BIOGRAPHICAL SKETCH

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NAME	POSITION TITLE
Fraass, Benedick A	Professor, Vice Chair for Research, Director of Medical Physics, Research Scientist IV
eRA COMMONS USER NAME (credential, e.g., agency login) bfraass	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
Stanford University, Stanford, CA	B.Sc.	06/74	Physics
University of Illinois, Urbana, IL	M.S.	06/75	Physics
University of Illinois, Urbana, IL	Ph.D.	01/80	Physics

A. Personal Statement

Many of the principle opportunities for improvement of clinical radiotherapy depend on imaging data and analysis, leading to a very important synergy between imaging research and research in radiation oncology. Collaboration with imaging scientists and physicians is crucial as we establish a clinically-oriented translational research effort in clinical radiation oncology and radiation oncology physics. Our expanding efforts in radiation oncology clinical research include the development and testing new technical capabilities to address clinical problems or needs while performing clinical trials to test those new capabilities or strategies. Several imaging-dependent efforts are among our main research efforts. (1) A new generation of treatment machines offers great opportunities for development of delivery techniques which will improve treatment quality, efficiency and/or patient safety using high level computer control and integrated imaging systems. Individualized treatments based on motion management and adaptive Image-Guided Radiation Therapy (IGRT) using real-time kV imaging, Conebeam CT, or even MRI enable more precise treatments and irradiation of less normal tissue, leading to improved patient outcomes. (2) Adapting and individualizing each patient's course of radiotherapy by integrating tumor and/or normal tissue response evaluation (during therapy) can be performed through the use of properly defined and validated imaging biomarkers. We perform retrospective studies correlating pre-therapy, during therapy and post-therapy imaging data with pre-clinical and clinical response data as well as dose distribution data to identify potential candidate biomarker information. Results from these early imaging (and other) studies will then be integrated into our on-going therapy and therapeutic studies for evaluation and validation, followed eventually by integration in adaptive therapy protocols which make use of that information to adapt and individualize patient treatment. Imaging used for this kind of evaluation includes specific MR, functional MR, PET, SPECT, CT, 4DCT and Conebeam CT imaging, depending on clinical site and relevant normal tissues involved. (3) Biological treatment planning is another active area of research with significant dependence on imaging data. Our knowledge of how to improve patient treatment plans will be enhanced by assimilating all the new data now available (imaging biomarkers, cytokines, various other biomarkers and physiological data) into the treatment planning process, rather than using simple dose-based planning. As our knowledge of the presence of relevant new biological information often depends on imaging, this is a crucial area for collaboration between imaging scientists and radiation oncology scientists and physicians. Enhancing the amount of biological information included in our treatment planning optimization can lead to further improvements in normal tissue sparing and/or improved tumor control, and these endpoints will eventually be the subject of the clinical trials which will grow out of the early treatment planning and imaging research. (4) The final imaging-related effort concentrates on improving patient safety and radiotherapy workflow. As the ability to apply new radiotherapy techniques in the clinic is often limited by efficiency and safety, this work will concentrate on improving the integration and workflow aspects of the integration of imaging into the radiotherapy process, with the goal of creating improved safety and efficiency for treatment of the patient, especially as imaging-based adaptive therapy modifies the routine radiotherapy workflow.

B. Positions and Honors

Positions and Employment

1974 Teaching Assistant, Department of Physics. Stanford University, Stanford, California.
1974-80 Teaching Assistant/Research Assistant, Department of Physics. University of Illinois.
1980-84 Staff Fellow/Senior Staff Fellow, Radiation Physicist, Radiation Oncology Branch, National Cancer Institute, National Institutes of Health, Bethesda, Maryland.
1984-88 Assistant Professor/Director of Radiation Physics, Department of Radiation Oncology, University of Michigan, Ann Arbor, Michigan.
1988-95 Associate Professor/Director of Radiation Physics, Department of Radiation Oncology, University of Michigan, Ann Arbor, Michigan.
1995-2009 Professor/Director of Radiation Physics, Department of Radiation Oncology, University of Michigan, Ann Arbor, Michigan
2009-11 Allen S. Lichter Professor and Director of Radiation Physics, Department of Radiation Oncology, University of Michigan, Ann Arbor, Michigan
2011 - Vice Chair for Research, Director of Medical Physics, Research Scientist IV, Department of Radiation Oncology, Cedars-Sinai Medical Center, Los Angeles, California
2012 - Professor, Vice Chair for Research, and Director of Medical Physics, Research Scientist IV, Department of Radiation Oncology, Cedars-Sinai Medical Center, Los Angeles, California
2013 - Health Sciences Clinical Professor, Step IV, Department of Radiation Oncology, University of California Los Angeles, Los Angeles, California

Other Experience and Professional Memberships (selected)

1981-84 NCI Intraoperative Radiation Therapy Working Group
1984-88 AAPM Task Group # 30, Total Skin Electron Therapy
1986-90 AAPM Task Group # 35, Accelerator Safety
1986-1989 NCI Collaborative Electron Treatment Planning Working Group
1991-99 U.S. Technical Advisory Group, Int. Electrotechnical Comm (IEC), Data Exchange Sub-Group
1992-98 AAPM Task Group #53, Treatment Planning QA, Chair
1999-2004 International Atomic Energy Agency (IAEA) Task Group: Treatment Planning Quality Assurance
2002 German Cancer Research Center (DKFZ) External Review, November 2002
2003 International Review Committee, Graduate School for Biomedical Image Sciences, University of Utrecht, Utrecht, The Netherlands, October 2003.
2003-2006 AAPM Board of Directors
2004-- AAPM Task Group 100: Radiation Therapy Quality Assurance
2005-2009 AAPM Therapy Research Subcommittee: Chair
2005-- AAPM Therapy Physics Committee
2005-- AAPM Science Council
2007-2011 ASTRO Multidisciplinary QA Subcommittee, Chair
2009-- AAPM Research Committee: Chair, co-Chair
2010-- ASTRO Representative to ASTRO/AAPM/ACR Task Force on Quality Assurance and Safety
2010-- ASTRO co-Chair, Safety Stakeholders Initiative
2010-13 User Review Committee for “A hybrid MRI radiotherapy system”, PI Prof. J.J.W. Lagendijk, Technology Foundation STW, Utrecht, the Netherlands
2011--12 Blue Book Steering Committee
2012-- ASTRO Multidisciplinary QA Committee
2012-- Co-Chair, ASTRO IHE-RO Committee
2012-- Co-Chair, National Radiation Oncology Registry
2012-- ASTRO Science Council Steering Committee
2014-- Radiation Oncology Healthcare Advisory Council (RO-HAC), associated with the ASTRO/AAPM Radiation Oncology Incident Learning System
2014-- Board of Directors, AANS-ASTRO Joint Radiosurgery Registry

Honors

1970-74 National Merit Scholarship

1970-74	California State Scholarship
1996	Fellow, American Association of Physicists in Medicine
2005	PTW Award of Excellence for the Best Radiation Measurements Article for "Surface buildup dose dependence on photon field delivery technique for IMRT." SK Yokoyama, PL Roberson, DW Litzenberg, JM Moran, BA Fraass: Journal of Applied Clinical Medical Physics 5: 71-81, 2004.
2006	Fellow, American Society of Therapeutic Radiology and Oncology
2006	The James A. Purdy Medical Physics Lectureship, Washington University St. Louis Department of Radiation Oncology, St. Louis, MO
2009-11	Allen S. Lichter Professor of Radiation Oncology, University of Michigan
2009	George TY Chen Visiting Professor of Medical Physics, Department of Radiation Medicine, Massachusetts General Hospital and Harvard Medical School, Boston MA, December 2009
2010	Fellow, American College of Radiology
2011	Professor Emeritus, University of Michigan
2013	William D. Coolidge Award, top award of the American Association of Physicists in Medicine
2015	Hideo Dale Kubo Memorial Lecture, UC Davis Comprehensive Cancer Center, Department of Radiation Oncology, May 2015

C. Selected Peer-reviewed Publications (Selected from 139 peer-reviewed publications)

1. Glatstein E, Lichter AS, Fraass BA, van de Geijn J: The imaging revolution and radiation oncology: Use of CT, ultrasound and NMR for localization, treatment planning, and treatment delivery. Int J Rad Onc Biol Phys, 11:299-314, 1985
2. Fraass BA, Roberson PL, Lichter AS: Dose to the contralateral breast due to primary breast irradiation. Int J Rad Oncol Biol Phys, 11(3):485-497, 1985
3. Fraass BA, McShan DL, Diaz RF, Ten Haken RK, Aisen A, Gebarski S, Glazer G, Lichter AS: Integration of magnetic resonance imaging into radiation therapy treatment planning: Technical considerations. Int J Rad Oncol Biol Phys, 13:1897-1908, 1987
4. Ten Haken RK, Thornton AF, Sandler HM, LaVigne ML, Quint DJ, Fraass BA, Kessler ML, McShan DL: A quantitative assessment of the addition of MRI to CT-based, 3-D treatment planning of brain tumors. Radiother Oncol, 25:121-133, October 1992
5. Ten Haken R, Fraass B, Lichter A, Marsh L, Radany E, Sandler H: A brain tumor dose escalation protocol based on effective dose equivalence to prior experience. Int J Rad Oncol Biol Phys 42: 137-141, 1998
6. Fraass BA, Lash KL, Matrone GM, Volkman SK, McShan DL, Kessler ML, Lichter AS: The impact of treatment complexity and computer-control delivery technology on treatment delivery errors. Int J Rad Onc Biol Phys 42: 651-659, 1998
7. EA Krueger, BA Fraass, DL McShan, R Marsh, LJ Pierce: Potential gains for irradiation of chest wall and regional nodes with IMRT. Int J Rad Onc Biol Phys 56: 1023-1037, 2003.
8. Kong F-M, Hayman JA. Griffith KA, Kalemkerian GP, Arenberg D, Lyons S, Turrisi A, Lichter A, Fraass BA, Eisbruch A, Lawrence TS, Ten Haken RK: Final toxicity results of a radiation dose escalation study in patients with non-small cell lung cancer: Predictors for radiation pneumonitis and fibrosis. Int J Radiat Oncol Biol Phys 65:1075-86, 2006. PMID: 16647222
9. Spalding AC, Jee K-W, Vineberg K, Jablonowski M, Fraass BA, Pan CC, Lawrence TS, Ten Haken RK, Ben-Josef E.: The potential for dose-escalation and reduction of risk in pancreatic cancer using IMRT optimization with lexicographic ordering and gEUD-based cost functions. Med Phys 34: 521-529, 2007. PubMed PMID: 17388169
10. BA Fraass, LB Marks, T Pawlicki: Safety Considerations in Contemporary Radiation Oncology: Introduction to a Series of ASTRO Safety White Papers. Prac Rad Onc 1: 188-189, 2011.
11. JM Moran, M Dempsey, A Eisbruch, BA Fraass, JM Galvin, GS Ibbott, LB Marks: Safety Considerations for IMRT: Executive Summary. Prac Rad Onc 1: 190-195, 2011. Co-pub Med Phys 38: 5067-5072, 2011.
12. B Fraass, J Steers, M Matuszak, D McShan: Inverse-optimized 3-D conformal planning: minimizing complexity while achieving equivalence with IMRT. MedPhys 39:3361-3374,2012. PMID: 22755717
13. TM Williams, JM Moran, SH Hsu, R Marsh, B Yanke, BA Fraass, LJ Pierce: Contralateral Breast Dose After Whole-Breast Irradiation: An Analysis by Treatment Technique. Int J Radiat Oncol Biol Phys 82: 2079085, 2012. PubMed PMID: 21489713
14. W Yang, EM McKenzie, M Burnison, S Shiao, A Mirhadi, B Hakimian, R Tuli, R Reznik, H Sandler,

BA Fraass: Clinical experience using a video-guided spirometry system for deep inhalation breath-hold radiotherapy of left-sided breast cancer. JACMP 16: 251-260, 2015.

15. DJ Hoopes, PA Johnstone, PS Chapin, CM Kabbant, WR Lee, AB Chen, BA Fraass, WJ Skinner, LB Marks: Practice Patterns for Peer Review in Radiation Oncology. Pract Rad Onc 5: 32-38, 2015.

D. Research Support

Ongoing Research Support

SOCCI Martz Foundation Yue (PI) 1/1/14 – 12/31/15
Identifying Basal-like Triple-negative Breast Cancer using Imaging Biomarkers with Tissue Biomarkers
This project will PET, MRI/DCE and MRI/DW textures and other markers in triple negative breast cancer patients and correlate imaging markers and FOXC1 with outcome
Role: mentor; $ 75,000 costs annually, $150,000 total cost, 2 years

Susan Scott Foundation Equipment Grant Fraass (PI) 4/2014
Implementation of Integrated Quality Monitor for Radiotherapy Quality Assurance
The goal is study and eventual clinical implementation of a new in-line real-time beam delivery QA device.
Role: PI; $ 55,000 cost, 1 year.

NCI R03 CA173273-01 Wang (PI) 2/1/13 – 7/31/15
Improving Pancreas RT Plans using Respiration-driven Anatomic Deformation
The goal of this project is to use MRI and inhale and exhale positions to spread dose out to normal tissues, allowing improvement of dose to critical normal tissues around the pancreas.
Role: co-Investigator; $ 50,000 direct costs annually, $100,000 total direct cost, 2 years

Completed Research Support

NCI 3-P01-CA-59827 Fraass (PI) 07/01/06 - 06/30/11
Optimization of High Dose Conformal Therapy
The goal of this program project is optimization of conformal therapy by studying improved automated plan optimization (Project 1), geometrical treatment individualization (Project 2), individualized IMRT treatment in brain and head/neck cancer (Project 3) and individualized dose escalation in liver and lung cancer (Project 4).
Role: PI (PPG), PI (Project), PI (Core)

NCI 2 R01 CA106770-01 Chetty (PI) 12/1/04 – 11/31/08
Better Correlation of Outcomes with MC Dose Calculation
Goal: Determine if Monte Carlo dose calculations improve correlation with clinical outcomes.
Role: co-Investigator

NCI R21 and R01 Pierce (PI) 07/1/03-06/30/07
IMRT for Node Positive Breast Cancer
This study investigates the use of IMRT for chest wall irradiation in breast cancer
Role: co-Investigator

NCI 2-P01-CA-59827 Fraass (PI) 08/01/00 - 07/31/05
Optimization of High Dose Conformal Therapy
The goal of this project is optimization of conformal therapy by studying automated optimization (Proj. 1), conformal and IMRT planning and delivery (Proj. 2), motion and setup uncertainty (Proj. 3) and clinical studies of dose escalation and conformal therapy (including IMRT) for brain, lung, prostate, head/neck,liver (Proj. 4).
Role: PI (PPG), Project (PI), Core (PI)

Netherlands Cancer Institute Research.Agreement Fraass, Kessler (PI) 05/1/96 - 04/30/06
Studies of 3-D Treatment Planning for Conformal Radiation Therapy

The goals of this project are improvement of planning for conformal therapy and accuracy of 3-D dose calculations, and comparisons of 3-D to conventional planning to evaluate costs for conformal treatments.
Role: PI, then co-PI

NCI PO1-CA-59827-01 Fraass (PI) 04/01/93 - 01/31/98
Optimization of High Dose Conformal Therapy
Goal is the optimization of conformal therapy by studying automated optimization (Proj 1), IMRT (Proj 2), motion/setup uncertainty (Proj 3) and dose escalation for brain, lung, prostate, head/neck and liver (Proj 4).
Role: PI (PPG), Project (PI), Core (PI)

NCI R01-CA-43200 Fraass (PI) 09/01/87 - 08/31/90
Integration/Evaluation of MRI-Assisted Treatment Planning
The goal of this project was to evaluate the use of MRI for treatment planning.
Role: PI

NCI N01-CM-67913 Fraass (PI) 08/01/86 - 07/31/89
Evaluation of High Energy Electron Beam Treatment Planning
The goal of this effort was to evaluate the use of 3-D Electron Beam treatment planning for clinical planning.
Role: PI