopa Medical Center Critical Care Grand Rounds, Phoenix, AZ September 17, 2004. Lecture Title: "Do You See What I See?"

Wake Medical Center, Raleigh, North Carolina, November 10, 1992 Medical Staff Grand Rounds. Title: "Functional Brain SPECT Imaging"

4. *Courses and workshops offered for physician CME and Outreach Programs (24):*

ARRS Instructional Course Director: "Understanding and Addressing Radiologist Burnout" Presented along with Drs. Timothy J. Mosher and Richard B. Gunderman at the 119th Annual Meeting of the American Roentgen Ray Society, Honolulu, HI, on May 5, 2019 as Instructional Course #FC08

ARRS Instructional Course Director: “Quality & Safety 101 – The Basics of Radiology Quality and Safety” and “Quality & Safety 102 – Advanced Topics in Radiology Quality & Safety” Co-presented with Drs. Hani Abujudeh, Timothy J. Mosher, Eric A. Walker, Mark S. Parker, Mark H. Willis and Nadja Kadom. Presented at the 116th Annual Meeting of the American Roentgen Ray Society, Los Angeles, California on April 18, 2016

ARRS Instructional Course Director: “Quality & Safety 101 – The Basics of Radiology Quality and Safety” and “Quality & Safety 102 – Advanced Topics in Radiology Quality & Safety” Co-presented with Drs. Hani Abujudeh, Timothy J. Mosher, Eric A. Walker, Mark S. Parker, James Duncan, Mark H. Willis and Nadja Kadom. Presented at the 115th Annual Meeting of the American Roentgen Ray Society, Toronto Canada on April 21, 2015

ARRS Instructional Course Faculty: “IC Competencies Course Track” Speaker and Panel Discussant on the topic of “Radiologist’s Mistakes and How To Deal With Them Appropriately.” Co-presenter with Dr. Ronald Eisenberg. Program presented on April 21, 2015 at the 115th Annual Meeting of the American Roentgen Ray Society, Toronto Canada

ARRS Instructional Course Director: “Mistakes We Make In Practice and How to Deal With Them Appropriately.” May 9, 2014; co-presented with Drs. Hani Abujudeh and Liem Bui-Mansfield at the ARRS 114th Annual Scientific Meeting, San Diego, California

Society for Nuclear Medicine and Molecular Imaging (SNMMI) Annual Meeting Instructional Course Faculty: *Quality and Performance Improvement in Nuclear Medicine*. Presentation entitled “Quality and Safety Processes and Tools Used in Radiology and Nuclear Medicine” June 8, 2014 at the 2014 SNMMI Annual Meeting, St. Louis, MO

ARRS Instructional Course Director: “Arthritis: Basic and Advanced Imaging.” May 8, 2014; co-presented with Drs. Donald Flemming and Eric Walker at the ARRS 114th Scientific Meeting, San Diego, California

ARRS Instructional Course Director: “Arthritis: Basic and Advanced Imaging,” May 6, 2011. Presented with Drs. Donald Flemming and Laura Bancroft at the ARRS 111th Annual Scientific Meeting, Chicago, IL, as Instructional Course #407

ARRS Instructional Course Director: “Arthritis: Basic and Advanced Imaging,” May 5, 2010. Presented with Drs. Donald Flemming and Laura Bancroft at the ARRS 110th Annual Scientific Meeting, San Diego, California, as Instructional Course #414

ARRS Instructional Course “2nd Annual Quality Assessment and Improvement.” April 27, 2009. Presented with Dr. Hani Abujudeh at the ARRS 109th Annual Scientific Meeting, Boston, MA, as Instructional Course #113

ARRS Instructional Course Director, Interactive Live SAM “Arthritis: Basic and Advanced Imaging,” April 30, 2009; Presented with Drs. Donald J. Flemming of Penn State University and Laura Bancroft at the ARRS 109th Annual Scientific meeting, Boston, MA as Instructional Course #404

ARRS Instructional Course “Quality Assessment and Improvement.” Presented with Dr. Hani Abujudeh at the ARRS 108th Annual Scientific Meeting, Washington, DC, on April 15, 2008, as Instructional Course #210

ARRS Instructional Course Director, “Arthritis, Basic and Advanced Imaging,” April 16, 2008; presented with Drs. Timothy Mosher and Donald Flemming at the ARRS 108th Annual Scientific meeting, Washington, DC as Instructional Course #315

Continuing Education for Nuclear Technologists Lecture Series, “Palliation of Painful Bone Metastases with ⁸⁹Sr.” Sponsored by GE Healthcare, Harrisburg, PA, October, 2007

ARRS Instructional Course Director, “Arthritis: Basic & Advanced Imaging,” May 9, 2007; Presented with Drs. Timothy Mosher and Donald Flemming of Penn State University at the ARRS 107th Annual Scientific meeting, Orlando, FL, as Instructional Course #31.

ARRS Instructional Course, “Practice-Based Learning: Quality Assessment and Improvement, Overview and Implementation,” May 8, 2007; Presented with Dr. H. Abujudeh at the ARRS 107th Annual Scientific Meeting, Orlando, FL, as Instructional Course #219

ARRS Instructional Course Director, “2nd Annual Advanced Imaging of Arthritis,” May 18, 2005; Presented with Drs. Timothy Mosher and Garry Gold. Presented at the ARRS 105th Annual Scientific Meeting, New Orleans, LA, as Instructional Course #320

ARRS Instructional Course Director, “Advanced Imaging of Arthritis,” May 6, 2004 Presented in cooperation with Drs. T. Mosher of Penn State University and G. Gold of Stanford University Medical Center, at the ARRS 104th Annual Scientific Meeting, Miami Beach, FL, as Instructional Course #410

Course Director, “Essentials of Radiology”, Sponsored by the International Institute for Continuing Medical Education, *Inc.* (IICME) Program held at the Westin Kierland Resort, Scottsdale, AZ, February 2 – 5, 2003

Course Director, “Practical Radiology in Hershey”, Sponsored by IICME Program held at the Hershey Lodge and Convention Center July 26-28, 2002

Course Co-Director, “Radiology at the Doral”, Sponsored by IICME. Program was Co-presented by the Depts. of Radiology of Penn State University (4 faculty) and University of California, Irvine (4 faculty). Program held at the Doral Golf Resort & Spa, Miami, Florida, February 26 – March 1, 2001

Speaker, “Radiology in the Outpatient Setting,” at the 14th Annual Family Medicine Primary Care Update, Vanderbilt University Campus, Nashville, Tennessee, May 5, 1997

North Carolina Society of Radiologic Technologists Educational Seminar Series, Presentation entitled: “Chest X-Ray Patterns and Differential Diagnosis” Burlington, NC, February 5, 1994

III. Additional Courses taught in Medical Student and Graduate Medical Education

Translating Health Systems Elective (Penn State College of Medicine Course #THS743)
Co-taught a seminar elective experience for 4th-Year Medical Students in Health Systems Science, spring, 2019

Penn State Resident/Fellow Health Systems Core Education: Value-Based Care (Sessions 1A and 2A) and Population Health (Sessions 2A and 2B); presented annually starting winter, 2018

Lecturer in MS-IV Radiology Core Elective, 1999 – 2003 (Course #X-Ray 771)
Penn State Hershey College of Medicine. Estimated enrollment 100 students/year

Course Director, MSIV Elective “Radiology Acting Internship,” 1999 – 2003
(Course # X-Ray 772) Penn State Hershey College of Medicine. Est. enrollment 12 students/year; developed curriculum and served as sole faculty.

St. Joseph’s Hospital and Medical Center Residency Program Lecture Series
Didactic presentations on musculoskeletal imaging topics for Radiology Residents
At St. Joseph’s Hospital and Medical Center, Phoenix, AZ, 2003 – 2004

Rheumatology Case Conference & Lecture Series
Case-based and didactic lecture conference in cooperation with the Division of Rheumatology, Penn State Milton S. Hershey Medical Center, 1999 – 2003

Penn State Hershey Medical Center: Musculoskeletal & BI Case Conference & Lecture Series
Case-based and didactic lecture conferences for Radiology Residents and Fellows
Developed curriculum for Body Imaging Didactic Lecture Series, 1999 – 2003

Vanderbilt University Emergency Medicine Residency Lecture Series
Didactic presentations on musculoskeletal and trauma imaging for Emergency Department House staff, 1996 – 1999.

Vanderbilt University: Musculoskeletal Case Conference & Lecture Series
Didactic presentations on musculoskeletal topics for Radiology Residents and Musculoskeletal Radiology Fellows, 1996 – 1999.

IV. Seminars, Scientific Sessions, and Colloquia

PA Patient Safety Authority Webinar 4/2/19 – “Error and Uncertainty in Radiology”
Presented a live 1-hour webinar under the auspices of the PA Patient Safety Authority; this was preserved as an enduring educational offering in video format, available on YouTube.
https://www.youtube.com/watch?v=4Hwc_Km3YZo

Vizient PSO Web Conference: “Closing the loop on Incidental Radiology Findings,” Presented as a live 1½-hour Webinar by the Vizient PSO on February 7, 2019 (Co-speakers were Lincoln L. Berland and Ben Wandke); available as an enduring online educational offering to Vizient Members

Presenter: *Emory University Research In Progress Seminar (RIPS)*, Atlanta GA, October 10, 2018. Title: "Role of the Default Mode Network and Mind-Wandering on Radiologists' Perceptual Errors"

Presenter: Department of Radiology *Scholarship Celebration*, Hershey, PA, June 21, 2018.

Title: "New Research in Progress on Radiologists' Perceptual Errors"

Panelist: *New Horizons for Young and Early Career Physicians*

Presented at the ACR2017 Annual Meeting, Washington, D.C., May 21, 2017

Discussant, *ACR-Derived Initiatives for Excellence in Radiology Quality and Safety*,

Presented at the ACR2017 Annual Meeting, Washington, D.C., May 23, 2017

Moderator, Scientific Session 15, "General / Emergency Radiology" ARRS 111th Annual Meeting, May 4, 2011, Chicago, IL.

Moderator, Scientific Session 22, "General / Emergency Radiology" ARRS 110th Annual Meeting, May 6, 2010, San Diego, CA.

Moderator, Scientific Session 29, "Emergency Radiology" ARRS 109th Annual Meeting, April 30, 2009, Boston, MA.

Moderator, Scientific Session 9 "Emergency Radiology" ARRS 107th Annual Meeting, May 8, 2007, Orlando, FL.

Moderator, Scientific Session 4 "Emergency Radiology" ARRS 108th Annual Meeting, April 14, 2008, Washington DC.

Maricopa Medical Center Orthopaedic & Radiology Residency Series on Orthopaedic Radiology. Given in Phoenix, AZ, 2003 – 2005.

Moderator, Scientific Session 23 "MSK: Spine and Hip" ARRS 104th Annual Meeting, May 5, 2004, Miami Beach, FL.

Moderator, Scientific Session 27: "Spine" American Roentgen Ray Society 101st Annual Meeting, May 3, 2001, Seattle, WA.

Moderator, Scientific Session 26, "Musculoskeletal: Knee MRI" American Roentgen Ray Society 100th Annual Meeting, May 7 — 12, 2000, Washington, DC.

Moderator, Scientific Session 18, "Musculoskeletal Trauma," American Roentgen Ray Society 99th Annual Meeting, May 9 – 14, 1999, New Orleans, LA.

Moderator, Scientific Session 19, "Musculoskeletal Ultrasound and MR Imaging," American Roentgen Ray Society 98th Annual Meeting, April 26, 1998, San Francisco, CA. Radiology/Pathology Correlative Conference Series, UC Irvine Dept. of Radiological Sciences, presented between 1989 and 1992:

Topics included:

"Non-Hodgkin's Lymphoma of the Head and Neck in Patients with AIDS"

"The Role of Computed Tomography in the Evaluation of Skeletal Metastases"

"Histiocytosis-X: A Spectrum of Pathological and Radiographic Features"

"Simultaneous Primary Lymphoma of the Breast with Infiltrating Ductal Carcinoma: Mammographic and Pathologic Features with a Review of the Literature"
"Ultrasound Diagnosis of a Case of Enteric Duplication"
"Rapid Renal Enlargement and Increased Renal Echogenicity in a Neonate with Beckwith-Wiedemann Syndrome"
"Differentiating osseous Brucellosis from Tuberculosis"

Proseminar Colloquium Series, UC Irvine Department of Physiology and Biophysics, 1983-85.

Topics included:

"Ion Channels and Cell Membrane Excitability"
"Physical Methods in the Study of Artificial Lipid Bilayers and Cell Membranes"
"Subendocardial Myocardium Perfusion in Training-Induced Hypertrophic States"
"Neural Development and Plasticity I: An Overview of the Literature"
"Neural Development and Plasticity II: Effects of Alterations in Afferent Inputs on Reorganization of Somatotopic Maps"
"Bioadhesive Interactions in Embryogenesis with Emphasis on the *Xenopus* Retinotectal Projection"
"Gap Junctions, Cell-Cell Communication and Regulation of Gene Expression in Embryogenesis"
"The Bacteriorhodopsin Membrane Photocycle"
"Possible Role of Neural Cell Adhesion Molecule in Neuronal Pattern Formation and Maintenance"

Colloquium of the UC Irvine Department of Biological Chemistry, March 1983:

"On the Origin of Mitochondria—A Biophilosophical Approach"

Developmental Biology Seminar Series, Department of Biology, The Johns Hopkins University, presented February, 1982: "The Living Developing Nerve Fiber—An Historical Review on the Work of Dr. Ross Granville Harrison."

V. Scholarship and Research Supervisory Oversight

Member, supervisory committee for Dr. Ottar Kristinsson, postdoctoral research fellow, Division of Pediatric Rheumatology, Penn State Milton S. Hershey Medical Center and College of Medicine. Project "Ultrasound in combination with novel biomarkers of identify subclinical disease activity in Juvenile Idiopathic Arthritis" October, 2015 – 17

Member, Research Mentorship Committee (Junior Faculty Development Grant program), for Dr. Scott Sheehan, Department of Radiology, Madison Wisconsin VAMC and The University of Wisconsin. Project: "Reducing imaging order errors with clinical decision support." October, 2015 – present

JOURNAL REFEREE & EDITORIAL WORK

a. Active Manuscript Reviewer for 15 peer-reviewed Journals:

Radiology

RadioGraphics

Radiology: Artificial Intelligence

American Journal of Roentgenology (AJR)
Member of AJR Editorial Advisory Panel, 2005 – 2008
The Journal of Nuclear Medicine (JNM)
The Journal of the American College of Radiology (JACR)
The Journal of Magnetic Resonance Imaging (JMRI)
Arthritis & Rheumatism
Arthritis Care and Research (AC&R)
Diagnosis
Journal of Clinical Imaging Science
IEEE Journal of Biomedical and Health Informatics
BMJ / BMJ Open / BMJ Quality
Academic Radiology
Canadian Association of Radiologists Journal (CARJ)

- b. Editorial Board, *Patient Safety* (Journal Online ISSN #261-4716), published by the Pennsylvania Patient Safety Authority beginning September, 2019
- c. Editorial Board, *Canadian Association of Radiologists Journal (CARJ)*, 2019 – 2022
- d. Guest Editor for the journal *Diagnosis*, Special Issue on Radiology, January, 2017
- e. Section Editor for Musculoskeletal Imaging, *Journal of Clinical Imaging Science*, an international peer-reviewed electronic-only Radiology Journal, available online at: <http://www.clinicalimagingscience.org>.
- f. Medical Editor for Medscape *e-medicine* Electronic Radiology Reference, 2002 – 10
30 Chapters edited (all musculoskeletal topics). <http://www.emedicine.medscape.com/>

RESEARCH

Research projects, research grants and contracts (including both supported and unfunded research)

1. Current Research in Progress – funded

“Neurocognitive Correlates of Mind-Wandering in Radiologists’ Perceptual Errors”
Role: Principal Investigator, 25% effort. This is an interdisciplinary, multi-center project, initially funded by a Stage I *Pathways to Partnership (P³)* Grant - \$5,000 Awarded by the Penn State Hershey Clinical and Translational Science Institute to Dr. Mosher. Research plan entails use fMRI and eye-tracking data during simulated radiologist work to elucidate the cause(s) of perceptual errors by radiologists. Current collaboration includes Drs. Elizabeth Krupinski from Emory University (Co-PI) Timothy J. Mosher, Prasanna Karunanayaka, Ph.D. (MR Physicist), Krish Sathian, M.D., Ph.D. (Neurology) and Joseph Fotos, M.D. from Penn State Hershey, along with Bradley Wyble, Ph.D. from Penn State University Park Campus, Howard Egeth, Ph.D. from The Johns Hopkins University, Baltimore, Maryland and Mariya Gusman, M.D., Ph.D. (Neuroradiology, Mallinckrodt Institute of Radiology). *A Department of Defense Clinical Translational Science Grant (invited submission) and Phase 2 P³ Grant application have been submitted in support of this work; these applications are currently under review.*

ACR Innovation Fund Grant, “Enhancing the Effectiveness of Clinical Decision Support by Understanding the Drivers of Clinician Resistance.” \$98,323.00 in total costs (Direct and Indirect). Role: Principal Investigator, 10% Effort, February 2019-20. The over-arching project goal of this 1-year (renewable) grant is to improve the value of diagnostic imaging for patients by helping physicians more appropriately utilize advanced imaging modalities. Electronic Clinical Decision Support (e-CDS), provided “just in time” at the point of care, is a proven strategy for increasing physician adherence to evidence-based utilization guidelines, such as the ACR Appropriateness Criteria (ACR-AC), however clinician resistance to e-CDS is a significant barrier. We are investigating the root causes of clinician resistance to e-CDS using mixed-methods research including an innovative modular education/testing platform known as Amplifire®, which is designed to uncover confidently held misinformation, and provides analysis of areas where subjects have particular difficulty.

“Actionable Findings Database and Communication Multisite (ACRIN ‘CURE13’) Project.” Contract, \$75,808 in total costs (Direct and Indirect). Role: co-investigator. This is a multi-institutional radiology project funded by the Pennsylvania Patient Safety Authority and Health Care Improvement Foundation and conducted under the auspices of ACRIN-PA, designed to develop and implement a state-wide radiology reporting system using uniform language and diagnostic codes for identification and follow-up of actionable focal masses in solid organs representing possible cancer in abdomen / pelvic cross-sectional imaging (CT, US and MRI) in Pennsylvania. Co-PIs for this project are Drs. Tessa Cook and Hanna Zafar of the University of Pennsylvania. Co-investigators include Dr. Timothy Mosher, Jonelle Thomas and Nabeel Sarwani (PSU), and Drs. Vijay Rao and Dr. Sandeep Deshmukh (Thomas Jefferson University).

“Ultrasound in Combination with Novel biomarkers to identify subclinical disease activity in Juvenile Idiopathic Arthritis.” Grant, \$13,800 (direct costs only) from the Children’s Miracle Network. Co-investigator / faculty mentor. The research goal is to correlate the results of noninvasive imaging using point-of-care Power Doppler ultrasound with novel serum biomarkers to determine which best predicts clinical disease activity vs. remission and outcomes in patients with Juvenile Idiopathic Arthritis and JRA. Collaborators include Drs. Ottar Kistinnsson, Christy French, Lisabeth Scalzi, Brandt Groh and Vernon Chinchilli. July 1, 2016 to June 30, 2017

2. *Current Research in Progress – unfunded or seeking funding*

“Predictive Modeling of Clinical Workflow to Optimize the Patient Experience and Match Radiologist Staffing to Workload.” This is a multidisciplinary project undertaken in collaboration with engineering faculty from the Penn State Berks Campus College Information Science and Technology (IST). The project has two specific aims: (1) to predictively model hour-by-hour fluctuations in radiologist work-demand in a large academic medical center department of radiology using highly granular data derived from three years’ past experience, and (2) to apply the predictive model to optimize physician staffing levels in order to improve patient access, reduce wait times, enhance efficiency and throughput and improve the patient and provider experience. Co-PI’s are M.A. Bruno and T.J. Mosher (Radiology) with M. Bartolacci and M. Nasereddin of Penn State Berks’ Campus (Department of Information Science and Technology).

“Training Models and Early Employment Performance in Radiology.” Unfunded project in collaboration with Dr. Christine Lamareaux (V-Rad), Dr. Elizabeth Krupinski (Emory) and Dr. Kristen DeStigter (U of Vermont), comparing the first year of practice effectiveness of newly hired radiologists between those trained with, vs. without, independent after-hours call experience during their radiology residency.

3. *Prior Externally Funded research (NIH and Private Foundation funding sources)*

NIH R-01 Grant: “MRI T2 Mapping of Cartilage for Diagnosis of Early Rheumatoid Arthritis” July 1, 2002 – July 31, 2004. PHS1RO1AR47179-01A1 (PI: T. J. Mosher), \$297,365 (Direct Costs) Co-investigator, 5% Effort.

Principal Investigator, “Quantified Amplitude Doppler Ultrasound in Juvenile Rheumatoid Arthritis.” Children’s Miracle Network Research Grant 2002-03 Program, \$10,800 (direct) 10% Effort.

Principal Investigator, “Quantified Amplitude Doppler Ultrasound in Juvenile Rheumatoid Arthritis.” Children’s Miracle Network Research Grant 2000-01 Program, \$7,500 (direct costs) 5% effort.

Principal Investigator, “Amplitude Color Doppler Sonography in Rheumatoid Arthritis and Related diseases Assessment.” 1998 Radiological Society of North America Seed Grant Award 1998-99, \$20,000 (direct costs) 10% Effort.

4. *Prior Corporate-sponsored Research*

Clinical site testing of novel digital imaging devices in the emergency/outpatient setting, in collaboration with Drs. David Pickens and Ronald R. Price, Division of Radiological Sciences, Vanderbilt University Medical Center. Sponsored by The Varian Corporation, 1998 – 99. Received \$10,000 in direct costs, 1999-2000.

5. *Prior Internally Funded Research – Hershey Medical Center*

“Assessment of Pulmonary Fibrosis from External Beam Radiation Therapy using ^{99m}Tc-MAA SPECT/CT of the Lungs.” Funded by Dean’s Feasibility Grant (Co-investigator; PI was Dr. J. Varletto). 5% effort. Total support: \$40,000. *This study was terminated 2013.*

6. *Prior Unfunded Research – completed projects*

“Improving the Appropriateness of Imaging Utilization in the Emergency Department: CTPE” Co-Principal Investigator, “Optimizing Utilization of CT Scans for Pulmonary Embolism in the Emergency Department using a customized decision support tool” along with Glenn Geeting, M.D., (Co-PI) Christopher S. Hollenbeak, PhD (Co-PI), Dr. Rickhesvar P.M. Mahraj, Dr. Gregory Caputo, Dr. Michael Beck, Dr. Christopher Deflitch, Eric Schaeffer, MS (Statistical Analyst) and others. *Completed 2015*

“Improving the Appropriateness of Imaging Utilization in the Emergency Department: MRI” Principal Investigator: “Drivers of Variability in Emergency Department and Outpatient Use of Lumbar Spine MRI for Evaluation of Low Back Pain.” Co-investigators T. Chan and

T. Mosher. Interdisciplinary project analyzed the causes of variation in practice utilization of lumbar spine MRI in the Emergency and Outpatient settings. *Completed 2016*

Handheld Bedside Ultrasound in Liver Assessment. Clinical site testing of a new handheld ultrasound instrument for bedside assessment of fatty hepatocellular disease (NASH). In collaboration with Dr. Thomas R. Riley, III, M.D., Division of Hepatology and Gastroenterology, Dept. of Medicine, *Completed 2005*

Cardiothoracic Radiology. Evaluation of film reader's ability to detect pulmonary oligemia on a series of plain chest radiographs. Study also evaluated inter-reader reliability in detection of oligemia, in collaboration with Drs. E. N.C. Milne (UC Irvine), W. S. Stanford (Univ. of Iowa) and C. W. Smith (Long Beach Memorial Medical Center). *Completed 1992*

Ultrasound Microscopy. Preliminary studies of GHz-range Ultrasound Microscopic imaging of human tissue biopsy specimens, with conventional light and electron-microscopic correlation. In collaboration with Drs. Joie P. Jones and Jacqueline Gallet of UC Irvine, August 1991 to March 1992

Neurodevelopmental Biology. Study of the role of Neural Cell Adhesion Molecules (NCAMs) in the establishment and maintenance of neuronal patterns in the visual tectum of the African Clawed Toad, *Xenopus Laevis*. Graduate research under the supervision of Dr. Scott E. Fraser, Ph.D., Department of Physiology and Biophysics, UC Irvine, 1985. (Research in partial fulfillment of the requirements for the Master of Science Degree in Biophysics and Physiology at UC Irvine, 1984-85).

Neurophysiology. Application of digital analytic methods to the discrimination of single-unit neuron activity using extracellular electrodes in the visual tectum of *Xenopus Laevis*, in the laboratory of Dr. R. Kevin Hunt, in the Thomas C. Jenkins Department of Biophysics, The Johns Hopkins University, 1981-82 (Undergraduate Research).

Neurophysiology of feline auditory cortical representational plasticity. Electrophysiologic mapping experiments of sonotopic neural patterns in the cat auditory cortex. Extramural research under the supervision of Dr. Michael M. Merzenich, Departments of Physiology and Otolaryngology, UC San Francisco, 1980-81. (Undergraduate summer research).

PUBLICATIONS AND SCHOLARLY / CREATIVE ACCOMPLISHMENTS

I. Research and/or scholarly publications

1. *Articles published in peer-reviewed journals to date (54)*

1. Chong, S.T., Robinson, J.D., Davis, M.A., **Bruno, M.A.**, Roberge, E.A., Reddy, S., *et al.* "Emergency Radiology: Current Challenges and Preparing for Continued Growth" *J of the Am Coll of Radiol (JACR)* May 2019 (epub ahead of print) **PMID: 31092353**
doi: 10.1016/j.jacr.2019.03.009

2. **Bruno, MA**, Duncan, JR, Bierhals, AJ, Tappouni, R, Krupinski, EA. “The Resident Preliminary Report: Benefits of a Second Read” *J of the Am Coll of Radiol (JACR)* March 2019; **16**(3):272-274 **PMID: 30832827** doi: 10.1016/j.jacr.2018.12.012
3. Lolaoi, J., Patel, A., McDevitt, P., **Bruno, M.A.**, and Riley, T. “How Strongly Do Physical Examination Estimates and Ultrasonographic Measurements of Liver Size Correlate? A Prospective Study.” *Am J Med* **132**(1): 103-108, Jan 2019
4. Itri, J.N., **Bruno, M.A.**, Lalwani, N., and Tappouni, R. “The Incentive Dilemma: Intrinsic Motivation and Workplace Performance” *J of the Am Coll of Radiol (JACR)* 2019; Jan;**16**(1):39-44. **PMID 20289330** doi 10.1016/j.jacr.2018.09.008
5. **Bruno, MA**, Duncan, JR, Bierhals, AJ, Tappouni, R. “Overnight Resident vs. 24-hour Attending Radiologist Coverage in Academic Medical Centers.” *Radiology* 2018; Dec; 289:809-813. doi: 10.1148/radiol.2018180690 **PMID: 30277849**
Article also featured in Editor’s Podcast, December, 2018.
6. Sarwani, N.I., **Bruno, M.A.**, and Huesch, M.D. “A Retrospective Comparison of Creatinine Changes Among Patients Receiving, Not Receiving, and Not Yet Receiving Contrast Administration.” *J Am Coll Radiol (JACR)* 2018 Sept; **15**(9):1285-1292 doi: 10.1016/j.jacr.2018.01.015 **PMID:29503148**
7. **Bruno, M.A.**, Petscavage-Thomas, J., Abujudeh H.H. “Communicating Uncertainty in the Radiology Report (Commentary)” *Am J Roentgenol (AJR)* **209** (11):1006-1008, November, 2017. **PMID: 28705061**
8. Gefen, R., **Bruno, M.A.**, Abujudeh, H.H. “Online Portals: Gateway to Patient-Centered Radiology” *Am J Roentgenol (AJR)* **209** (11):987-991, November 2017 **PMID: 28726503**
9. **Bruno, M.A.** “256 Shades of gray: uncertainty and diagnostic error in Radiology” *Diagnosis (Berl)* 2017 Sept; **4**(3):149-157, doi: 10.1515/dx-2017-0006 **PMID: 29536935**
10. **Bruno, M.A.**, Johnson, K., Argy, N. and Graber, M.L. “Improving diagnosis in Radiology – progress and proposals (Editorial)” *Diagnosis (Berl)* 2017 Sept **4**(3):111-112 doi: 10.1515/dx-2017-0031 **PMID: 29536928**
11. Walker, E.A., Petscavage-Thomas, J.M., Fotos, J. and **Bruno, M.A.** “Quality Metrics Currently Used in Academic Radiology Departments: Results of the QUALMET Survey” *Br J Radiol* 2017 **90**:20160827, DOI: 10.1259/bjr.20160827
12. Abujudeh, H.H., Kaewlai, R., Shaqdan, K., **Bruno, M.A.** “Key Principles in Quality and Safety in Radiology.” [Review] *Am J Roentgenol (AJR)* 208(3):W1-W9, March, 2017 DOI:10.2214/AJR.16.16951 **PMID:28075621**
13. Geeting, G., Beck, M., **Bruno, M.A.**, Mahraj, R.P., Caputo, G., DeFLitch, C., and Hollenbeak, C.S. “Mandatory Assignment of Modified Wells Score Before CT Angiography for Pulmonary Embolism Fails to Improve Utilization of Percentage of Positive Cases.” *Am J Roentgonol. (AJR)* **207**(2):442-449, August, 2016 **PMID: 27144311** DOI:10.2214/AJR.15.15394

14. Bosmans, J.M.L., Dhondt, M., Smits, L., **Bruno, M.A.**, Parizel, P.M. and Gemmel, P. “Are Patients Ready for Communication with Radiologists? Results of the R₂P₂ Survey” *Acta Radiologica* **57**(9): 1089-1098, September 2016 **PMID: 26622059**
15. Abujudeh, H., Danielson, A., **Bruno, M.A.** “A Patient-Centered Radiology Quality Process Map: Opportunities and Solutions.” [Review: Featured on the November 2016 issue cover] *Am J Roentgenol. (AJR)* **207**(5):18-25, November 2016 DOI:10.2214/AJR.16.16803
16. Keshitkar-Jahromi, M., Rassaei, N., **Bruno, M.A.**, Maneval, M.L, and Whitener, C.J. “Photo Quiz: A 59-year-old Man With Multiple Liver Lesions, Rash and Uveitis” *Clinical Infectious Disease* **62**(1): 82-3 and 123-4, January 2016 **PMID: 26668352**
17. **Bruno, M.A.**, Walker, E.A. and Abuhudeh, H.H. “Understanding and Confronting our Mistakes: The Epidemiology of Error in Radiology and Strategies for Error Reduction.” *RadioGraphics* 2015; 35:1668-1676, October, 2015 (Cited 101 times as of July, 2019)
18. Mosher, T.J., Kransdorf, M.J., Adler, R., Appel, M., Beaman, F.D., Bernard, S.A., **Bruno, M.A.**, Dempsey, M.E., Blair-Fries, I., Khoury, V., Khurana, B., Roberts, C.C., Tuite, M.J., Ward, R.J., Zoga, A.C. and Weissman, B.N. “ACR Appropriateness Criteria: Acute Trauma to the Ankle.” *J Am Coll Radiol.* 2015;12:221-227, March 2015 **PMID: 25743919**
19. Payne, S.J., Smucker, J.E., **Bruno, M.A.**, Winner, L.S., Saunders, B.D., Goldenberg, D. “Radiographic Evaluation of Non-Localizing Parathyroid Adenomas.” *AM J Otolaryngol.* **36**(2):217-222, Mar-Apr 2015 **PMID: 25465322**
20. Bancroft, L.W., Kransdorf, M.J., Adler, R., Appel, M, Beaman, F.D., Bernard, S.A., **Bruno, M.A.**, Dempsey, M.E., Blair-Fries, I., Khoury, V., Khurana, B., Mosher, T.J., Roberts, C.C., Tuite, M.J., Ward, R.J. Zoga, A.C. and Weissman, B.N. “ACR Appropriateness Criteria: Acute Trauma to the Foot.” *J Am Coll Radiol.* **12**(6):575-581, June 2015 **PMID: 25935824**
21. **Bruno, M.A.**, Nagy, P., “Fundamentals of Quality and Safety in Diagnostic Radiology.” *J Am Coll Radiol.* **11**(12 Pt A):1115-1120, December 2014 **PMID: 25467723**
22. **Bruno, M.A.** “Advanced Practice Quality Improvement: Beyond the Radiology Department.” *J Am Coll Radiol.* **11**(12 Pt A):1150-1154, December 2014 **PMID: 25444068**
23. Abujudeh, H., Pyatt, R.S., **Bruno M.A.**, Chetlen, A.L., Buck, D. Hobbs, S.K., Roth, C., Truwit C., Agarwal R., Kennedy S.T., Glenn L. “RADPEER™ Peer Review: Relevance, Use, Concerns, Challenges and Direction Forward.” *J Amer Coll Radiol.* **11**(9):899-904, September 2014 **PMID: 24842585** (Cited 29 times as of July, 2019)
24. **Bruno, M.A.**, Petscavage-Thomas, J., Mohr, M.J., Bell, S.K., Brown, S.D. “An Open Letter: The Radiologist’s Report in the Era of the Patient Web Portal.” *J Amer Coll Radiol.* **11**(9):863-867, May 2014 **PMID: 24836272** (Cited 50 times as of July, 2019)
25. **Bruno, M.** “Invited Commentary: Pediatric Distal Forearm and Wrist Injury.” *RadioGraphics* **34**(2):490-491, March-April, 2014 **PMID: 24617693**

26. Petscavage-Thomas, J.M., Kaneda, H., **Bruno, M.A.** “Value of Training Technologists for Adverse Reactions to Contrast.” *J Radiologic Technol.*, **85**(3):256-260, February 2014. **PMID: 24395891**
27. Ward, R.J., Weissman, B.N., Krasdorf, M.J., Adler, R., Appel, M., Bancroft, L.W., Bernard, S.A., **Bruno, M.A.**, Fries I.B., Morrison, W.B., Mosher, T.J., Roberts, C.C., Scharf, S.C., Tuite, M.F., Zoga, A.C.. “ACR Appropriateness Criteria® Acute Hip Pain—Suspected Fracture,” *JACR* **11**(2):114-120, February 2014. **PMID:24368044**
28. ‘The ‘Abujudeh Curve’ in Radiology Quality & Safety Research” *AJR* – Web exclusive article (letters) *Am J Roentgenol. (AJR)* 2014; 204:W1 0361-803X/14/20145/W1 Available at: <http://www.ajronline.org/> doi: 10.2214/AJR.14.14088.
29. Yang, C., Kasales, C.J., Ouyang, T., Peterson, C.M., Sarwani, N.I., Tappouni, R., and **Bruno, M.A.** “A Succinct Rating Scale for Radiology Report Quality” *Sage Open Medicine*, 2014. Published online, December 2014 doi: 10.1177/1050312114563101
30. Tuite, M.J., Daffner, R.H., Weissman, B.N., Bancroft, L., Bennett, D.L., Blebea, J.S., **Bruno, M.A.**, Fries, I.B., Hayes, C.W., Krasdorf, M.J., Luchs, J.S., Morrison W.B., Roberts C.C., Scharf S.C., Stoller D.W., Talijanovic M.S., Ward R.J., Wise J.N., Zoga A.C., “ACR Appropriateness Criteria® on Acute Trauma to the Knee” *J Am Coll Radiol (JACR)* **9**(2):96-103, February, 2012 **PMID: 22305695**
31. **Bruno, M.A.**, Weissman, B.N., Krasdorf, M.J., Adler, R., Appel, M., Beaman, F.D., Bernard, S.A., Blair-Fries, I., Khoury, V., Mosher, T.J., *et al.* “Acute Hand and Wrist Trauma” ACR Appropriateness Criteria® Peer reviewed online publication available at <http://www.acr.org/> November 2013, 8 pages
32. Wise, J.N., Weissman, B.N., Appel, M., Arnold, E., Bancroft, L., **Bruno, M.A.**, Blair-Fries, I., Hayes, C.W., Jacobson, J.A., Krasdorf, M.J., Luchs, J.S., Morrison, W.B., Mosher, T.J., Murphey, M.D., Palestro, C.J. “Chronic Foot Pain” ACR Appropriateness Criteria® Peer reviewed online publication available at <http://www.acr.org/> November 2013, 6 pages
33. Morrison, W.B., Weissman, B.N., Krasdorf, M.J., Adler, R., Appel, M., Bernard, S.A., **Bruno, M.A.**, Blair-Fries, I., Germano, I., Holly, L.T., Mosher, T.J., Olson, J.J., Palestro, C.J. “Primary Bone Tumors.” ACR Appropriateness Criteria® Peer reviewed online publication available at <http://www.acr.org/> November 2013, 5 pages
34. Ward, R.L., Weissman, B.N., Krasdorf, M.J., Adler, R., Appel, M., Bancroft, L.W., Bernard, S. A., **Bruno, M. A.**, Blair-Fries, Il., Morrison, W.B., Mosher, T.J., Roberts, C.C., Scharf, S.C., Tuite, M.J. and Zoga, A.C. “Acute Hip Pain – Suspected Hip Fracture” ACR Appropriateness Criteria® Peer reviewed online publication available at <http://www.acr.org/> March 2013, 5 pages
35. Zoga, A. C., Weissman, B.N., Krasdorf, M.J., Adler, R., Appel, M., Bancroft, L.W., **Bruno, M.A.**, Blair-Fries, I. Morrison, W.B., Mosher, T.J., Palestro, C.J., Roberts, C.C., Tuite, M.J. and Ward, R.J. “Soft Tissue Masses” ACR Appropriateness Criteria® Peer reviewed online publication available at <http://www.acr.org/> March 2013, 4 pages.

36. Wise, J. N., Daffner, R.H., Weissman, B.N., Bancroft, L. D., Bennett, D.L., Blebea, J.S., **Bruno, M.A.**, Fries, I.B., Jacobson, J.A., Luch, J.S., Morrison, W.B., Resnik, C.S., Roberts, C.C., Schweitzer, M.E., Seeger, L.L., Stoller, D.W., Taljanovic, M.S., “ACR Appropriateness Criteria® on Acute Shoulder Pain” *J Am Coll Radiol (JACR)* **8(9):602-609**, September, 2011. **PMID: 21889746** (Cited 37 times as of July, 2019)
37. Temprano, K., Bessman, E., Bhagia, S.M., **Bruno, M.A.**, Rheumatoid Arthritis. eMedicine from WebMD. Updated March 29, 2011. Peer-reviewed online journal. Article URL: <http://emedicine.medscape.com/article/331715-overview>
38. Daffner, R.H., Weissman, B.N., Appel, M., Bancroft, L., Bennett, D.L., Blebea, J.S. **Bruno, M.A.**, Blair-Fries, I.B., Hayes, C.W., “Stress (Fatigue/Insufficiency) Fracture, including Sacrum” ACR Appropriateness Criteria® Peer reviewed Online Publication available at <http://www.acr.org/> April, 2011, 8 pages
39. Richmond, B.J., Daffner, R. H., Weissman, B.N., Arnold, E., Bancroft, L., Bennett, D. L., Blebea, J.S., **Bruno, M.A.**, Blair-Fries, I., Jacobson, J.A., Luchs, J.S., “Osteoporosis and Bone Mineral Density” ACR Appropriateness Criteria® Peer reviewed Online Publication available at <http://www.acr.org/> January, 2010, 7 pages
40. Roberts, C.C., Daffner, R.H., Weissman, B.N., Bancroft, L., Bennett, D.L., Blebea, J.S., **Bruno, M.A.**, Fries, I.B., Germano, I. M., Holly, L., Jacobson, J.A., Luchs, J.S., Morrison W.B., Olson J.J., Payne W.K., Resnik C.S., Schweitzer M.E., Seeger L.L., Talijanovic M., Wise J.N., Lutz S.T., “ACR Appropriateness Criteria ® on Metastatic Bone Disease” *J Am Coll Radiol (JACR)* **7(6):400-409**, June 2010 **PMID: 20522392** (57 Citations as of July, 2019)
41. **Bruno, M.** “Invited Commentary: MR Imaging of Early Rheumatoid Arthritis.” *RadioGraphics*, Vol. 30(1): 163-165, January 2010.
42. Pichardo-Lowden, A., Durvesh, S., Douglas, S., Todd, W., **Bruno, M.**, Goldberg, D. “Anaplastic Thyroid Carcinoma in a Young Woman: A Rare Case of Survival.” *Thyroid*, Vol. 19(7):775-779, July 2009 **PMID: 19583489**
43. Ondik, M.P., Kang, J., Bayerl, M.G., **Bruno, M.** and Goldenberg, D. “Teflon Laryngeal Granuloma Presenting as Laryngeal Cancer on combined PET/CT Scanning” *J. Laryngology & Otology*, Vol. 123(5):575-578, May 2009 **PMID: 18976510**
44. Jacobson, J.A., Daffner, R.H., Weissman, B.N., Arnold, E., Bancroft, L., Bennet, D.L., Blebea, J.S., **Bruno, M.A.**, Blair-Fries, I., Luchs, J.S., Morrison, W.B., Payne, W.K. “Chronic Ankle Pain” Invited Article: ACR Appropriateness Criteria® Peer reviewed Online Publication available at <http://www.acr.org/> September, 2009, 4 pages.
45. Morrison, W.B., Zoga, A.C., Daffner, R.H., Weissman, B.N., Bancroft, L., Bennett, D.L., Blebea, J.S., **Bruno, M.A.**, Blair-Fries, I., Jacobson, J.A, “Soft Tissue Masses” Invited Article: ACR Appropriateness Criteria® Peer reviewed Online Publication available at <http://www.acr.org/> September, 2009, 3 pages

46. Riley, T.R., Mendoza, A., **Bruno, M.A.** “Bedside Ultrasound Can Predict Nonalcoholic Fatty Liver Disease (NAFLD) in the Hands of Clinicians Using a Prototype Image. *Dig Dis Sc.*, 51(5):982-985, May 2006 **PMID: 16783524**
 47. Riley, T.R., **Bruno, M.A.** Sonographic Measurements of the Thickness of Subcutaneous Tissues in Non-Alcoholic Fatty Liver Disease versus other Chronic Liver Diseases. *J Clin Ultrasound*, 33(9):439-441, December 2005 **PMID:16281268**
 48. Tsao, I., Peh, W., **Bruno, M.A.** “Rheumatoid Arthritis: Hand” in e-medicine Radiology online Peer-Reviewed Radiology Journal, e-Medicine Reference 5(4): First published online April 6, 2004. Most recently updated and republished on September, 2016. This article has received a total of 41,515 page views as of January, 2012, of which 1,547 occurred since the August, 2013 update. URL: <http://www.emedicine.medscape.com/article/401271-overview>
 49. Chinratanalab, S., **Bruno, M.A.**, Fuchs, H.A. “Color Doppler Ultrasonographic Findings Show Tendon Sheath Inflammation in Mechanic’s Hands” *Journal of Clinical Rheumatology* 8:2:104-109, April 2002. **PMID: 17041332**
 50. Rothschild, B. and **Bruno, M.A.** “CPPD Arthritis” in Medscape e-medicine Radiology online Electronic Peer-reviewed Radiology Journal, e-Medicine Reference 2(12): First published online December, 2001; This article was most recently updated and republished on August 29, 2013, and has received a total of 13,545 page views as of January, 2013. URL: <http://www.emedicine.medscape.com/article/388348-overview>
 51. Nadalo, L.A., Moody, J.A., **Bruno, M.A.** “Upper Cervical Spine Trauma” in e-medicine Radiology online Electronic Peer-reviewed Journal, e-Medicine Journal 3(12), Published online December 11, 2002. This article is no longer available online.
 52. **Bruno, M.A.**, Milne, E.N., Stanford, W.S., Smith, C.W. "Pulmonary Oligemia in Aortic Valve Disease." *Radiology* 210(1):37-45, January 1999. **PMID: 9885584**
 53. **Bruno, M.A.**, Spear, G.S., Dietrich, R.B., Pugh, P.A. "Bile Nephrosis in a Neonate: Sonographic Echogenicity." *AJR* 159:628-630, September 1992. **PMID: 1503040**
 54. **Bruno, M.A.**, Gyepes, M.T. "Ultrasound Diagnosis of Duodenal Duplication: A Case Report." *1991 Year Book of Pediatric Radiology* 3:55-8, 1991.
2. *Accepted articles, in press (3)*
55. **Bruno, M.A.**, Mosher, T.J., Armah, K.O., Hardy, S.M., Abujudeh, H.H. “Playing Well With Others: The Challenge of Academic and Community Practice Integration, *Am J Roentgenol (AJR)*, *In Press*
 56. Brown, S., **Bruno, M.A.**, Shyu, J.Y., Eisenberg, R., Abujudeh, H.H., Norbash, A. and Gallagher, T.H. “Error Disclosure and Apology in Radiology: The Case for Further Dialogue” *Radiology*, *In press*

57. Matari, N.H, Di Marco,-Serra, G., Beidas, A-K., **Bruno, M.A.**, Abujudeh, H.H. “A Guided Survey Approach for Joint Commission Preparedness in Radiology” *Current Radiology Reports, In press*

3. *Articles Submitted (5):*

Wintermark, M., Willis, M.H., Hom, J., Franceschi, A.M., Fotos, J., Mosher, T.J., Reuss, T., Horton, R., Fredericks, N., Burleson, J., Haines, B., and **Bruno, M.A.** “Everything Every Radiologist Always Wanted (and Needs) to Know About Clinical Decision Support” *Submitted to the J of the Am Coll of Radiol (JACR), under review.*

Bruno, M.A., Huesch, M. “Rising to the Challenge of Bias in Radiology AI Systems” *Submitted to Radiology: Artificial Intelligence, under review.*

Irani, N., **Bruno, M.A.**, Saedipour, S. “Closing the Loop – A Pilot in Health System Improvement” Submitted to *Current Problems in Diagnostic Radiology, under review*

Brunner, M.C., Sheehan, S.E., Yanke, E.M., Sitig, D.F., Safdar, N., Hill, B., Lee, K.S., Orwin, J.F., Vanness, D.J., Hildebrand, J., **Bruno, M.A.**, Erickson, T.J., Zea, R. and Moberg, P. “Co-Designing Clinical Decision Support for Value-Based Advanced Shoulder Imaging.” *Submitted to Applied Clinical Informatics, under review.*

Sheehan, S.E., Safdar, N., Singh, H., Sittig, D.F., **Bruno, M.A.**, Keller, K., Kinnard, S., Brunner, M. “A combined approach utilizing trigger tools and pre-imaging checklists for the detection and remediation of misidentification errors in radiology examination ordering.” *Submitted to Applied Clinical Informatics, under review.*

4. *Books Authored / Edited (4)*

1. **Bruno, M.A.** Error and Uncertainty in Radiology. (Monograph) New York: Oxford University Press, © 2019. *Published March, 2019.* ISBN: 978-0190665396
2. Abujudeh, H. **Bruno, M.A.** Radiology Noninterpretive Skills—The Requisites, 1st Ed. With 55 contributors. Philadelphia: Elsevier Scientific Press. © 2018. ISBN: 978-0-32-346297-6
3. Abujudeh, H., **Bruno, M.A.** Quality and Safety in Radiology. With 47 contributors. New York: Oxford University Press. © 2012. ISBN: 978-0-19-973575-4.
4. **Bruno, M.A.**, Gold, G.E., Mosher, T.J. Arthritis in Color: Advanced Imaging In Arthritis. With 5 Contributors. Philadelphia: Saunders Elsevier Scientific Press. © 2009. ISBN: 978-14160-4722-3.

5. *Book Chapters (10)*

1. **Bruno, M.A.**, Hollenbeak, C.S. “Statistical Tools and Methods,” Chapter 18 in Abujudeh, H.H., Bruno, M.A. Radiology Noninterpretive Skills—The Requisites, 1st Ed. Philadelphia: Elsevier Scientific Press © 2017. Anticipated release June, 2017

2. Bhimani, C., and **Bruno, M.A.** “Error in Radiology.” Chapter 14 in Abujudeh, H.H., Bruno, M.A. Radiology Noninterpretive Skills—The Requisites, 1st Ed. Philadelphia: Elsevier Scientific Press © 2017. Anticipated release June, 2017
3. Filatova, I and **Bruno, M.A.** “Error Management and Reduction.” Chapter 15 in Abujudeh, H.H., Bruno, M.A. Radiology Noninterpretive Skills—The Requisites, 1st Ed. Philadelphia: Elsevier Scientific Press © 2017. Anticipated release June, 2017
4. **Bruno, M.A.** “Musculoskeletal Ultrasound in the Emergency Setting.” In Abujudeh, H., ed. Emergency Radiology. New York: Oxford University Press, © January, 2016 ISBN: 9780190223656
5. **Bruno, M.A.,** Abujudeh, H.M. “Chapter 77: Quality Assessment and Improvement: General Principles” in Kandarpa, K., Machan, L, and Durham, J., *Eds.*, Handbook of Interventional Radiologic Procedures, 5th edition, Philadelphia: Lippincott Williams & This was an update to Chapter 77 of the 4th Edition © 2010. Chapter revised and updated for 5th edition, © January 2016 ISBN-13: 978-1496302076
6. **Bruno, M.A.,** Gettle, L.M. “Infection Control in the Radiology Suite” Chapter 6.10 in Allen, George and Frye, C., *Ed.*, Infection Control: A Practical Guide for Health Care Facilities. New York: Wolters-Kluwer © 2014 ISBN: 9780735563209.
7. **Bruno, M.A.** “‘Real-Time’ Communications Between OR Personnel and the Radiologist in the 21st Century” in Frye, C and Brazen, L., *eds.* Perioperative Services: Administration, Resource Management and Patient Care. New York: Wolters-Kluwer, © 2014.
8. **Bruno, M.A.,** Nath, A.K., Sethu. R. “Chapter 12: Muscle and Soft-Tissue Foreign Bodies” in Dogra, V., Ed., Musculoskeletal Ultrasound with MRI and CT Correlation, New York, NY: Thieme © 2010.
9. **Bruno, MA.** 10 Case Chapters in Tehranzadeh, J. Cases: Musculoskeletal Imaging, New York: McGraw-Hill Professional, © 2009. ISBN: 978-0-07-1465427
Case chapter Titles are as follows: Chapter 1.5 (Chronic Supraspinatus Rotator Cuff Tear), pp. 12-13; Chapter 6.1 (Synovial Osteochondromatosis of the Shoulder), pp. 78-79; Chapter 14.1 (Rheumatoid Arthritis of the Hand & Wrist—Borghei, P. was coauthor for this chapter), pp. 260-261; Chapter 21.28 (Bony Metastases of Femoral Neck) pp. 418-419; Chapter 26.1 (Chronic Osteomyelitis of Tibia), pp. 532-533; Chapter 27.28 (Parosteal Osteosarcoma of Distal Femur), pp. 594-595; Chapter 35.6 (Flexion Teardrop Fracture of the Cervical Spine), pp. 764-765; Chapter 35.9 (Unilateral and Bilateral “Jumped” Facets), pp. 770-771; Chapter 37.1 (Atlantoaxial Instability in Rheumatoid Arthritis), pp. 812-813. Chapter 40.5 (Primary Hyperparathyroidism), pp. 854-855.
10. **Bruno, M.A.,** Lopez-Ben, R. “Chapter 74: Endocrine and Metabolic Bone Disease” in Radiology: McGraw-Hill Specialty Board Review. Ed.: Canon, CL. New York, NY: McGraw-Hill, © 2009. ISBN: 978-0-07-160164-1.

6. *Book reviews (7)*

1. **Bruno, Michael A.** Book Review: “MRI Normal Variants and Pitfalls” in *Radiology* 256(2):365-366, August, 2010
2. **Bruno, Michael A.** Book Review: “Ultrasound of the Musculoskeletal System” in *Radiology* 252(2):346, August 2009
3. **Bruno, Michael A.** Book Review: “Imaging of Soft Tissue Tumors, 2nd ed.” in *radiology* 247(2):344, May, 2008
4. **Bruno, Michael A.** Book Review: “Musculoskeletal Imaging: A Teaching File, 2nd Ed.” in *Radiology* 246(3):723, March 2008
5. **Bruno, Michael A.** Book Review: “Fracture Classifications in Clinical Practice” in *Radiology* 244(2):379-380, August, 2007
6. **Bruno, Michael A.** Book Review: “Musculoskeletal Imaging: A Teaching File” in *AJR* 183(5):1378, November, 2004
7. **Bruno, Michael A.** Book Review: “Guidelines and Gamuts in Musculoskeletal Ultrasound,” in *Radiology* 212(1):74, July 1999

7. *Articles published in non-peer-reviewed journals and electronic media (6)*

1. **Bruno, M.A.** “Penn State Health Innovates with Radiology ‘Failsafe’ Program” *Pennsylvania Physician*, Winter, 2018
2. **Bruno, M.A.** “Improving Communication of Test Results: The Challenge of Patient Engagement” Feature Article. *Inside Medical Liability*, January, 2016, pp 36-38
3. **Bruno, M.A.** “How Safe Are Your Patients?” *ARRS In Practice Insight* Online article publication, URL: <http://www.rrs.org/publications/inpractice/insight.aspx> Accessed November, 2015
4. **Bruno, M.A.** “A Focus on Radiology Quality & Safety.” Invited Cover Article for *Oxford Medicine Online* (OxMed). Online only; first posted January 14, 2014. <http://oxfordmedicine.com/> Accessed November, 2015
5. **Bruno, M.A.** “Imaging Arthritis” *Diagnostic Imaging* (non peer-reviewed journal) Magazine Cover Feature Article, **Vol. 24**(1):34-39, January 2002.
6. **Bruno, M.A.** “Imaging the Spine, Issues and Challenges for the 21st Century” *Diagnostic Imaging* (non peer-reviewed) **Vol. 23**(12):103-105, November, 2001.

II. Abstracts, Exhibits, Enduring Web-based Materials and Other Scholarly Presentations:

1. *Electronic Media: “Webcast” Lectures Available Online for CME and SA-CME Credit*

AJR Live! Web-lecture: “Communicating Uncertainty in the Radiology Report.” Presented as a live webcast on November 16, 2017; recorded presentation offered as an enduring educational resource for CME credit. Moderated by Dr. Howard Foreman.

“ARRS Quality & Safety Online Course” A series of SA-CME lectures offered on a fee basis for physicians for SA-CME Credit by the American Roentgen Ray Society. Date of Release: September 1, 2015. URL: http://store.arrs.org/detail.aspx?id=OC_QS15

“Quality & Safety: Mistakes We Make in Practice and how to Deal With Them.” — Webcast SA-CME lecture offered on a fee-basis for physician SA-CME Credit by the American Roentgen Ray Society. Date of Release: December 1, 2014, renewed November, 2017. [Note: This has received 2027 downloads and 480 persons have claimed CME credit to date]. URL: http://store.arrs.org/detail.aspx?id=WL1412_IC503

“Arthritis: Ultrasound and Molecular Imaging in Rheumatoid Arthritis (SAM).” Offered on a fee-basis webcast lecture for CME and SAM Credit by the American Roentgen Ray Society. Date of release: October 1, 2009. URL: <http://store.arrs.org>

“Quality Assessment and Improvement in Radiology”—Webcast CME lecture offered on a fee-basis for physician CME Credit by the American Roentgen Ray Society, Date of Release: April 15, 2008. URL: <http://store.arrs.org>

“Issues in Practice Quality Improvement,” online video commentary, part of the *J Am Coll Radiol*. “Video Extras” series, viewable online at the following URL: <http://www.jacr.org> Accessed November, 2015

2. *Comprehensive Practice Quality Improvement (PQI) Template, Available Online*

Co-creator, along with Drs. James A. Brink, John K. Crowe and Mark S. Parker, “Chest CT Radiation Exposure Reduction PQI Template.” This work is a comprehensive Quality Improvement project template designed to assist Radiologists in carrying out a practice quality improvement (PQI) project which satisfies Part IV of the American Board of Radiology Maintenance of Certification (MOC) requirements; 20 CME Credits. <http://www.arrs.org/PQI/>

3. *Abstracts, Posters and Exhibits Presented at Professional Meetings (35)*

1. Gusman, M., Bruno, M.A., Mosher, T.J., Krupinski, E.A., Egeth, H., Wyble, B., *et al.* “Radiologist Image Processing as a Model of Warfighter Perceptual Error: Neuro-ergonomics of the Human-Machine Interface” Presented at the 2019 Military Health Sciences Research Symposium (MHSRS-2019), Orlando, Florida.
2. Stratchko, L., Bruno, M.A., Walker, E. “Cognitive Bias and Errors in Radiology” Presented as electronic exhibit E2068 at the 2019 Annual Meeting of the American Roentgen Ray Society, Honolulu, HI, May, 2019

3. Moore, M., Mosher, T.J., and **Bruno, M.A.** “Program to Improve Identification of Diagnostic Discrepancies in Preliminary Overnight Radiology Resident Reports on Trauma patients” Presented at the 11th Annual International Conference on Diagnostic Error, New Orleans, LA November 6, 2018
4. Chan, T., **Bruno, M.A.** “Optimal Utilization of the Portable Chest Radiograph in the Critical Care Setting” Presented by Dr. Chan at the 102nd Annual Meeting of the Pennsylvania Radiological Society September 9, 2017 in Philadelphia, PA and also presented by Dr. Bruno at the ACR Annual Quality & Safety Meeting October 13, 2017 in Boston, MA. An updated version of this abstract was also presented by Dr. Chan at the 118th Annual Meeting of the American Roentgen Ray Society on April 22, 2018 in Washington, DC, as Abstract #1139.
5. Armstrong, A., Ostrov, B.E., Munion, R., **Bruno, M.A.**, Riley, T.D., Wolfe, H. and Gonzalo, J. “An Innovative Institution-Wide Curriculum for Health Systems Science in Graduate Medical Education: Training “Systems-Ready” Physicians.” Presented at “Ed Venture” Penn State Health, April 19, 2018
6. Sheehan, S.E., Brunner, M., **Bruno, M.A.**, Safdar, N., and Singh, H. “Detecting Patient Misidentification Errors in Diagnostic Radiology Exam Ordering.” Presented by Dr. Sheehan at the 9th Annual International Conference on Diagnostic Error in Medicine, of the Society to Improve Diagnosis in Medicine (SIDM), October 2017, Boston MA.
7. Kristinsson, O.G., Scalzi, L.V., **Bruno, M.A.**, French, C., Chinchilli, V.M. and Groh, B. “Use of Ultrasound to Determine Remission Status in Children with Juvenile Idiopathic Arthritis.” Poster Presentation for the 2017 American College of Rheumatology/ARHP Pediatric Rheumatology Symposium (PRSYM), Houston TX, May, 2017
8. Chetlen, A.L., Stratchko, L., Amos, B., Methratta, S.T., **Bruno, M.A.**, and Beatty-Chadha, J. “Let’s Talk: Teaching Provider-to-Provider Communication.” Poster presentation for the 2017 Penn State Hershey EdVenture Conference, April 4, 2017
9. Smith, T., **Bruno, M.A.**, Mosher, T.J. “Variability in Emergency Department Utilization of Lumbar Spine MRI for Evaluation of Low Back Pain: How Much Inappropriate Imaging is Being Done, and for What Reasons.” Oral Presentation by Dr. Smith at the 2016 Annual Meeting of the Radiological Society of North America (RSNA), Chicago, IL on November 28, 2016 as Abstract #16011360
10. Sarwani, N.I. Mrozowski, S., **Bruno, M.A.** “Improving Access to Pediatric MR Performed Under General Anesthesia – Benefits of a Rapid Improvement Event (RIE).” Presented by Dr. Sarwani at the 2016 Annual Meeting of the Radiological Society of North America (RSNA), Chicago, IL, on November 27, 2016 as Abstract #16007633
Winner, Quality Storyboard Award
11. Nasereddin, M., Bartolacci, M., and **Bruno, M.A.** “Minimizing Radiology Error By Improving Staff Scheduling” Oral presentation by Dr. Nasereddin at the 2016 *INFORMS* Conference, Nashville, TN, on November 12, 2016 as Abstract #WC-80-3.

12. Chan, T., **Bruno, M.A.**, Mosher, T.J., Abendroth, T. “Optimizing the Utilization of Portable Chest Radiographs in the ICU Setting.” Scientific Exhibit presented as an e-poster by Dr. Chan at the ACR Annual Conference on Quality and Safety, Boston, MA, on September 16 – 17, 2016.
13. Geeting, G., **Bruno, M.A.**, Beck, M., Caputo, G. Mahraj, R., Hollenbeak, C.C. “Computerized Decision Support for Utilization of CT Angiography for Suspected Pulmonary Embolism.” Presented by Dr. Geeting at the 20th Institute for Healthcare Improvement (IHI) Scientific Symposium, Orlando FL, on December 8, 2014.
14. **Bruno, M.A.**, Thomas, J.M., Mohr, M.J., Bell, S.K., Brown, S.D. “The Radiologist’s Report in the Era of the Patient Web Portal: Addressing the Quality of Written Communications When Radiology Reports Are an ‘Open Letter’” Presented at the 2014 ACR Quality and Safety Meeting, February 14-15, 2014, in Scottsdale, AZ
15. Petscavage, J.M., **Bruno, M.A.**, Eggli, K.D. “Failsafe – A Novel Strategy That Promotes Active Involvement Of Patients In Their Own Care” Presented at the poster session of the 2013 ACR Annual Conference on Quality and Safety, Scottsdale, AZ, Feb 15-16, 2013.
16. Petscavage, J.M., **Bruno, M.A.**, Eggli, D.F., Yanchuck, T. "Outcomes of an Integrated Automated Peer Review System for Quality Assurance of Radiologist Performance." Accepted for presentation at the Society for Imaging Informatics in Medicine (SIIM), Orlando, Florida, June 8, 2012.
17. Petscavage, J.M., Kaneda, H., **Bruno, M.A.** “Benefits of an Education Program for Radiology Technologists in Prevention and Management of Adverse Effects to Contrast Media.” Presented by Dr. Kaneda as Abstract #1521 at the American Roentgen Ray Society (ARRS) Annual Meeting, Vancouver, BC, April 30, 2012.
18. **Bruno, M.A.**, Showalter, M.M., Mahraj, R.P.M., Eggli, K. “Developing an Evidence-Based Interdisciplinary Program to Optimized Utilization of CT Scans for Pulmonary Embolism in an Academic Medical Center.” Presented at the American College of Radiology (ACR) Conference entitled “Maximizing Value in Radiology through Quality & Safety Improvements,” Phoenix, AZ, October 23, 2010.
19. Otto, N.P., **Bruno, M.A.** “Counting the Cost: Resource Overutilization Due to Duplication in Trauma Imaging.” Presented by Dr. Otto (Resident) as Poster #34 at Penn State Hershey Medical Center Resident/Fellow Research Day, March 19, 2010.
20. Tappouni, R., Sarwani, N.I., **Bruno, M.A.** “What Does The ‘Customer’ Really Want? How Do Clinicians Read the Radiology Report and What Are Their Preferences Regarding Communication of Unexpected Findings: A Survey of Academic Center Staff Physicians.” Presented by Dr. Tappouni at the 2009 Radiological Society of North America Meeting in Chicago, IL, on December 1, 2009 as paper #SSJ11-03.
21. McDevitt, P., **Bruno, M.**, Riley, T. “Translating the Reported Ultrasound Liver Size to the Physical Exam Liver Size.” Presented by Dr. McDevitt at the American College of Gastroenterology Annual Meeting in San Diego, CA, October 24, 2009.

22. Durvesh, S., Pichardo-Lowden, A., Douglas S., Todd W., **Bruno, M**, Goldenberg, D. Anaplastic Thyroid carcinoma in a young woman: A rare case of survival. Presented at the World Congress on Thyroid Cancer, Toronto Canada, August 1, 2009.
23. **Bruno, M.A.**, Dykes, T.D., Eggli, K.D. “Novel Use of the ACR e-Radpeer System to Track Resident Overnight Discrepancies in an Academic Department of Radiology: How We Did it, and How Well it’s Working for us.” Association of University Radiologists (AUR) 57th Annual Meeting, Arlington, VA on May 13, 2009; Paper #SS02-11.
24. Tappouni, R.F., **Bruno, M.A.**, Sarwani, N. “After-Hours Faculty Coverage in Academic Institutions in the United States and Canada.” Presented by Dr. Tappouni at the AUR 55th Annual Meeting, Denver, CO on April 26, 2007 as Paper #SS05-38.
25. Syed, Z.A., Guelfgat, M., **Bruno, M.A.** “Giant Cell Tumor of the Tendon Sheath Arising from the Posterior Cruciate Ligament of the Knee: MR Findings with Review of the Literature” Presented by Dr. Guelfgat at the Program of the 29th Annual Meeting of the Society of Skeletal Radiology, Palm Desert, CA., March, 2005.
26. Hopper, K.D., Kunselman, M.A., **Bruno, M.A.**, *et. al.* “CT Colonoscopy in a Large Screening Population” Radiology Suppl. **225**(P). RSNA 2002 Scientific Exhibit (Poster Presentation), November 2002.
27. Hopper, K.D., Kunselman, M.A., **Bruno, M.A.**, *et. al.* “A Comparison of Mucosal Visualization using Auto-Navigation vs. Manual Navigation with Extensive Look Around for CT Colonoscopy” Radiology Suppl. **225**(P), RSNA 2002 Scientific Exhibit (Poster Presentation), November 2002.
28. Blebea, J.S., LaRusso, S., Meilstrup, J., **Bruno, M.A.**, *et. al.* “Ultrasound-Guided Biopsies of Musculoskeletal Tumors: Comparison of fine-needle aspiration and core biopsy Techniques.” Presented by Dr. Blebea at the Radiological Association of North America (RSNA) 86th Annual Meeting, Chicago, IL, November, 2000.
29. **Bruno, M.A.**, Fuchs, H.A. “Quantification of Amplitude Color Doppler (ACD) Ultrasound for Assessment of Rheumatoid Arthritis: Preliminary Findings and Description of a New Technique.” Presented at the Special Scientific Session of the 27th Annual Meeting of the International Skeletal Society, Barcelona, Spain September 10, 2000.
30. **Bruno, M.A.**, Fuchs, H.A. “Mechanics’ Hands: A Variant of Rheumatoid Arthritis? Clinical and Imaging Findings Including Amplitude Color Doppler Ultrasound” Presented by Dr. Bruno at the Program of the 23rd Annual Meeting of The Society of Skeletal Radiology, Scottsdale, AZ, March 2000.
31. Pickens, D.R., Price, R.R., **Bruno, M.A.**, Partain, C.L., Riddle, W.R., Partain, L. “Clinical and Physical Evaluation of an Amorphous Silicon X-Ray Imaging System Suitable for Extremity Imaging.” Poster Exhibited at the RSNA 85th Scientific Assembly and Annual Meeting, Chicago IL, November, 1999 as exhibit #0125PH.

32. **Bruno, M.A.**, Pickens, D.R., Price, R.R., Partain, L., Batts, M., Gilblom, D. "Clinical Performance of a Novel Amorphous Silicon Digital X-Ray Sensor: Preliminary Results." *AJR Suppl.*172(3):201, 1999. Poster Exhibited at the 99th Annual Meeting of the American Roentgen Ray Society, New Orleans, LA, May, 1999.
33. **Bruno, M.A.**, Fuchs, H.A., Donnelly, E.F., Kepple, D.M., Nance, E.P., Fleischer, A.C. Amplitude Color Doppler Sonography (ACDS) In Assessment of Rheumatoid Arthritis and Related Disease – Preliminary Findings. Presented by Dr. Bruno at the Program of the 21st Meeting of The Society of Skeletal Radiology, Palm Springs, CA, March, 1998.
34. **Bruno, M.A.**, Milne, E.N.C., Stanford, W.S. "Pulmonary Oligemia: Film Reader Reliability with Special Reference to Oligemia in Aortic Stenosis" *AJR Suppl* 160 (4):96, 1993. Presented by Dr. Bruno at the 93rd Annual Meeting of the American Roentgen Ray Society, San Francisco, CA, May, 1993.
35. **Bruno, M.A.** "Exogenous Antibodies to Neural Cell Adhesion Molecule in Xenopus Neural Tissue are no longer Detectable after Three Days." Abstract published in *Clinical Research* 34(1):68A, January, 1986.

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