

Brian D Kavanagh, MD, MPH, FASTRO
University of Colorado School of Medicine
CURRICULUM VITAE
January, 2020

1. Current Position

Professor & Chair
Department of Radiation Oncology
University of Colorado School of Medicine
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Medical Director, Radiation Oncology
Rocky Mountain Gamma Knife at the University of Colorado Hospital

2. Education

- Tulane University School of Engineering, 1980-84
 - Bachelor of Science in Engineering, 1984, *summa cum laude*, with Departmental Honors in Biomedical Engineering
- University of London, 1982-83
 - The Imperial College of Science & Technology, Department of Mechanical Engineering, exchange student program
- Tulane University School of Medicine, 1984-88
 - Doctor of Medicine, June, 1988
- Tulane University School of Public Health & Tropical Medicine, 1984-88
 - Master of Public Health, May, 1988
- The Charity Hospital of Louisiana, 1988-89
 - Internship, Tulane University Department of Internal Medicine
- Duke University Medical Center, 1989-93
 - Residency in Radiation Oncology

3. Academic appointments

- Colorado State University, School of Veterinary Medicine
 - Department of Environmental and Radiological Health Science
 - Affiliate Faculty, 2010-present
- University of Colorado School of Medicine
 - Department of Radiation Oncology
 - Associate Professor, 2001-2007
 - Vice-Chair & Clinical Practice Director, 2001-2014
 - Professor, 2007-present
 - Interim Chair, 2014-2015, Chair 2016-present

- Medical College of Virginia, Virginia Commonwealth University
 - Department of Radiation Oncology
 - Assistant Professor, 1993-1999
 - Associate Professor, 1999-2001

4. Hospital, government or other professional positions

- Attending Physician, Medical College of Virginia Hospitals, 1993-2001
- Attending Physician, University of Colorado Hospital, 2001-present
- Consulting Physician, Denver Health Medical Center, 2001-present
- Allos Therapeutics, Inc., Scientific Advisory Board, 2006-7
 - i. Scientific Expert Testimony to the FDA Oncology Drug Advisory Committee (ODAC), 2006
- Investment/Legal Advisory or Ad Hoc Consulting positions:
 - i. Medacorp, Inc.; Medpanel, Inc.; The Greely Corporation, Inc.; Clinical Advisors, LLC; Vista Research, Inc.; Gerson Lehrman Group, Inc., Investment Advisory Board [GLG Scholars Top 20% rating among consultants based on client evaluations]
 - ii. *NOTE: Per COI rules for ASTRO Board members, all industry consulting relationships were voluntarily discontinued in 2011*

5. Honors, special recognitions, and awards

- National Merit Scholar, 1980
- Tulane Engineering School Merit Scholarship, 1980-84
- Tau Beta Pi (National Engineering Honor Society), 1983-84
- Bachelor of Science in Engineering, 1984, *summa cum laude*, with Departmental Honors in Biomedical Engineering
- Delta Omega (National Public Health Honor Society), 1988
- American Society for Therapeutic Radiology and Oncology (ASTRO) Resident Research Paper Award Runner-up
 - travel grant to ASTRO meeting, 1992
- American Cancer Society Clinical Oncology Fellow, 1992-93
- American Society for Therapeutic Radiology and Oncology (ASTRO)- European Society for Therapeutic Radiology and Oncology (ESTRO) Exchange Fellowship, Aarhus, Denmark, 1998
- RSNA Certificate of Merit Award, Annual Meeting, 1998
- Certificate of Merit, Annual Meeting, American Roentgen Ray Society, 1999
- Keynote Speaker, “The Emerging Role of Stereotactic Body Radiation Therapy: A new Era of Radiation Oncology Practice”, 38th Annual San Francisco Radiation Oncology Conference, April, 2005
- Opening Plenary Session Lecture, Annual Meeting of the American College of Radiation Oncology, Orlando, Florida, February, 2006, “Stereotactic Body Radiation Therapy”

- Association of Residents in Radiation Oncology Teacher of the Year Award, University of Colorado, 2006-7
- Senior Author, Certificate of Merit, ASTRO Annual Meeting, 2006 (top resident poster discussion award), “Improved Local Control Associated With Dose-Escalated Stereotactic Body Radiation Therapy (SBRT) Indicates Dose-Response Relationship”
- Closing Keynote Address, “The Expanding Roles of SBRT and Hypofractionation: *Measured Steps Toward a New Practice of Radiotherapy*”, 40th Annual San Francisco Radiation Oncology Conference, April, 2009
- Senior author, 1st place Resident Poster Viewing Recognition Radiation Physics, ASTRO Annual Meeting, Miami, FL, 2011, “Evaluation of Rectal Interfractional Dosimetric Variation using Balloon Immobilization during Volumetric Modulated Arc Therapy for Stereotactic Body Radiation Therapy of the Prostate”
- Co-author, “Best in Physics” Paper selection, ASTRO Annual Meeting, Miami, FL, 2011, “Density Changes and Deformation in Normal Lung Tissue outside High Dose Regions after Stereotactic Body Radiation Therapy”
- Elected to *Best Doctors*, 2011
- Editor’s Pick, Jan. 2012, *Medical Physics* (featured on cover of issue): Diot Q, Kavanagh BD, Timmerman RD, Miften M. Biological-based optimization and volumetric modulated arc therapy delivery for stereotactic body radiation therapy. *Med. Phys.* 2012; 39: 237-245
- *5280 Magazine*, Annual Top Doctors List, 2012
- Canadian Association of Radiation Oncology Annual Meeting, Best Abstract in Science and Technology Award, 2012, “NTCP Modeling of Radiographic Changes in Normal Lung Tissue after Conventional or Hypofractionated Radiation Therapy”, co-author (first author D Palma)
- 4th Annual Roger Potish Lectureship, University of Minnesota, 2013
- Plenary Lecture, 1st India Cancer Congress, New Delhi, November 2013
- Fellow of the American Society for Radiation Oncology (ASTRO), 2014
- Guest Editor, *Journal of Clinical Oncology*: ASCO 50th Anniversary Special Series Issue on Radiation Oncology, 2014
- *5280 Magazine*, Annual Top Doctors List, 2015
- Guest Editor, *The Cancer Journal*, Special Issue on Stereotactic Radiation, July/August 2016
- Keynote Address, 30th Annual Meeting of the Chinese Society for Therapeutic Radiology and Oncology (CSTRO), Chengdu, Sichuan Province, 2016
- Keynote Address, 2nd Annual UK SABR Consortium, Birmingham, England, November 2016
- Keynote Speaker, UCLA Symposium, Integrating State-of-the-Art Innovations into Clinical Radiation Oncology Practice, David Geffen School of Medicine, June, 2017
- Presidential Address, 2017 ASTRO Annual Meeting, “*Effort’s Bounty* and Other Imaginings of Past and Future”, San Diego, September, 2017
- Keynote Address, 2018 Stereotactic Ablative Radiotherapy (SABR) Symposium, Peter MacCallum Cancer Center, Melbourne, Australia, November, 2018.

- Keynote Address, 2019 Radiosurgery Society Meeting, San Diego, Ca, January, 2019.
- The Annual Malcolm Bagshaw Lecture, Stanford University, March, 2019.
- The Annual Dale Kubo Lecture, UC Davis, June 2019.
- JASTRO Presidential Symposium, Plenary Lecture, 32nd Annual meeting of the Japanese Society for Radiation Oncology, Nagoya, Japan, November, 2019.

6. Membership in professional organizations

- American Society for Radiation Oncology
- American Society of Clinical Oncology
- Radiation Research Society, 1995-2005
- International Society of Stereotactic Radiosurgery (ISRS)
- American Medical Association
- American College of Radiology

7. Major Committee and Service Responsibilities

- Medical College of Virginia
 - MCV/VCU Graduate Medical Education Committee, 1994-96
 - Radiation Oncology Residency Training Director, 1994-96
 - Massey Cancer Center
 - Clinical Trial Review Committee, 1994-2000
 - Chair, Massey Cancer Center Tumor Board, 1997-98
 - Biostatistics Core Laboratory oversight committee, 2000-1
 - Chair, Protocol Review and Monitoring System Committee, 2001
 - MCV Hospital Radiation Safety Committee, 1998-2001
 - Community Memorial HealthCenter, South Hill, Cancer Committee, 1999-2001
 - MCV Hospital/MCV Physicians Managed Care Committee, 1999-2001
- University of Colorado Hospital and School of Medicine
 - UCH Practice Operations Committee
 - Clinical Practice Director, Department of Radiation Oncology, 2001-2014
 - Colorado Multiple Institution Review Board (COMIRB), member, Panel D, 2005-7
 - UCH Medical Board, 2014-present
 - UC SOM Executive Committee, 2014-present
- University of Colorado Cancer Center (UCCC)-related activities
 - UCCC Protocol Quality and Assurance Committee
 - UCCC Clinical Investigations Core PI Advisory Committee
 - Chair, UCCC Protocol Review and Monitoring Committee, 2004-2008
 - PRMS Executive Committee, 2017-present
- American Board of Radiology, Task Force for Written Board Exam
 - New Item Development, Medical Ethics, 2000

- New Item Development, Biostatistics and Clinical Trials, 2001-5
- American Society for Therapeutic Radiology and Oncology (ASTRO)
 - Communications Committee, 2005-9
 - Health Policy Council, selected activities:
 - Regulatory Committee, Local Carrier Determination Work Group, 2006-8
 - Co-Chair, ASTRO HPC SBRT/SRS Workgroup, 2006-8
 - ASTRO AMA Relative Value System Update Committee (RUC) 5 Year Review Task Force, 2005-6
 - ASTRO AMA Relative Value System Update Committee (RUC) 5 Year Review Task Force, 2005-6
 - ASTRO AMA RUC Advisory Panel Meeting, Scientific Expert Consultant Presenter for CPT valuation of SBRT
 - April, 2006, Chicago, IL
 - February, 2011, Naples, FL
 - ASTRO Special Expert Representative to the AMA CPT Editorial meeting, October, 2008, Chicago, IL
 - Special Workshop on Proposed CPT Code Changes, Dallas, January, 2009
 - Vice-chair, Regulatory Committee, 2010
 - Chair, Regulatory Committee, 2011-
 - Member, Code Development and Valuation Committee, 2010-
 - CPT code 77427 special task force member
 - ASTRO Clinical Affairs and Quality Committee
 - Member, SBRT Q/A White Paper Committee
 - ASTRO Government Relations Council
 - ASTRO Congressional Advocacy Day Participant, 2004-2009
 - ASTRO Grassroots Action Committee, 2006-present
 - Grassroots State Captain, Colorado, 2007-12
 - ASTRO-American College of Radiology Collaborative Committee to create a Practice Guideline for Intensity-Modulated Radiation Therapy (IMRT), 2006-9
 - ASTRO/ACR Guide to Radiation Oncology Coding Workgroup, 2007
 - ASTRO/ACR IGRT Guideline Taskforce, 2007-8
 - ASTRO/ACR SBRT Guideline Taskforce, 2008-9
 - Co-author, ASTRO response to the California Technology Assessment Forum (CTAF) regarding its position on SBRT
 - ASTRO IMRT IGRT SBRT Symposium, Las Vegas, March 2011
 - Organizing Committee Member
- **ASTRO Board of Directors**
 - Chair, Health Policy Council, 2011-2015
 - Chair, Payment Reform Task Group
 - President-elect, 2015-2016
 - President, 2016-2017
 - Chair, 2017-2018
 - Immediate Past-chair, 2018-2019

- American Association of Physicists in Medicine (AAPM)
 - Task Group 101, Stereotactic Body Radiation Therapy, 2004-2011
 - AAPM Working Group on SBRT, steering committee
- ASTRO-AAPM QUANTEC Project (QUAntitative estimates of Normal Tissue Effects in the Clinic), 2007-2009
 - Upper Abdomen Site Leader (Liver, Kidney, Stomach/Small intestines)
- Agency for Healthcare Research and Quality (AHRQ), 2009
 - Expert Reviewer, Technical Brief EHC-2009-02-0013 Stereotactic Radiosurgery for Non-brain Cancer
- Centers for Medicare and Medicaid Services
 - Medicare Evidence Development & Coverage Advisory Committee (MEDCAC), 2015-
 - Ambulatory Payment Classification (APC) Advisory Panel, 2010-14
 - Revised committee name, 2012: Hospital Outpatient Payment Advisory Panel (HOP)
- National Comprehensive Cancer Network (NCCN)
 - Policy Advisory Group, 2014-
- ASTRO-AANS SRS Registry
 - Board of Directors, 2014-7
- Organizing Committee, ASTRO/NCI/AAPM Workshop: Exploring Opportunities for Radiation Oncology in the Era of Big Data, NIH Campus, August 2015
- Radiation Oncology Institute
 - Board of Directors, 2018-19
- Association for Residents in Radiation Oncology (ARRO)
 - Faculty Advisor, 2019-

8. Licensure and board certification

- American Board of Radiology, Radiation Oncology, 1993
- Colorado State Medical License, 2001-present
- DEA License, current
- National Cancer Institute Registered Investigator

9. Inventions, intellectual property and patents held or pending

- Modular, low cost transmission line accelerator (with D Westerly, Q Diot)
 - Disclosure filed with CU Innovations June 2016
- A compact, horizontal cone beam CT scanner (with C Altunbas, Y Vinogradskiy)
 - Disclosure filed with CU Innovations May 2017

10. Review and referee work

- Associate Senior Editor, *International Journal of Radiation. Oncology Biology Physics*, 2011-2016
- Radiation Therapy Section Editor, *UpToDate* online medical reference service, 2005-

- 2015
- Senior Editor, *Journal of Radiosurgery and SBRT*, 2011-
 - Ad hoc reviewer for the following journals:
 - *Radiation Oncology Investigations, Oncology Research, Journal of Clinical Oncology, Annals of Surgery, The Lancet, Cancer Research, PharmacoEconomics, Medical Physic, American J of Clinical Oncology, Radiotherapy and Oncology*
 - Abstract reviewer for scientific meetings:
 - ASTRO Annual Meeting, 2003-5
 - ISRS Meeting, 2007
 - Cancer League of Colorado
 - Scientific Advisory Board, 2008-9
 - **Federal Study Sections Reviewer service:**
 - PAR-16-089, <http://grants.nih.gov/grants/guide/pa-files/PAR-16-089.html>, Imaging and Biomarkers for Early Detection of Aggressive Cancer (U01), May, 2018
 - PAR-18-011, <https://grants.nih.gov/grants/guide/pa-files/PAR-18-011.html>, Early Phase Clinical Trials in Imaging and Image-Guided Interventions, May, 2018

11. Invited extramural lectures, special presentations, and visiting professorships

- “Current topics in the Management of Locally Advanced Cervical Carcinoma”, Visiting Fellow Symposium, Dept. of Oncology, Aarhus University Hospital; Aarhus, Denmark, September, 1998
- “Altered Fractionation Schemes in the management of Cervical Cancer”, at the symposium “Gynecologic Malignancies: An Update”, Duke University Medical Center, Durham, NC, February, 2000
- “Chronicle of a drug foretold: the story of RSR13”, Duke University Dept. of Radiation Oncology Grand Rounds, Durham, NC, February, 2001
- “Current Controversies in the Combined Modality Management of Esophageal Cancer”, 7th Annual Oncology Symposium, Memorial Hospital of Martinsville, Virginia, 2001.
- “Analyzing a new application of Intensity-Modulated Radiotherapy: the case of locally advanced cervix cancer”, University of Colorado, 2001
- “The MCV experience in applying IMRT for cervix cancer”, 6th International Symposium on 3D-CRT and IMRT, Williamsburg, VA, June, 2001.
- Invited speaker, Indiana University ESR Symposium, Niagara Falls, May, 2002.
- “Radiation Therapy and its Effects”, National Brain Tumor Foundation Conference, September, 2002.
- “Radiosensitization by RSR13”, Radiation Oncology Academy of Indiana Annual Educational Meeting, Indianapolis, Indiana, November, 2002.
- Invited Speaker, UC-Denver Math/Science Initiative, July, 2003

- “Solutions to Tumor Hypoxia in Clinical Cancer Therapy”, ASTRO Satellite Educational Symposium, Salt Lake City, 2003.
- Invited speaker, 2nd International SBRT symposium, Nova Scotia, May, 2003.
- “The Science of RSR13”, Food and Drug Administration Oncologic Drugs Advisory Committee (ODAC), Gaithersburg, MD, May, 2004
- “Radiation Therapy for Prostate Cancer,” Rocky Mountain Society of Urologic Nurses and Associates, August, 2004.
- “Stereotactic Body Radiation Therapy (SBRT): Dosimetric Considerations”, University of Colorado Medical Dosimetrist and Radiation Therapist Conference, Denver, Colorado, October, 2004.
- “Progress in Prostate Cancer, 2004”, University of Colorado ASTRO Review Course, January, 2005.
- Keynote Speaker, “The Emerging Role of Stereotactic Body Radiation Therapy: A new Era of Radiation Oncology Practice”, 38th Annual San Francisco Radiation Oncology Conference, April, 2005.
- Invited speaker, Stereotactic Body Radiation Therapy: State of the Science, Dallas 2005
- University of Virginia, “SBRT for Liver Metastases”, 12th International Conference on GI Tumors, Charlottesville, Virginia, October, 2005.
- American College of Radiation Oncology, Annual Meeting, February, 2006, Orlando, FL. Plenary Session I, Opening Lecture, “Stereotactic Body Radiation Therapy”.
- **Visiting Professor, Baylor Medical College**, March, 2006, “Tumor Hypoxia and Efavoxiral” and “Stereotactic Body Radiation Therapy”
- **Visiting Professor, UT-Southwestern**, April, 2006, “Clinical and Translational Research in Stereotactic Body Radiation Therapy at the University of Colorado”
- Invited speaker, 5th International SBRT symposium, Dallas, Texas, May, 2006. “Translational Research in Stereotactic Body Radiation Therapy: Converging Two Ends of the Spectrum”
- **Visiting Professor, SUNY-Stony Brook**, May, 2006, “The Oncology, Radiobiology, and Deontology of Stereotactic Body Radiation Therapy”.
- **Visiting Professor, University of New Mexico**, June, 2006, “The Past, Present, and Future of Stereotactic Body Radiation Therapy”.
- Loyola University, Chicago, Annual Fall Conference, “Targeted and Tailored Therapies in Hematology/Oncology”, invited speaker, September, 2006.
- Mid-Atlantic Society of Radiation Oncology (MASRO) Annual Meeting, Invited Speaker on SBRT, Washington, DC, October, 2006.
- Memorial Hermann Hospital System, Houston, TX, Invited Speaker, Inaugural Annual Fall Cancer Conference, November, 2006.
- University of Maryland, Annual Thoracic Oncology Conference, Cambridge, Maryland, November, 2006
- World Congress of Interventional Oncology, 2007, Invited Speaker

- **Visiting Professor, Tufts University** Department of Radiation Oncology, August, 2007
- University of Groningen, SBRT Symposium, Groningen, Netherlands, November, 2007
- **Visiting Professors, Erasmus Medical Center**, Rotterdam, Netherlands, Department of Radiation Oncology, November, 2007
- American College of Radiation Oncology 2008 Annual meeting, Invited Speaker, February, 2008
- North Central Cancer Treatment Group Annual Meeting, Invited Lecture, Mayo Clinic, Rochester, Minnesota, April, 2008
- **Visiting Professor, Virginia Commonwealth University** Department of Radiation Oncology, June, 2008
- **Visiting Professor, University of Florida** Department of Radiation Oncology, September, 2008
- Boston University Medical Center, 2nd Annual Department of Radiation Oncology Lecture Series: Advances in Stereotactic Radiosurgery, Invited Speaker, Boston, MA; September, 2008
- 20th Annual Fall Foliage Cancer Conference, Wake Forest University SOM CME, Invited Speaker, Asheville, NC; October, 2008
- **Visiting Professor, University of Louisville** Department of Radiation Oncology, December, 2008
- Invited Speaker, Perspectives in Lung Cancer, 2009 Lung Cancer Symposium, Duke University CME, Charleston, SC, January, 2009
- 40th San Francisco Radiation Oncology Conference 2009, April, 2009
 - 1) “Management of Tumor Motion: Recommendations for Current Practice”
 - 2) Closing Keynote address, “The Expanding Roles of SBRT and Hypofractionation: *Measured Steps Toward a New Practice of Radiotherapy*”
- ASTRO IGRT/SBRT Practical Course, Invited Faculty, Miami, FL, May, 2009, “Liver SBRT”
- **Visiting Professor, City of Hope Medical Center**, Duarte, CA, August, 2009
- **Visiting Professor, St. Agnes Medical Center**, Fresno, CA, October, 2009
- Course Faculty, 15th Annual Kakuna-o-ka-la Radiation Oncology Conference, Maui, HI, February, 2010
 - 5 lecture series on Medical Physics and Clinical Issues in SBRT
- **Visiting Professor, Queens Medical Center**, Honolulu, HI, July, 2010
- Future of Radiation Medicine Symposium, UCLA CME program, Phoenix, AZ, February, 2011, “Novel Radiobiology, New Clinical Opportunities in SBRT”
- American College of Radiation Oncology 2011 Annual meeting, Invited Speaker, February, 2011

- 1) “Stereotactic Body Radiation Therapy (SBRT) for Early Stage Lung Cancer”, didactic session and interactive case review session
 - 2) “Nuts and Bolts of SBRT for Residents”, resident educational session
- Fourth Annual International Symposium on Stereotactic Body Radiation Therapy and Stereotactic Radiosurgery, Cleveland Clinic Foundation, Orlando, FL, February, 2011, “SBRT for Prostate Cancer”
 - International Symposium Stereotactic Body Radiation Therapy for Liver Tumors, Erasmus University Medical Center, Rotterdam, Netherlands, March, 2011, “Qualitative and Quantitative Imaging Changes in Tumor and Normal Tissue After Lung, Liver, and Spine SBRT: Implications for Response Evaluation”
 - **Visiting Professor, University of Pennsylvania** Department of Radiation Oncology, Philadelphia, April, 2011; “100 Years of Radiotherapy: Now where do we go?”
 - Invited lecture, Rocky Mountain Chapter of the AAPM, Annual Meeting, Boulder, June, 2011; “Current SRS and SBRT Clinical Evidence”
 - The Tatar Family Foundation’s Cancer Symposium on Oligometastatic Disease, “Stereotactic Body Radiation Therapy (SBRT) and Radiosurgery for Oligometastatic Disease”, Kettering Medical Center/Sinclair Community College, Dayton, Ohio, Sept, 2011
 - Internal Medicine Grand Rounds, Presbyterian-St. Luke’s Hospital, “Stereotactic Body Radiation Therapy (SBRT) for lung cancer: where did it come from, where is it going?”, Denver, CO, October, 2011
 - Invited Speaker, XI Curso de Radioterapia de Última Geração e Controle da Qualidade, Hospital Sirio Libanês, Sao Paulo, Brazil
 - 1) SBRT: Basic Technical and Safety Issues and Clinical Outcomes in Early Stage Lung Cancer
 - 2) Radiobiological Aspects of SBRT and a Review of Non-lung SBRT Outcomes
 - 3) Emerging Opportunities to Expand the Role of SBRT in New Indications
 - Stanford University SBRT Symposium, Invited Lecture: “Clinical Utility of SBRT: The Physician’s Perspective”; December, 2011
 - American College of Radiation Oncology 2012 Annual meeting, Invited Speaker, Annual Meeting, Ft. Myers, FL, February, 2012, “Liver SBRT”
 - Fifth Annual International Symposium on Stereotactic Body Radiation Therapy and Stereotactic Radiosurgery, Cleveland Clinic Foundation, Orlando, FL, February, 2012, “SBRT for Prostate Cancer”
 - **Visiting Professor, University of Maryland**, February 2012
 - **Visiting Professor, University of North Carolina**, March 2012
 - **Visiting Professor, Mayo Clinic**, Rochester, MN, April 2012
 - New Frontiers in Cancer Treatment: A Focus on Photon and Carbon Ion Radiation Therapy, Fostering International Collaboration between Japan and the United States, “Recent observations in normal tissues after high dose per fraction radiation: clinical and biological implications”; CSU, April, 2012

- American Radium Society, invited lecture, “SBRT for Oligometastatic Disease After Biologic Therapy”, Las Vegas, April, 2012
- Keynote Speaker, Veterinary Society of Surgical Oncology, “Cranial radiosurgery and SBRT: past, present and future”. Ft. Collins, May, 2012
- The Lahey Clinic, Grand Rounds, “Zooming in and out: Stereotactic Body Radiation Therapy and Screening for Early Stage Lung Cancer”, Burlington, MA, July, 2012
- ASTRO-ASCO Multi-Disciplinary Symposium in Thoracic Oncology, “Role of Local Therapy in Management of Oligometastases”, September, 2012
- ASTRO Annual meeting, Scientific Panel, “Fractionation Schemes for SRS and SBRT and Outcome Data: Empirical Dose-Effect Observations”, Boston, November 2012
- Los Angeles Radiological Society Mid-Winter Meeting, Los Angeles, January, 2013, Invited Speaker,
 - SBRT for Lung Cancer: Technical and Clinical Update
 - SBRT for Non-Lung Primary Malignancies: Pancreas, Liver, Prostate
 - SBRT in the Management of Oligometastatic Cancer
- **Visiting Professor, Kaiser Permanente Medical Center**, Los Angeles, CA, January, 2013; “Radiation Oncology: A Crazy History, an Unknown Future”
- Grand Rounds Lecture, “Stereotactic Body Radiation Therapy: An evolution from harebrained schemes to well-aimed beams, in 4 chapters”, Memorial Hospital, Colorado Springs, CO, February 2013
- Lynn Cancer Institute, 14th Annual Sun, Sand, and Seeds: New Frontiers in Prostate Cancer; “Evolving Strategies for SBRT for Prostate Cancer”; March, 2013, Boca Raton, FL
- International Association for the Study of Lung Cancer (IASLC) Webinar, “Motion Management for Stereotactic Body Radiotherapy”, April, 2013
- **Visiting Professor, University of Minnesota**, 4th Annual Roger Potish Lectureship, May 2013: “Radiation Oncology: A Crazy History, an Unknown Future”
- “Recent observations in normal tissues after high dose per fraction radiation: clinical and biological implications”; Advanced Radiation Oncology Treatment Strategies with Photon, Proton, and Carbon Radiation; CSU-UC-NIRS Joint Symposium, Aurora, CO, August 2013
- “An Overview of the ASTRO Payment Reform Initiative”; ASTRO Annual Meeting, Health Policy Panel, Atlanta, 2013
- “Role of Ablative Local Therapy in Oligometastatic Disease” and “Stereotactic Ablative Radiotherapy in Primary and Metastatic Liver Cancer”; International Stereotactic Radiotherapy Symposium, MD Anderson Hospital, Houston, October, 2013
- Indian College of Radiation Oncology Radiosurgery Workshop, Invited Lecture “Benign & Malignant spinal lesions: Indications, Target & Critical Structure Delineation, Dose, & Outcomes”, New Delhi, November 2013

- 1st India Cancer Congress, Plenary Lecture, “SBRT and Surgery for Early Stage Lung Cancer”, New Delhi, India, November 2013
- American College of Radiation Oncology (ACRO) Annual Meeting, Orlando, FL, February, 2014, Economics Committee Session. “The ASTRO Payment Reform Action Plan”
- **Visiting Professor, University of Wisconsin**; Carbone Cancer Center Grand Rounds, Department of Human Oncology, “Stereotactic Body Radiation Therapy: Evolving Role in Oncology Practice”, March, 2014
- ASTRO State of the Art Radiation Therapy Meeting, “Treatment Strategies: SBRT for early stage lung cancer”, San Antonio, TX, April 2014
- CSU-NIRS-CU Forum to promote International Collaboration: Photon, Proton, and Carbon Ion Radiotherapy. “Normal Tissue Effects after High Dose Per Fraction Photon Radiation”. Denver, July 2014.
- AANS/ASTRO Stereotactic Radiosurgery Course for Neurosurgery and Radiation Oncology Residents. “Neuroimaging for Radiosurgery”. Memorial Sloan Kettering Cancer Center, New York, NY August 2014
- NCCN Lung Cancer Tumor Board Webinar Series, “ Locally Advanced NSCLC: Stage IIIA Management”, August, 2014.
- IASLC 6th Latin American Conference on Lung Cancer, “The role of Radiotherapy in Advanced Disease”, Lima, Peru, September, 2014
- ASTRO Annual Meeting, HP-GR Session, “Ongoing Developments in the Design of Alternative Payment Models and an Update of the ASTRO SEER-Medicare Analysis”, San Francisco, September, 2014
- ASTRO 2014 International Symposium: Workshop on Safe Implementation of Advanced Technologies in Radiation Oncology. “Clinical implementation of SBRT and SRS program”. San Francisco, September, 2014
- **Visiting Professor, Rutgers University**, “A Time Capsule of Radiation Oncology: What we think we know, □ what we need to do from here”, January, 2015
- **Visiting Professor, MD Anderson Cancer Center**, Houston, TX, April 2015
- American College of Radiation Oncology (ACRO), Annual Meeting, Plenary Lecture I, “Glioblastoma and Gliosarcoma”, May 2015, Washington, DC
- American College of Radiation Oncology (ACRO), Annual Meeting, “SBRT for oligometastatic/oligoprogressive NSCLC”, May 2015, Washington, DC
- American College of Radiology (ACR), Annual Meeting, Leibel Debate, “Randomized Clinical Trials for New Technology: Not Even Wrong”, Washington, DC, May 2015
- American College of Radiology (ACR), Annual Meeting, “Future Payment Systems for Radiation Oncology”, Washington, DC, May 2015
- IASLC/6th Latin American Conference on Lung Cancer, “The Rolf of Radiotherapy for Advanced Disease”, Denver CO July 2015

- ASTRO Annual Meeting, “IMRT/SBRT as an Alternative to Brachytherapy in Gynecologic Cancers: Theoretical applicability/potential benefits”; San Antonio, October 2015
- ASTRO Annual Meeting, “Advanced Treatment of Non Small Cell Lung Cancer: Selected case studies”; San Antonio, October 2015
- **Visiting Professor, University of Nebraska Medical Center**, October 2015
- 10th Annual Fall Midwest Thoracic and GI Oncology Conference, “Efficacy and Tolerability of Stereotactic Ablative Radiotherapy for Lung Metastases” Omaha NE, October 2015
- 27th Annual Fall Foliage Cancer Conference, Carolinas Healthcare System: “SBRT for early stage lung cancer”, Asheville, NC October 2015
- **Visiting Professor, University of Pennsylvania**, November 2015
- **Visiting Professor, Cleveland Clinic Foundation**, March, 2016: “Tense in Radiation Oncology: Past, Present, Future...”
- Ariad NSCLC and ALK Preceptorship, “Radiotherapy Options for Metastatic Progression in Non-Small Cell Lung Cancer (NSCLC)”, Denver, CO, March 2016
- Harvard University, Global Health Catalyst Summit, April, 2016: “Global Health Efforts of The American Society for Radiation Oncology (ASTRO)”
- Keynote Address, 30th Annual Meeting of the Chinese Society for Therapeutic Radiology and Oncology (CSTRO), Chengdu, Sichuan Province, China, October, 2016: “*Local opportunities, global impact: How CSTRO can influence the future of radiation oncology around the world*”
- Keynote Address , 2nd Annual UK SABR Consortium, Birmingham, England, November 2016: “New Lenses, New Visions for Radiotherapy in the Molecular-Genetic-Immunomodulator Era of Oncology”
- 2nd Annual UK SABR Consortium, Birmingham, England, November 2016, topic debate, for the proposition: *This house believes that in times of austerity, the UK Government should only fund and commission SABR with photons, not protons*
- Osher Lifelong Learning Institute, University of Denver, “Leading Edge Medicine” series, Radiation Oncology, aka Therapeutic Radiology: *What is it and when is it used?* February, 2017
- Keynote Address, AAPM SE Chapter Annual meeting, “The rationale for ablative radiotherapy: A lesson in radiobiology and healthcare economics”, Charleston, SC, Feb 2017
- 10th Annual International Symposium on Stereotactic Body Radiation Therapy and Stereotactic Radiosurgery, Cleveland Clinic Foundation, Orlando, FL, February, 2017, “Radiosurgery (SBRT) in the Treatment Prostate Cancer: *What have we learned?*”
- **Visiting Professor, Oregon Health Sciences University**, May 2017
- **Visiting Professor, UCLA**, June 2017
- Keynote Speaker, UCLA Symposium, Integrating State-of-the-Art Innovations into Clinical Radiation Oncology Practice, David Geffen School of Medicine, June, 2017

- AAPM Annual Meeting, Presidential Symposium, “The Role and Value of the Medical Physicist in Radiation Oncology for the Future,” Denver, July 2017
- AAPM Annual Meeting, Invited presentation, “Clinical Aspects of SBRT in Abdominal Regions”, Denver, July 2017
- AAPM Annual Meeting, Invited presentation, “The Economic Future of Medical Physics”, Denver, July 2017
- National Coalition for Cancer Survivorship, Invited Panel Discussion, Annual Meeting, November, 2017; Washington, DC
- House Committee on Energy and Commerce, Health Subcommittee, Hearing titled, “MACRA and Alternative Payment Models: Developing Options for Value-based Care.” Invited Testimony, November, 2017, Washington, DC.
- Presidential Address, 2017 ASTRO Annual Meeting, “*Effort’s Bounty* and Other Imaginings of Past and Future”, San Diego, September, 2017
- 11th Annual International Symposium on Stereotactic Body Radiation Therapy and Stereotactic Radiosurgery, Cleveland Clinic Foundation, Orlando, FL, February, 2018, invited debate, “SBRT for prostate cancer: why would anyone still use seeds?”
- Society of Chairs and Radiation Oncology Program Directors Meeting, Washington, DC, June 24, 2018. “ASTRO’s Strategic Plan: *Vision? Myopia? Dream?*”
- ASTRO Annual Advocacy Day, June 25, 2018, Washington DC. “Ongoing Progress Toward Improved Quality Care”
- Association of Residents in Radiation Oncology (ARRO) Annual Luncheon, San Antonio, October 2018. “ASTRO’s Strategy & How (I hope) It Will Help You”
- Keynote Address, 2018 Stereotactic Ablative Radiotherapy (SABR) Symposium, Peter MacCallum Cancer Center, Melbourne, Australia, November, 2018. “Back stories and out-takes: some behind-the-scenes observations from the early days of ESR, later called SBRT, later called SABR”
- 2018 SABR Symposium, Peter MacCallum Cancer Center, Melbourne, Australia, November, 2018. “Prostate SBRT: what have we learned in recent years?”
- Northwell Health/Cleveland Clinic Best of Radiation Oncology Symposium, New York, December, 2018. “Developing trends in the fiscal-clinical interface of radiation oncology: threats and opportunities”
- Keynote Address, 2019 Radiosurgery Society Meeting, San Diego, Ca, January, 2019. “Value-Based Medicine in the Current Healthcare Economic Environment”
- **Visiting Professor, Virginia Commonwealth University**, April, 2019. “A decade of advances in SBRT: what was right, wrong, and irrelevant from the 2008 predictions”
- **Visiting Professor, Stanford University**, May, 2019. Annual Malcolm Bagwell Lecture and Professorship. “Transformative moments in oncology in the 20th century: have we seen any yet in the 21st?”
- **Visiting Professor, UC Davis**, June 2019. Annual Hideo “Dale” Kubo Memorial Lectureship, Sacraento, CA.
- Invited speaker, 2nd Annual Lung Cancer Survivorship Celebration, Aurora, CO, October 2019.

- Rocky Mountain AAPM Chapter, Annual Meeting, November, 2019. “Hype, Hope, and Devilish Details inside the proposed Radiation Oncology Alternative Payment Model”
- The 32nd Annual JASTRO Meeting, Presidential Symposium. “Japan’s Achievements & Opportunities for Curing Cancer Without Surgery: One Outsider’s Perspective” Nagoya, Japan
- Upcoming:
- ASTRO Annual refresher course, invited speaker, New Orleans, LA, March 2020
- **Visiting Professor, Duke University**, scheduled April 2020

12. Teaching record

- Instructor, Medical College of Virginia, Virginia Commonwealth University, M-1 Medical Ethics Course, 1997-2001
- Residency Training Director, MCV/VCU Department of Radiation Oncology, 1994-96
 - *Successfully prepared all documentation to achieve full 5 year ACGME re-accreditation during this time*
- University of Colorado SOM course participation
 - Foundations of Doctoring, 2003-4 (Student Kelly McLean)
 - Bench-to-bedside, Fall, 2005, small group discussion leader
 - 2006 Genitourinary Cancer Conference (H Drabkin and F Kim, course directors): “Where are we in the management of low and high risk prostate cancer in 2006?”
 - 2007 Thyroid Cancer Symposium (B Haugen, Course Director): “External Beam Radiotherapy in the Management of Thyroid Cancer”
 - Colorado Cancer Day, University of Colorado, Cancer Care for Primary Care Physicians, September, 2009, “Some Additional Questions about Radiation Oncology a Primary Care Physician Has a Right to Ask”
 - Mountain States Cancer Conference, University of Colorado Anschutz Medical Campus, November, 2010, “Contemporary radiation therapy options for prostate cancer”
 - Colorado Cancer Day, “Technophilia for treatment of early stage prostate cancer: facts and fiction”; November, 2011
 - 10th International Course of the Brazilian Cancer Society, hosted at the University of Colorado, “Update on Radiation Oncology”, February, 2014
- University of Colorado Department of Radiation Oncology
 - Rotating medical student supervision, variable time commitment depending on number or visiting students, 2001-present
 - Clinical supervision of residents

- One-on-one faculty-resident contact averaging 20+ hours per week, plus teaching interaction during the following tumor boards each week:
 - Brain Tumor Conference (1hr/week)
 - GU Tumor Conference (1hr/week)
 - Denver Health Tumor Board (ad hoc cross cover)
 - VA Tumor Board (ad hoc cross cover)
 - Chest Tumor Clinic Tumor Board (1hr/week)
 - Radiation Oncology Chart Rounds (1hr/week)
- 4-6 formal lectures per year to radiation oncology residents
- “Stereotactic Body Radiation Therapy (SBRT): Dosimetric Considerations”, University of Colorado Medical Dosimetrist and Radiation Therapist Conference, Denver, Colorado, October, 2004.
- Annual Refresher Course, University of Colorado, Co-course director
 - “Current status of IGRT”, January 2008
 - “Prostate Cancer: Ups and downs, 2008”, January, 2009
 - Pancreas and other case discussion moderator, 2010
- Annual Radiation Therapist Educational Conference, September, 2011, “100 Years of Radiotherapy: The Evolution and Current Status of Stereotactic Body Radiation Therapy
- Graduate Student Thesis Committees:
 - Prema Rassiah, Ph.D. in Medical Physics, UT-San Antonio, external committee member; *Characterization of Dose in Stereotactic Body Radiation Therapy of lung lesions via Monte Carlo Calculation*
 - James Tanyi, Ph.D. in Medical Physics, UT-San Antonio, external committee member; *Ramifications of Target Motion in Localization and Dosimetry for Stereotactic Body Radiation Therapy*
 - Wouter Wunderink, PhD, Erasmus University Medical Center, Rotterdam, The Netherlands, external committee member; *Accurate targeting of liver tumors in stereotactic radiation therapy*
 - Ward Mazyad, MS, Colorado State University, *Determining the difference between measured and calculated dose to canine oral mucosa during stereotactic radiation therapy using Gafchromic™ film*
 - Michael Nolan, PhD, Colorado State University, *Outcomes of Pelvic Irradiation in Normal and Tumor-bearing Dogs* (served as clinical consultant)
- Formal didactic lectures at national/international meetings:
 - “Extracranial Stereotactic Radiosurgery”, American Association of Physicists in Medicine (AAPM), 2003 and 2004 AAPM Meetings

- “Vaginal and Vulvar Cancer”
 - ASTRO Annual Meeting, 2003
 - ASTRO Annual Meeting, 2004
 - “Stereotactic Body Radiation Therapy: Clinical and Biological Update”
 - ASTRO Annual Meeting, 2005
 - ASTRO Annual Meeting, 2006
 - ASTRO Annual Meeting, 2007
 - ASTRO Annual Meeting, 2008
 - ASTRO Annual Meeting, 2009
 - ASTRO Annual Meeting, 2010
 - Scientific Session Discussant, Lung II: SBRT, ASTRO Annual Meeting, 2011, Miami, FL
 - Scientific Session Discussant, SBRT, ASTRO Annual Meeting, 2012, Boston, MA
 - ASTRO Educational Session: Contouring Lung Cancer, 2008
 - AAPM Annual Meeting, 2007-11, educational session on SBRT.
 - AAPM Self-Assessment Module presentation, 2008
 - AAPM Annual Meeting, 2009: SBRT Educational Session
 - AAPM 2010 Annual Meeting, 3 educational lectures
 - AAPM 2011 Meeting, Vancouver, Educational Session, “Physics and Dosimetry of SBRT Part III: Planning Case Studies”
 - ASTRO IMRT IGRT SBRT Annual Symposium, 2010-2011
 - Didactic lecture: “Abdomen: SBRT” and Case Discussion Session, Dallas, TX, 2010
 - Closing Address: “Summary of SBRT Evidence”, Las Vegas, March 2011
 - ASTRO State-of-the-Art Techniques in IMRT, IGRT, SBRT, Proton and Brachytherapy: Emphasis on Safety and Quality, 2012
 - “SBRT v Surgery for Early Stage Lung Cancer”
 - “Coding and Billing for IMRT, IGRT and SBRT”
 - ASTRO State-of-the-Art Techniques Symposium, 2013
 - “SBRT: Current Status and Update on Clinical Trials”
 - “How to Develop Your Own SBRT Program (A to Z)”
 - ASTRO Annual Meeting, Educational Session, 2013
 - Radiation Treatment for Hepatic Tumors: Current treatment approaches and controversies”
 - ASTRO State-of-the-Art Techniques Symposium, 2015
 - “Radiation Therapy for Lung Cancer: Selected Challenging or Unusual Cases”
- Founding Director (later co-Director), Stereotactic Body Radiation Therapy: Principles & Practice, instructional hands-on course for SBRT training, University of Colorado, 2008-2012, 2014

13. Grant support

- 5R21CA198462-02 (PI: C Altunbas) NIH/NCI. A dedicated two dimensional antiscatter grid for CBCT in radiation therapy. Role: co-investigator
- Co-investigator, Clinical trial personalizing radiation therapy through a novel lung function imaging modality, 1R01CA200817 - 01 PI Name: Vinogradskiy, Yevgeniy; total costs approx. \$465,000 per year for 3 years.
- Mentor, Bernard Jones, PhD, K12 training grant, 2014-
- AANS-ASTRO National Radiosurgery Registry, participating center as one of 30 sites of excellence, UCH PI and National Co-Director, 2014-7.
- NCI R21 CA181973-01, Impaired Endothelial Vasodilation Alters Perfusion After High Dose Radiation. S Larue, CSU, PI; role: clinical consultant. Impact score 29, 16th percentile; total cost \$ 439,076. Applied 2013; resubmitted 2014.
- Department of Defense, Hypothesis Development Grant, The role of glycine to enhance radiation therapy for prostate cancer (top 7 percent funded). Role: PI. Total costs \$109,000; 2011-2012
- NIHR21 grant submitted March 2010 (title subject to IP rights/disclosure of information restriction); impact score 32; 23rd percentile, not funded.
- Department of Defense, Phase I and II Study of Stereotactic Body Radiation Therapy (SBRT) for Low and Intermediate Risk Prostate Cancer, funded, co-investigator (RD Timmerman, UTSW, PI)
- NCI P50 CA058187, Lung SPORE Grant (P Bunn, PI) Nitric oxide as a key factor in mediating lung cancer response to therapy, pilot project, co-investigator
- NCI P30 CA 046934 University of Colorado Comprehensive Cancer Center Support Grant (P Bunn, PI). Chair, Protocol Review and Monitoring Committee, 10% effort, 2005-9
- External Advisory Board member, University of Texas-Southwestern Program Project Grant in Stereotactic Body Radiation Therapy, application submitted
- Principal Investigator, A Phase II Trial of erlotinib (Tarceva®) in combination with Stereotactic Body Radiation Therapy (SBRT) for patients with locally advanced or metastatic non-small cell lung cancer (NSCLC). OSI/Genentech, to be subcontracted through UT-SW, estimated \$4,000 per patient enrolled
- Allos RT-0014, A Phase 1 Open-label Study of RSR13 (efaproxiral) and Supplemental Oxygen with Concurrent Carboplatin, Paclitaxel, and Thoracic Radiation Therapy in Patients with Locally Advanced, Unresectable (Stage IIIA/IIIB) Non-Small Cell Lung Cancer. Allos Therapeutics, Inc., contract for providing radiation therapy quality assurance review—completed 2007.
- Co-investigator on numerous other industry-sponsored clinical oncology trials either completed or currently active at UCCC, variable amounts of funding per patient enrolled
- The Effect of RSR13 on Hypoxia-Mediated p53 Mutation and Selected Hypoxia-Induced Tumor Gene Expression Products, In Vivo. Allos Therapeutics, Inc., \$34,000, completed at UCCC
- P.I., Protocol RSR13 RT-002, A phase Ib study to evaluate the safety and tolerance of

multiple daily intravenous doses of RSR13 administered to patients receiving concurrent radiation therapy. Allos Therapeutics, Inc., \$170,000, completed while on faculty at MCV/VCU

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2. Meyer, JF; **Kavanagh BD**, Purdy JA, Timmerman RD. *IMRT, IGRT, SBRT: Advances in the Treatment Planning and Delivery of Radiotherapy*. Frontiers in Radiotherapy and Oncology, Volume 40; Berlin: Karger, 2007.
3. **Kavanagh BD**, Timmerman RD. *PPO Updates: Principles & Practice of Oncology—Stereotactic Body Radiation Therapy*. Lippincott, Williams & Wilkins, 2011
4. Benedict SH, Schlesinger DJ Goetsch S, **Kavanagh BD**. Stereotactic Radiosurgery and Radiotherapy. Imaging in Medical Diagnosis and Therapy Series, CRC Press (WR Hendee, Series Editor), 2014.

Book chapters:

1. **Kavanagh BD**, Lyckholm L, Sugarman J. Ethics, Professional Values, and Legal Considerations in Radiation Oncology. In *Principles and Practice of Radiation Oncology*, 4th edition, Lippincott, Williams & Wilkins, 2004.
2. Perez CA, **Kavanagh BD**. Uterine Cervix Cancer. In *Principles and Practice of Radiation Oncology*, 4th edition, Lippincott, Williams & Wilkins, 2004.
3. Lillehei KO, **Kavanagh BD**. Brain Metastases from Renal Cell Carcinoma. In *Textbook of Neuro-oncology*, Berger MS and Prados MD, eds., Elsevier, Inc., 2004.
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American Cancer Society, 2005.

9. **Kavanagh BD**, Petrylak DP, Vestal JC. Ch 24, "Other Therapies in Use". In *Prostate Cancer*. Bostwick DG, Crawford ED, Higano CS, Roach M, eds. American Cancer Society, 2005.
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(Note in abstract section, *IJROBP* = *Int J Radiat Oncol Biol Phys*)