

AWARD NUMBER: W81XWH-17-1-0468

TITLE: Evaluation of Lipid Poor Renal Masses with  
Magnetic Resonance Spectroscopy in Tuberous  
Sclerosis Complex

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REPORT DATE: Sept 2018

TYPE OF REPORT: Annual

PREPARED FOR: U.S. Army Medical Research and Materiel Command  
Fort Detrick, Maryland 21702-5012

DISTRIBUTION STATEMENT: Approved for Public Release;  
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REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
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1. REPORT DATE Sept 2018		2. REPORT TYPE Annual		3. DATES COVERED 1 Sep 2017 - 31 Aug 2018	
4. TITLE AND SUBTITLE  Evaluation of Lipid Poor Renal Masses with Magnetic Resonance Spectroscopy in Tuberous Sclerosis Complex				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER W81XWH-17-1-0468	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)  Adam S. Feldman, M.D., M.P.H.				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)  Massachusetts General Hospital 55 Fruit Street Boston, Massachusetts 02114-2554				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)  U.S. Army Medical Research and Materiel Command Fort Detrick, Maryland 21702-5012				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT  Approved for Public Release; Distribution Unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT The Research Project supported by this DOD Award investigates the potential of in vivo and ex vivo MRS in characterizing the metabolomic spectra of TSC-associated lipid poor renal masses. After a brief delay in IRB approval, which led to a later than expected start to our subject enrollment we have proceeded with <i>in vivo</i> and <i>ex vivo</i> MRS of renal masses in patients with TSC. In an effort to optimize our <i>in vivo</i> image acquisition protocol, we began by scanning healthy volunteers. Subsequently, our overall enrollment of TSC patients with lipid poor renal masses has been lower than expected. For this reason and in order to meet our goals of gaining more metabolomic data on renal masses, we have expanded our subjects to include TSC patients with lipid rich masses, non-TSC patients with lipid poor and lipid rich renal masses. We continue to enroll patients and analyze our current and ongoing data.					
15. SUBJECT TERMS Kidney Cancer; Metabolomics; Tuberous Sclerosis Complex					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT  Unclassified	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON USAMRMC
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified			19b. TELEPHONE NUMBER (include area code)

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## **Introduction:**

The Research Project supported by this DOD Award investigates the potential of *in vivo* and *ex vivo* Magnetic Resonance Spectroscopy (MRS) in characterizing the metabolomic spectra of Tuberous Sclerosis Complex (TSC)-associated lipid poor renal masses. We hypothesize that MRS metabolomic profiling of lipid poor renal masses will provide clinical biomarkers to noninvasively differentiate benign from malignant tumors and can help predict the tumor grades and pathological stages defined by histopathology, thus improving decision making for patient care. This information is urgently needed in today's TSC clinic to help clinicians to assess the malignant potentials of specific tumors, improve prognostic accuracy, and select the most appropriate therapy for individual patients.

## **Keywords:**

Tuberous Sclerosis Complex; Metabolomics; Kidney Cancer; Biomarker

## **Accomplishments:**

- **What were the major goals of the project?**

There are three defined major goals of the project to be accomplished over the course of a 24 month period:

Major Task 1: Administrative startup tasks; Subject recruitment (total n=80); *In vivo* MRI/MRS acquisition and interpretation, with correlation of MRS data with multiparametric MRI data; Histopathologic analysis of biopsy and surgical specimens; Correlation of *in vivo* MRS data with histopathology and clinical data.

Major Task 2: *Ex vivo* MRS performance on biopsy and surgical specimens; Correlation of *ex vivo* MRS data with histopathology and clinical data; Assess consistency of *in vivo* and *ex vivo* MRS metabolomic signatures and correlate signatures with tumor tissue assessment for mutations of the cellular metabolic pathway and direct measurement of

tumor metabolite levels.

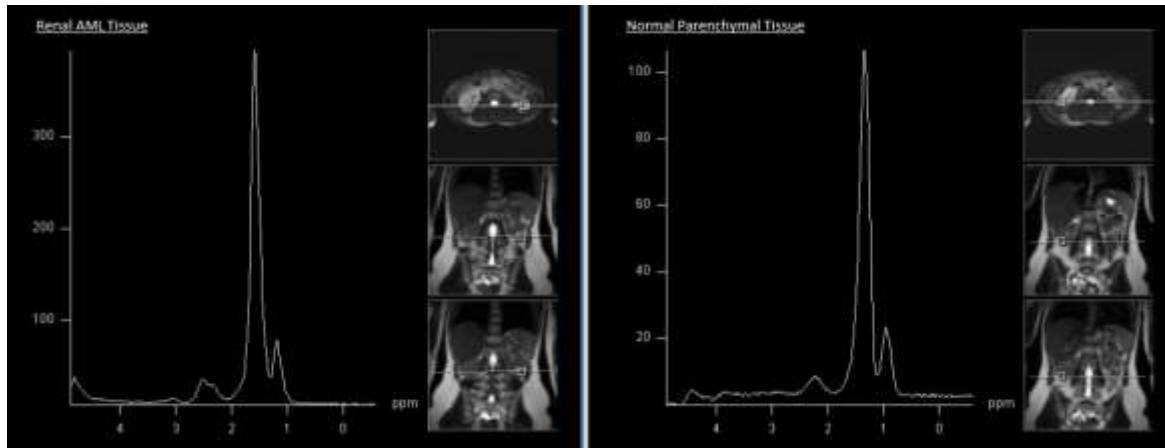
Major Task 3: Correlation of *ex vivo* and *in vivo* MRS data; GC-MS and qRT-PCR of surgical tissue specimens; Correlation of all MRS, histopathologic and clinical data with GC-MS and qRT-PCR data.

- **What was accomplished under these goals?**

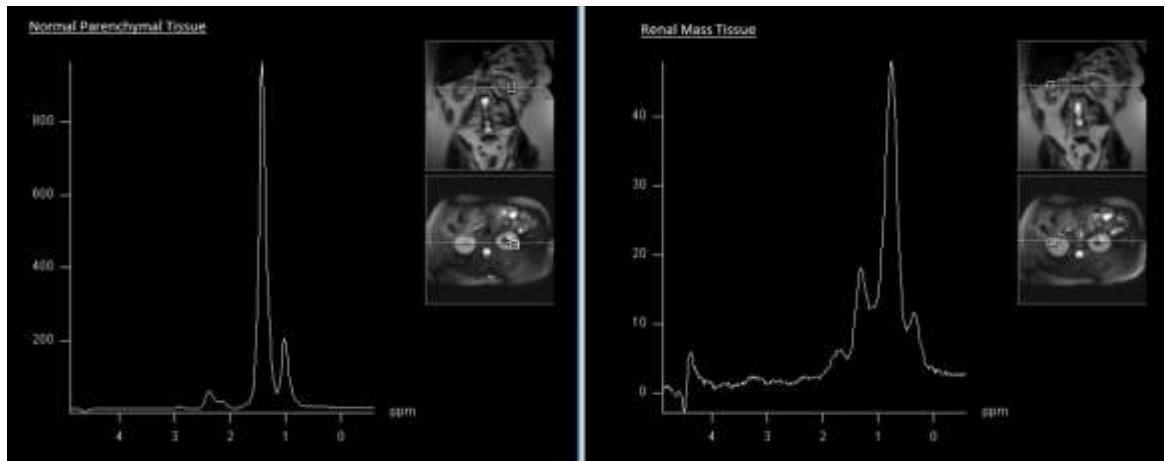
We encountered some delays in obtaining IRB approval and ultimately were given local IRB approval for the research project in January 2018. Subject enrollment began in February 2018 with patients recruited from the Urology Clinic at Massachusetts General Hospital. Given that there has been limited data in performing *in vivo* MRS of the kidney, healthy volunteers were first consented to the project to undergo *in vivo* MRS and help develop the imaging protocol for ultimate subject scans. Since the project start, 10 research subjects have been consented and scheduled for multiparametric MRI and MRS of the kidneys. Nine of the subjects have confirmed diagnoses of Tuberous Sclerosis Complex. Six have undergone clinically-indicated MRIs of the kidneys with the additional *in vivo* MRS sequence. The remaining 4 subjects are scheduled and will undergo MRI and MRS in the near future along their imaging follow-up protocol for their TSC care.

The routine multi-parametric renal MRI includes multiecho gradient-echo, diffusion weighted images with 3 b values (0, 500 and 1000) and dynamic enhanced images with temporal resolution of 6 seconds. Two single voxels are targeted over the area of interest for the *in vivo* MRS spectra. We ran prior axial and coronal imaging sequences with non-breath hold technique to use as references for the MRS sequences. Metabolic spectra of both the tumor(s) of interest and regions of benign parenchymal tissue were recorded and analyzed. We used both a non-water suppression sequence and a LASER MRS sequence with water suppression using TE/TR=30ms/1500ms. Examples of these images are seen in Figures 1 & 2 from both a patient with a TSC-associated lipid-poor AML and a patient with a sporadic renal mass, which was found to be renal cell carcinoma (RCC) on final pathology. There have been issues with interference of metabolites from the surrounding retroperitoneal fat along with the heterogeneity of the tumors. The *in vivo* MRS sequence

has been updated and improved with each scan to more accurately reflect the metabolic profile of the tumor(s) being targeted.

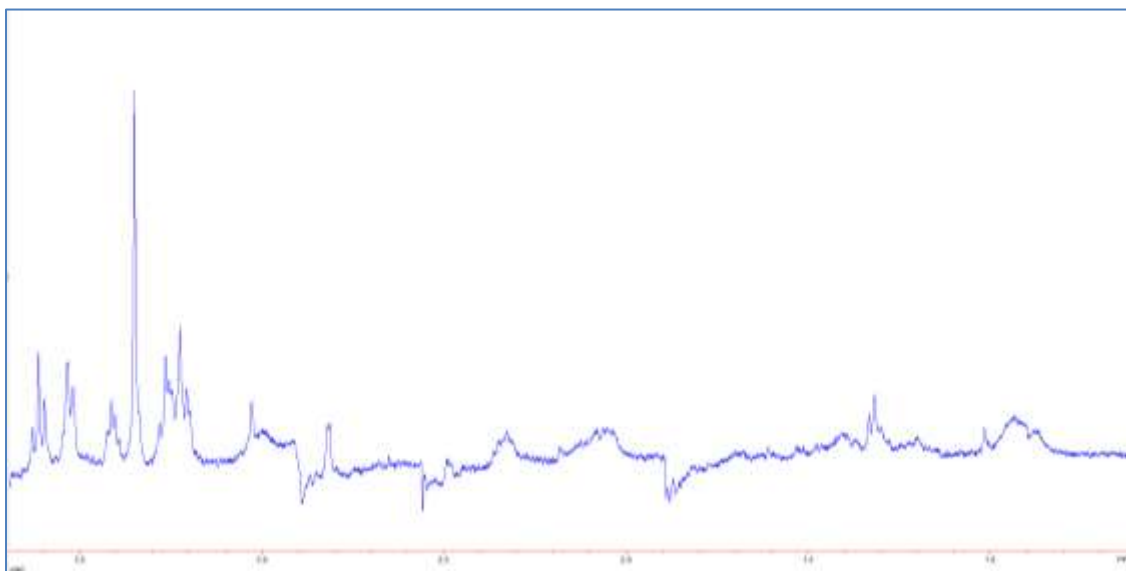


**Figure 1:** Example of *in vivo* MRS spectra images from single patient with confirmed diagnosis of TSC. The spectra image on the left obtained with targeting of biopsy-proven (fat-poor) angiomyolipoma. Image on the right obtained with targeting contralateral normal kidney tissue.



**Figure 2:** Example of *in vivo* MRS spectra images from single patient with sporadic renal mass, no history or family history of TSC. The spectra image on the right obtained with targeting of sporadic renal mass, which was found to be renal cell carcinoma (RCC) on final pathology. Image on the left obtained with targeting contralateral normal kidney tissue.

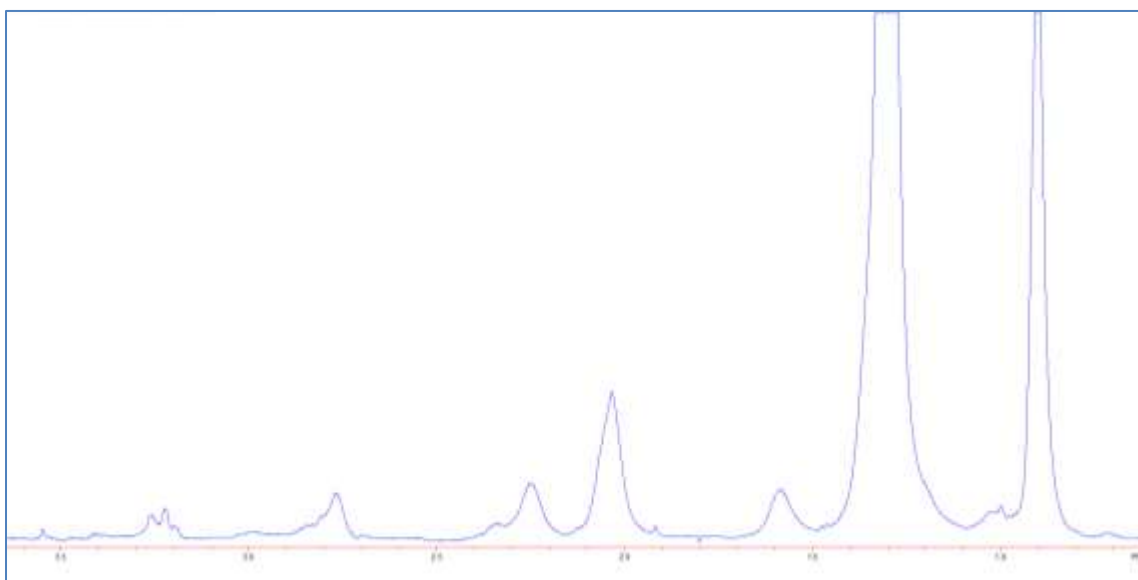
From the current cohort of subjects, two patients have been consented and undergone renal mass biopsy (RMB) as clinically indicated from imaging results. Immediately after RMB, core biopsy specimens are transported on ice to the A.A. Martinos Center for Biomedical Imaging at MGH for *ex vivo* MRS. Following MRS, the specimens were transported to the MGH Pathology department for routine histopathologic processing. The metabolic spectra of the core biopsy specimens were recorded and analyzed. These were compared to the *in vivo* MRS results to assess for consistency between the metabolic signatures. Histopathologic analysis of the core biopsy specimens showed one subject with an epithelioid oncocytic neoplasm, favor epithelioid angiomyolipoma negative for CA-IX on immunostain. The RMB for the second subject confirmed the renal mass to be an angiomyolipoma (fat-poor). The example of this spectra is present in Figure 3. Both patients had confirmed diagnoses of TSC.



**Figure 3:** Example of high-resolution magic angle spinning ( $^1\text{H}$  HRMAS) *ex vivo* MRS spectra image obtained with intact biopsy-core specimen from fat-poor angiomyolipoma kidney tissue from single patient.

There has been one non-TSC patient, with a sporadic renal mass, that has proceeded to partial nephrectomy. Following resection, the specimen was taken to the Surgical Pathology lab as soon as possible to minimize changes in the metabolomic profile from

devascularization. One portion of the tissue was provided for *ex vivo* MRS and another portion from the same location for an immediate snap freeze in liquid nitrogen. Example of the spectra image obtained from the renal mass is present in Figure 4. The remaining portion of tissue was stored at minus 80 degrees Celsius for future GC-MS analysis and qRT-PCR to examine the metabolomic profile and enzymes implicated in central carbon metabolism. The histopathologic analysis of the surgical specimen was consistent with clear cell Renal Cell Carcinoma (ccRCC), stage T1a, grade 2, with no evidence of tumor necrosis or lymphovascular invasion.



**Figure 4:** Example of high-resolution magic angle spinning ( $^1\text{H}$  HRMAS) *ex vivo* MRS spectra image obtained with intact partial nephrectomy specimen from renal cell carcinoma, clear cell type kidney tissue from single patient.

We continue to actively enroll patients in our protocol. As our accrual of TSC patients with lipid poor renal masses has been lower than expected, we continue to also accrue some patients with sporadic renal masses, including those with sporadic lipid rich AML. We believe that it will be important to gain data on the MRS profile of lipid rich AML in addition to lipid poor masses so that we can better understand the normal metabolic spectra of AML and renal masses in general. Furthermore, we are actively in the process



of comparing the metabolic spectra across our patients and comparing between *in vivo* and *ex vivo* imaging.

- **What opportunities for training and professional development has the project provided?**

This project has provided multiple opportunities for training and professional development by increasing our understanding of how to successfully perform *in vivo* metabolomic imaging of the kidney and renal masses.

- **How were the results disseminated to communities of interest?**

We have communicated the results to the multidisciplinary members of our research group, however, have not yet disseminated results to the larger TSC community as we are awaiting additional data and analysis.

- **What do you plan to do during the next reporting period to accomplish the goals?**

Our primary task to accomplish the listed goals of the research project is to recruit a greater number of TSC patients with lipid rich and poor renal masses and patients with sporadic renal masses and lipid rich AMLs to record more data on the metabolomic signatures of renal masses from *in vivo* and *ex vivo* MRS. This will also help update and improve the current *in vivo* MRS protocol to better reflect the metabolic profile of the tumor(s) being targeted.

#### **Impact:**

- **What was the impact on the development of the principal discipline(s) of the project?**

Nothing to report.

- **What was the impact on other disciplines?**

Nothing to report.

- **What was impact on technology transfer?**

Nothing to report.

- **What was the impact on society beyond science and technology?**

Nothing to report.

### **Changes/Problems:**

- **Changes in approach and reasons for change**

During the past reporting period, we decided to consent a greater number of healthy volunteers and patients with sporadic renal masses. The volunteers helped us improve the technique used for the *in vivo* MRS sequence given our initial difficulties with signal interference. We also began consenting patients with sporadic renal masses to accumulate more MRS data on lipid-poor renal masses due to the slow enrollment of patients diagnosed with TSC. Recruitment has now increased and we have helped reduce signal interference from surrounding tissues when targeting renal masses, providing more accurate spectra images.

- **Actual or anticipated problems or delays and actions or plans to resolve them**

We anticipated initial slow enrollment into the research study, which was resolved by consenting patients with sporadic lipid-poor renal masses. Part of the delay was related to our prolonged process for IRB approval, but part of it also can be attributed to improving the *in vivo* MRS sequence technique to limit signal interference. This was accomplished by consenting healthy volunteers prior to TSC-associated renal mass patients intended for the study. Given the length in time of the MRS sequence, we had to begin using non-breath hold gating when targeting the tumor of interest. These actual problems have been resolved and we anticipate to consent a greater number of participants according to the schedule for year 2 of the research study.

- **Changes that had a significant impact on expenditures**

Nothing to report.

- **Significant changes in use or care of human subjects, vertebrate animals, biohazards, and/or select agents**

Nothing to report.

#### **Products:**

- **Publications, conference papers, and presentations**

Nothing to report.

- **Website(s) or other Internet site(s)**

Nothing to report.

- **Technologies or techniques**

Nothing to report.

- **Inventions, patent applications, and/or licenses**

Nothing to report.

- **Other Products**

Imaging data and associated clinical databases; biospecimen collections

#### **Participants & Other Collaborating Organizations:**

- **What individuals have worked on the project?**

Name:	<i>Adam S. Feldman, MD, MPH</i>
Project Role:	<i>PI</i>

Researcher Identifier (e.g. ORCID ID):	
Nearest person month worked:	3
Contribution to Project:	<i>Dr. Feldman is responsible for the overall performance of this study. He consents patients in his clinic and then oversees the progress. He coordinates meetings with the various members of the project research team to discuss progress, data and troubleshoot difficulties.</i>
Funding Support:	

Name:	<i>Edouard Nicaise</i>
Project Role:	<i>Research Assistant</i>
Researcher Identifier (e.g. ORCID ID):	
Nearest person month worked:	6
Contribution to Project:	<i>Mr. Nicaise coordinates subject scheduling for MRI with in vivo MRS, records and maintains all data, coordinates the acquisition of all specimens and assists with laboratory preparation of specimens for ex vivo MRS and other analyses.</i>
Funding Support:	

Name:	<i>Eva Ratai, PhD</i>
Project Role:	<i>Co-Investigator</i>
Researcher Identifier (e.g. ORCID ID):	
Nearest person month worked:	1

Contribution to Project:	<i>Dr. Ratai has expertise in in vivo MRS and has worked on the development of our in vivo MRS protocol in the kidney and interpretation of MRS data</i>
Funding Support:	

Name:	<i>Mukesh Harisinghani, MD</i>
Project Role:	<i>Co-Investigator</i>
Researcher Identifier (e.g. ORCID ID):	
Nearest person month worked:	1
Contribution to Project:	<i>Dr. Harisinghani has expertise in diagnostic multiparametric MRI of the kidney. He has worked to interpret the clinical MRI images and will help to correlate our metabolomic data with standard multiparametric MRI imaging data.</i>
Funding Support:	

Name:	<i>Leo Cheng, PhD</i>
Project Role:	<i>Co-Investigator</i>
Researcher Identifier (e.g. ORCID ID):	
Nearest person month worked:	1
Contribution to Project:	<i>Dr. Cheng has expertise in ex vivo MRS and has worked on the development of our ex vivo MRS protocol for renal tissues and interpretation of MRS data</i>
Funding Support:	

Name:	<i>Chin-Lee Wu, MD, PhD</i>
Project Role:	<i>Co-Investigator</i>
Researcher Identifier (e.g. ORCID ID):	
Nearest person month worked:	1
Contribution to Project:	<i>Dr. Wu has expertise in genitourinary pathology, kidney cancer in TSC and angiomyolipoma. He reviews all pathology associated with this study.</i>
Funding Support:	

Name:	<i>Elizabeth Thiele, MD</i>
Project Role:	<i>Co-Investigator</i>
Researcher Identifier (e.g. ORCID ID):	
Nearest person month worked:	1
Contribution to Project:	<i>Dr. Thiele is the Director of the Herscot TSC Center here at MGH and is very involved in the referral of patients to Dr. Feldman for clinical care and also for consideration of this study. As we collect and analyze more data, she will help with continued interpretation and clinical correlation.</i>
Funding Support:	

Name:	<i>Elizabeth Henske, MD</i>
Project Role:	<i>Co-Investigator</i>
Researcher Identifier (e.g. ORCID ID):	

Nearest person month worked:	1
Contribution to Project:	<i>Dr. Henske is a leader in the care of TSC patients and an active part of our local TSC community. She is very involved in the referral of patients to Dr. Feldman for clinical care and also for consideration of this study. As we collect and analyze more data, she will help with continued interpretation and clinical correlation</i>
Funding Support:	

Name:	<i>Othon Iliopoulos, MD</i>
Project Role:	<i>Co-Investigator</i>
Researcher Identifier (e.g. ORCID ID):	
Nearest person month worked:	1
Contribution to Project:	<i>Dr. Iliopoulos has expertise in the clinical and basic biology of RCC, and specifically has expertise in the metabolic pathways in RCC pathogenesis. As we collect and analyze more data, she will help with continued interpretation and clinical correlation.</i>
Funding Support:	

- **Has there been a change in the active other support of the PD/PI(s) or senior/key personnel since the last reporting period**

Nothing to report.

- **What other organizations were involved as partners?**

Nothing to report.

### **Special Reporting Requirements:**

Nothing to report.

## **Appendices:**

### **Curriculum Vitae**

**Date Prepared:** March 9, 2019

**Name:** Adam S. Feldman, M.D., M.P.H.

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Newton, MA 02459

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**Work E-Mail:** afeldman@mgh.harvard.edu

**Work FAX:** 617-726-9150

**Place of Birth:** New York, NY

**Education**

1994	B.A. - Biological Basis of Behavior	University of Pennsylvania
1996	M.A. (Alpha Epsilon Lambda) - Medical Sciences	Boston University School of Medicine



2000	M.D. (Alpha Omega Alpha)	University of Massachusetts Medical School
2009	M.P.H. – Clinical Effectiveness	Harvard School of Public Health

### **Postdoctoral Training**

07/00-06/01	Intern in Surgery, Massachusetts General Hospital
07/01-06/02	Resident in Surgery, Massachusetts General Hospital
07/02-06/05	Resident in Urology, Massachusetts General Hospital
07/05-06/06	Chief Resident in Urology, Massachusetts General Hospital
07/06-06/08	Fellow in Urologic Oncology, Massachusetts General Hospital

### **Faculty Academic Appointments**

2000-2006	Clinical Fellow in Surgery, Harvard Medical School, Boston, MA
2006-2010	Instructor in Surgery, Harvard Medical School, Boston, MA
2010-present	Assistant Professor of Surgery, Harvard Medical School, Boston, MA

### **Appointments at Hospitals/Affiliated Institutions**

2006-present	Assistant in Urology, Massachusetts General Hospital, Boston, MA
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### **Major Administrative Leadership Positions**

2011	Scientific Program Chair, American Urological Association, New England and Mid-Atlantic Sections, Annual Meeting
2015-present	Director, Combined Harvard Urologic Oncology Fellowship
2018-present	Director of Research, Department of Urology, Massachusetts General Hospital

### **Other Professional Positions**

2012	American Urological Association Representative, Lower Anogenital Squamous Terminology Standardization (LAST) Consensus Conference, 2012
2012	Member: Scientific Program Committee, American Urological Association, New England Section Annual Meeting
2012-present	Board Member: Sean Kimerling Testicular Cancer Foundation
2013-present	Co-Leader of the Career Development Program: DFCI/HCC Prostate Cancer SPORE
2016	Scientific Co-Chair: DF/HCC Kidney Cancer Program Retreat
2016	Course Director: State of the Art Imaging in the Diagnosis and Management of Prostate Cancer
2017	Course Director: State of the Art Imaging in the Diagnosis and Management of Prostate Cancer

### **Committee Service - Local**

2012-present	Member: Surgical Coordination Committee, Department of Urology, MGH
2013-2015	Member: MGH eCare Big Data and Data Repository Workgroup
2013-present	Urology Representative: Clinical Research Workgroup of the Continuous of the Continuous Research Operations Improvement (CROI) Task Force
2016-present	Urology Representative: MGH Research Council

2018 Urology Representative: MGH Frigoletto Committee on Physician Well-Being

### **Committee Service - Regional**

2012-present Member: Massachusetts Medical Society Committee on Men's Health

### **Committee Service - National**

2013-present Member: Eastern Cooperative Oncology Group (ECOG) Genitourinary Committee

### **Professional Societies**

1998-present Massachusetts Medical Society, Member

2002-present American Urological Association, Member

2004-present American Association of Clinical Urologists, Member

2009-present Society of Urologic Oncology, Member

### **Grant Review Activities**

2012-19 Prostate Cancer Foundation Young Investigator Awards Review Committee

2013-15 Bladder Cancer Advocacy Network Young Investigator Awards Review Committee

2013-19 Prostate Cancer Foundation Challenge Awards Review Committee

2013-19 DFCI/HCC Prostate Cancer SPORE Review Committee

### **Editorial Activities**

2006 Ad-Hoc Reviewer, International Braz J Urol

2007-present Ad-Hoc Reviewer, Journal of Urology

2010-present Ad-Hoc Reviewer, Urology

2010-present Ad-Hoc Reviewer, Prostate Cancer and Prostatic Diseases

2010-present Ad-Hoc Reviewer, Urologic Oncology

2011-present Ad-Hoc Reviewer, BJU International

2012-present Ad-Hoc Reviewer, Molecular Cancer Research

2013-present Ad-Hoc Reviewer, European Urology

2014-present Ad-Hoc Reviewer, Journal of Endourology

2015 Ad-Hoc Reviewer, JAMA

### **Editorial Board**

2015-present Editorial Board Member, BMC Urology

2017-present Editorial Board Member, Urologic Oncology: Seminars and Original Investigations

### **Honors and Prizes**

1996 Alpha Epsilon Lambda - Graduate Honors Society, Boston U. School Of Medicine

2000 Senior Scholar - Department of Surgery, U. Of Massachusetts Medical School

2000 Alpha Omega Alpha Honor Medical Society, U. Of Massachusetts Medical School

2003 Resident Abstract Travel Award, American Urological Association - New England Section

2005	Merit Award for Outstanding Abstract, The ASCO Foundation Grants Program – Multidisciplinary Prostate Cancer Symposium
2006	Gerald P. Murphy Scholar, American Urological Association
2008	Merit Award for Outstanding Abstract, The ASCO Foundation Grants Program – Multidisciplinary Genitourinary Cancers Symposium
2009	AUA Foundation Research Forum – AUA New England Section Nominee
2008	Prostate Cancer Foundation Young Investigator Award
2011	CINE Golden Eagle Award – CBS Public Service Announcement on Prostate Cancer
2011	Best Poster - Annual Meeting of the American Urological Association, Washington, D.C.
2012	AUA Foundation Research Forum – AUA New England Section Nominee
2018	Best Poster - Annual Meeting of the American Urological Association, San Francisco
2018	Summa Cum Laude Award at the 2018 Annual Meeting of the International Society for Magnetic Resonance in Medicine

## **Report of Funded and Unfunded Projects**

### **Funding Information**

#### **Past:**

1997	Student	Institutional Grant, Joseph P. Healy Grant, Pre-clinical Intercultural Program, University of Massachusetts Medical School <ul style="list-style-type: none"> <li>• Summer intercultural immersion program in clinical medicine in Latino community in Miami, FL</li> </ul>
1997-1998	Project Director	Institutional Grant, Community Service Grant funding Creating Our Future Program, University of Massachusetts Medical School <ul style="list-style-type: none"> <li>• Program in which medical students tutored and mentored children of homeless families in Worcester, MA</li> </ul>
2007-2008	P.I.	Claire and John Bertucci Prostate Cancer Research Fund, A Proteomic Approach to Prostate Cancer Biomarker Discovery <ul style="list-style-type: none"> <li>• Use proteomic techniques for urine biomarker discovery in men with prostate cancer</li> <li>• \$25,000 award</li> </ul>
2007-2009	P.I.	Company – Predictive Biosciences; Evaluation of Urine Based Protein Biomarkers in Bladder Cancer <ul style="list-style-type: none"> <li>• Analyze urinary proteins as novel diagnostic and surveillance markers in bladder cancer</li> <li>• Sponsored Research Agreement</li> </ul>

2009-2010	P.I.	<p>Claire and John Bertucci Prostate Cancer Research Fund - Active Surveillance for Prostate Cancer: Management Patterns, Outcomes, and Quality of Life</p> <ul style="list-style-type: none"> <li>• Funding supports research personnel for data mining and management</li> <li>• \$25,000 award</li> </ul>
2008-2012	P.I.	<p>Prostate Cancer Foundation – Young Investigator Award; Proteomic Discovery and Analysis of Novel Biomarkers in Prostate Cancer</p> <ul style="list-style-type: none"> <li>• Use proteomic mass spectrometry techniques for identification of novel prostate cancer biomarkers in urine and serum</li> </ul>
2009-2010	Investigator	<p>\$75,000 per year for 3 years. Harvard Catalyst Pilot Grant Program</p> <p>NIH UL1 RR 025758-02 Clinical and Translational Science Center Grant</p> <p>Sonoelastography for Tumor-Targeted Prostate Biopsy</p>
2015	P.I.	<ul style="list-style-type: none"> <li>• This study is a pilot study of the utility of sonoelastography for targeting biopsy to foci of cancer in the prostate.</li> </ul> <p>Project Title: A Collaborative Study Using Primary Prostate Cells and their Reprogramming for the Study of Progression to Castrate Resistant Prostate Cancer Role on the Project: Site PI Supporting Agency: Georgetown University/GHUCCTS/Clinical and Translational Science Awards Level of Funding: \$10,000</p>
2014-2015	Site-P.I.	<p>An Open registry to Measure the Impact of Adding Genomic Testing (Prolaris) on the Treatment Decision Following Biopsy in Newly Diagnosed Prostate Cancer Patients by Specialists (CTA:PROCEDE-2000)</p> <p>Myriad Genetic Labs, Inc. The objective of this registry is an estimation study intended to evaluate the impact of genomic test results towards selecting a first-line therapy option for newly diagnosed localized prostate cancer patients</p>
2011-2016	P.I.	<p>Department of Defense Prostate Cancer Research Program - Physician Research Training Award; Analysis of Novel Prostate Cancer Biomarkers and Their Utility in an Active Surveillance Protocol</p>

The research project will investigate novel biomarkers in prostate cancer detection and prediction of disease outcome.  
\$130,000 per year for 5 years

- 2013-2016 P.I. Project Title: Validating Conditionally Reprogrammed Cells to Advance Personalized Medicine for Prostate Cancer  
Role on the Project: Site PI  
Supporting Agency: Georgetown University/DoD (W81XWH-12-PCRP)  
Level of Funding: \$50,000
- 2014-2017 Site P.I. Project Title: An Open registry to Measure the Impact of Adding Genomic Testing (Prolaris) on the Treatment Decision Following Biopsy in Newly Diagnosed Prostate Cancer Patients by Specialists (PROCEDE-2000)  
Role on the Project: Site PI  
Supporting Agency: Myriad Genetic Labs., Inc.

### **Current:**

- 2009-present Investigator RTOG 0712: A Phase II Randomized Study for Patients With Muscle-Invasive Bladder Cancer Evaluating Transurethral Surgery and Concomitant Chemoradiation by Either BID Irradiation Plus 5-Fluorouracil and Cisplatin or QD Irradiation Plus Gemcitabine Followed by Selective Bladder Preservation and Gemcitabine/Cisplatin Adjuvant Chemotherapy
- 2013-present Investigator RTOG0938: A Randomized Phase II Trial of Hypofractionated Radiotherapy for Favorable Risk Prostate Cancer
- 2013-present Investigator Phase III randomized clinical trial of proton therapy vs IMRT for low or low-intermediate risk prostate cancer
- 2013-present Investigator Characterizing Prostate Cancer by ex vivo MRS Signature (Cheng) NIH/NCI, R01CA115746  
The proposed project is aimed at permitting translation of our pre-clinical human study results into new diagnostic and evaluation paradigms for the PCa clinic
- 2014-present P.I. Prognostic Utility of CCP Score in Patients with Renal Cell Carcinoma Myriad Genetics, Inc.  
The specific aims are: 1) to evaluate the prognostic utility of the CCP score generated from nephrectomy to predict recurrence and cancer-specific mortality in patients who have undergone radical nephrectomy; 2) to evaluate the correlation between CCP scores generated from biopsies and nephrectomy tissue in patients with paired samples; and 3) to evaluate the association between CCP score from biopsy and observed tumor growth rate in patients with RCC managed by active surveillance.

2015-present	Site-P.I.	<p>Tissue-based Genomics for Risk Stratification in Localized Renal Cell Carcinoma</p> <p>University of Michigan/NCCN</p> <p>The goal of this subcontract work is to collaborate with University of Michigan to provide clinical specimens and clinical data to Myriad Genetics on the clinical management of patients with RCC.</p>
2013-2019	Site-P.I.	<p>DF/HCC SPORE in Prostate Cancer</p> <p>Dana Farber Cancer Institute/NIH-NCI</p> <p>The specific aims for Administrative Core are: 1) monitor research progress and plan for the future; 2) foster collaborative research within and between SPOREs and integrate the DF/HCC Prostate Cancer SPORE into the structure of DF/HCC; 3) provide necessary resources and fiscal oversight; 4) promote rapid dissemination of significant research findings and free and open; and 5) communication and resource exchange between the DF/HCC SPORE and other institutions.</p>
2017-2019	P.I.	<p>Evaluation of Lipid Poor Renal Masses with Magnetic Resonance Spectroscopy in Tuberous Sclerosis Complex</p> <p>Department of Defense - W81XWH-17-1-0468</p> <p>The major goals of this project are to assess in vivo and ex vivo metabolomic profiles of renal masses in patients with Tuberous Sclerosis Complex in order to differentiate malignant from benign lesions.</p> <p>Project Role: Principal Investigator</p>

## Unfunded Projects

### Past:

1991	Research Assistant	Isolation and sequencing of a conserved domain of the DnaJ family of chaperonins. Department of Surgical Research, Children's Hospital, Boston, MA.
1994-1995	Research Assistant	Evaluation of Critical Pathways for CHF, DVT, and Normal Vaginal Delivery with 24 hour LOS. Brigham and Women's Hospital, Boston, MA.
1994-1995	Research Assistant	Adverse Drug Events Prevention Study Group. Brigham and Women's Hospital, Harvard School of Public Health.
1999-2000	Research Fellow	Characterization of Angiogenic Markers in the Rat Genitourinary System. Laboratory for Cellular Therapeutics and Tissue Engineering, Department of Urology, Children's Hospital, Boston, MA.
2002-2004	Investigator	Development of bladder cancer in a murine model for Cables knock-out mice exposed to N-butyl-N-(4-hydroxybutyl)nitrosamine (BBN). Laboratory of Urology/Pathology, Massachusetts General Hospital, Boston, MA.
2002-2004	Investigator	The Role of Cables, a novel cell-cycle regulatory protein in human transitional cell carcinoma and prostate cancer. Laboratory of Urology/Pathology, Massachusetts General Hospital, Boston, MA.
2004-2005	Investigator	Proteomic analysis of voided urine specimens for biomarker discovery and validation in prostate and bladder cancer. Laboratory of Urology/Pathology,

		Massachusetts General Hospital. Department of Vascular Biology, Children's Hospital, Boston, MA.
2007-2008	Investigator	Laparoscopic and Open Radical prostatectomy after laparoscopic inguinal hernia repair. Massachusetts General Hospital, Boston, MA.
2010	Investigator	Outcomes of Organ Sparing Surgery in Penile Cancer. Massachusetts General Hospital, Boston, MA.
2010- 2012	Investigator	Multi-Institutional Bladder Cancer Quality Care Initiative for non-metastatic muscle invasive transitional cell carcinoma of the bladder.

**Current:**

2008-present	P.I.	A comparison of nephron sparing techniques: percutaneous radiofrequency ablation (RFA) vs. open and laparoscopic partial nephrectomy. Massachusetts General Hospital, Boston, MA.
2009-present	P.I.	Active Surveillance in Prostate Cancer: Retrospective analysis of quality of life and outcomes and development of a prospective cohort. Massachusetts General Hospital, Boston, MA.
2010-present	P.I.	Renal Biopsy for Small Renal Masses. Massachusetts General Hospital, Boston, MA.
2013-present	Investigator	PARTIQoL (Prostate Advanced Radiation Technologies Investigating Quality of Life) Registry

**Report of Local Teaching and Training****Teaching of Students in Courses**

2006-present	<u>Urologic Surgery</u>			
			<i>contact time</i>	<i>prep time</i>
	Attending	30 Medical Students 8 Residents	10 hours/week for 50 week(s)	none reported
2008-2010	<u>Patient Doctor II</u>			
			<i>contact time</i>	<i>prep time</i>
	Attending	5 Medical Students	8 hours/year for 1 year(s)	none reported
2010, 2015	<u>HMS2 Pathophysiology</u>			
			<i>contact time</i>	<i>prep time</i>
	Attending	25 Medical Students	3 hours/year for 1 year(s)	3 hours
2013-present	HMS Surgical Clerkship Lecture on Urologic Surgery			

		<i>contact time</i>	<i>prep time</i>
Attending	10 Medical Students	4 hours/year for 1 year(s)	3 hours

### **Formal Teaching of Residents, Clinical Fellows and Research Fellows (post-docs)**

2007	<u>Surgical Chief's Rounds - Department of Surgery - Injuries to the Urogenital Tract</u>			
			<i>contact time</i>	<i>prep time</i>
	Lecturer	25 Residents	1 hour	5 hours
2008-present	<u>Ambulatory Teaching Rounds - Department of Medicine – Uro-oncology for the primary care physician; Management of Small Renal Masses</u>			
			<i>contact time</i>	<i>prep time</i>
	Lecturer	30 Residents	4 hours/year	10 hours/year
2010	<u>General Surgery Teaching Rounds – Department of Surgery – Bladder Cancer Review</u>			
			<i>contact time</i>	<i>prep time</i>
	Lecturer	25 Residents	0.5 hour	3 hours

### **Clinical Supervisory and Training Responsibilities**

2006-present	Urological Surgery – Training of Residents/Fellows	15 hours/week
2008-2012	Sub-specialty Faculty Advisor for the Acute Care Surgery fellow	10 hours/year
2015-present	Director, Combined Harvard Urologic Oncology Fellowship	
2018-present	Director of Research, Department of Urology, Massachusetts General Hospital	

### **Laboratory and Other Research Supervisory and Training Responsibilities**

2007-present	Supervision and mentoring of Research Fellow	5 hours/week
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### **Formal Teaching of Peers (e.g., CME and other continuing education courses)**

1996-1997	Worcester, MA	Teaching Assistant/Tutor in Biochemistry, University of Massachusetts Medical School
		Responsibility: Tutor fellow medical students in Biochemistry.
2009	Las Vegas, NV	Faculty (CME Course): Maximizing Bone Health for Patients With Prostate Cancer: Establishing the "Who, What, Why & How?"
2009	Scottsdale, AZ	Faculty (CME Course): Maximizing Bone Health for Patients With Prostate Cancer: Establishing the "Who, What, Why & How?"



2010	San Francisco, CA	Faculty (CME Course): Master Class on Integrating Novel Antiresorptive Agents into the treatment of Prostate Cancer
2010	Boston, MA	Faculty (CME Course): Trauma and Critical Care Symposium – Penile and Genitalia Trauma
2011	Boston, MA	Faculty (CME Course): Society of Translational Oncology Prostate Cancer Symposium – Prostate Cancer: Progress and Promise
2011	Cambridge, MA	Faculty (CME Course): Primary Care Internal Medicine: Principles & Practice – Case Studies in Urology [ <i>Invited Lecture</i> ]
2013	Ft. Lauderdale, FL	Faculty (CME Course): Winter Oncology Symposium – Holy Cross Hospital – Management of the Small Renal Mass
2013	Waltham, MA	Faculty (CME Course): Men’s Health Symposium – Prostate Cancer: Screening, Management and Controversy
2013	Chicago, IL	Faculty (CME Course): Radiologic Society of North America – Refresher course: Small renal mass (T1a) – the case for resection
2014	Cambridge, MA	Faculty (CME Course): Primary Care Internal Medicine: Principles & Practice – Male Urology [ <i>Invited Lecture</i> ]
2014	Boston, MA	Faculty (CME Course): 17th Biennial Urologic Cancer Course – Bladder Cancer Biomarkers
2014	Chicago, IL	Faculty (CME Course): Radiologic Society of North America – Refresher course: Small renal mass (T1a) – the case for resection
2015	Video Series	Faculty (CME Course): Comprehensive Review of Urology – Penile and Urethral Cancer
2015	Boston, MA	Faculty (CME Course): UroTrack – Renal Mass Biopsy
2015	Boston, MA	Faculty (CME Course): UroTrack – MGH Experience in MRI Fusion Prostate Biopsy
2014	Cambridge, MA	Faculty (CME Course): Primary Care Internal Medicine: Prostate in the Aging Male [ <i>Invited Lecture</i> ]
2015	Chicago, IL	Faculty (CME Course): Radiologic Society of North America – Refresher course: Small renal mass (T1a) – the case for resection
2016	Baltimore, MD	Faculty (CME Course): UroTrack – Renal Mass Biopsy Debate - Pro
2016	Boston, MA	Faculty (CME Course): 18th Biennial Urologic Cancer Course – Role of Biomarkers in Diagnosis and Followup of Bladder Cancer
2016	Boston, MA	Faculty (CME Course): State of the Art Imaging in the Diagnosis and Management of Prostate Cancer - Rising PSA, Prior Negative Biopsy
2017	Boston, MA	Faculty (CME Course): Trauma & Critical Care Symposium – Approaches to the Ureters and Bladder: High and Low
2017	Boston, MA	Faculty (CME Course): State of the Art Imaging in the Diagnosis and Management of Prostate Cancer – Utilization of Other Diagnostics/Biomarkers for the Detection of Prostate Cancer
2017	Boston, MA	Faculty (CME Course): State of the Art Imaging in the Diagnosis and Management of Prostate Cancer – Tips and Tricks: Fusion vs. Cognitive Biopsy
2017	Boston, MA	Faculty (CME Course): UroTrack – To Biopsy or Not to Biopsy: Role of Renal Mass Biopsy
2018	Ft. Lauderdale, FL	Faculty (CME Course): Winter Oncology Symposium – Holy Cross Hospital – To Biopsy or not to Biopsy: Role of the Renal Mass Biopsy

2018	Boston, MA	Faculty (CME Course): National Comprehensive Cancer Network Prostate Cancer Tumor Board Webinar
2018	Santo Domingo, Dominican Republic	Faculty (CME Course): Latin America Prostate Cancer Summit – Management of Patients post-radical prostatectomy [ <i>Invited Lecture</i> ] Management of Hormone Sensitive Prostate Cancer [ <i>Invited Lecture</i> ]
2018	San Francisco, CA	Course Director and Faculty: AUA Course – Trimodality Therapy for Management of Muscle Invasive Bladder Cancer
2018	Boston, MA	Faculty (CME Course): 18th Biennial Urologic Cancer Course – Role of Biomarkers in Diagnosis and Followup of Bladder Cancer

## **Report of Regional, National and International Invited Teaching and Presentations**

### **Local Invited Presentations and Courses**

2008	Boston, MA	Comparative Analysis of Nephron Sparing Techniques. Update on Urologic Oncology – Massachusetts General Hospital, Harvard Medical School [ <i>Invited Lecture</i> ]
2008	Boston, MA	Prostate Cancer: Diagnosis and Management. Prostate Cancer Support Group, Massachusetts General Hospital [ <i>Invited Lecture</i> ]
2011	Boston, MA	Controversies Around the Management of Small Renal Masses – DF/HCC Kidney Cancer Program [ <i>Invited Lecture</i> ]
2011	Boston, MA	Proteomic Discovery of Novel Biomarkers in Prostate Cancer – Massachusetts General Hospital Department of Urology Centennial Academic Program [ <i>Invited Lecture</i> ]
2011	Cambridge, MA	Management of Small Renal Masses – Harvard University Health Services Grand Rounds [ <i>Invited Lecture</i> ]
2011	Boston, MA	Incidental Radiologic Findings: "Incidental Renal Masses" – Massachusetts General Hospital Medical Grand Rounds [ <i>Invited Lecture</i> ]
2012	Concord, MA	Controversies in the Management of the Small Renal Mass – Emerson Hospital Medical Grand Rounds [ <i>Invited Lecture</i> ]
2014	Boston, MA	Management of Renal Lesions in Tuberous Sclerosis Complex – Massachusetts General Hospital Department of Pathology Grand Rounds [ <i>Invited Lecture</i> ]
2015	Boston, MA	Management of the Small Renal Mass – Massachusetts General Hospital Department of Urology Grand Rounds [ <i>Invited Lecture</i> ]

2015	Boston, MA	Prostate Cancer: Facts and Misconceptions – Massachusetts State House, Prostate Cancer Awareness Day [Invited Lecture]
2016	Cambridge	Evaluation and Management of the Small Renal Mass – Cambridge Health Alliance, Department of Surgery Grand Rounds [Invited Lecture]
2016	Boston, MA	Evaluation and Management of the Small Renal Mass – Massachusetts General Hospital Department of Urology Grand Rounds [Invited Lecture]
2017	Boston, MA	Penile and Urethral Cancer– Massachusetts General Hospital Department of Urology Grand Rounds [Invited Lecture]
2018	Boston, MA	MGH/MIT Center for Ultrasound Research & Translation (CURT) Lecture Series - I'm still trying to figure it out: A busy surgeon's evolving journey in translational and clinical research [Invited Lecture]
2018	Boston, MA	MGH Chief's Council – Urologic Oncology at MGH: Research and Scholarly Activity
2018	Cambridge, MA	Harvard University Health Services: Grand Rounds – Bladder Cancer Review [Invited Lecture]

#### **Regional Invited Presentations and Courses**

2009	Dedham, MA	Urologic Oncology: An Overview. Massachusetts Health Information Management Association [ <i>Invited Lecture</i> ]
2010	Mt. Kisco, NY	Controversies in the Management of Small Renal Masses [ <i>Invited Lecture</i> ]
2011	Dedham, MA	Penile Cancer. Urology Nursing Society [ <i>Invited Lecture</i> ]
2012	Boston, MA	AUA Update in Bladder and Prostate Cancer. AUA New England Section, Annual Meeting
2013	Ft. Lauderdale, FL	Faculty (CME Course): Winter Oncology Symposium – Holy Cross Hospital – Management of the Small Renal Mass
2013	Waltham, MA	Faculty (CME Course): Men's Health Symposium – Prostate Cancer: Screening, Management and Controversy
2015	Bahamas	Renal Mass Biopsy Should Be Used Selectively Prior To a Treatment Decision [ <i>Invited Lecture</i> ]
2016	Boston, MA	DF/HCC Kidney Cancer Program Retreat - Metabolomic imaging of RCC using MR Spectroscopy: Proposal for a comparative <i>in vivo</i> and <i>ex vivo</i> study
2016	Portland, ME	Multiparametric MRI for the Detection of Prostate Cancer. AUA New England Section, Annual Meeting
2017	Boston, MA	First Annual Herscot Center for Tuberous Sclerosis Complex Symposium – Management of Renal Masses in Tuberous Sclerosis Complex
2018	Ft. Lauderdale, FL	Faculty (CME Course): Winter Oncology Symposium – Holy Cross Hospital – To Biopsy or not to Biopsy: Role of the Renal Mass Biopsy

**National Invited Presentations and Courses**

2007	Hollywood, FL	Radical prostatectomy after inguinal hernia repair. The American Hernia Society <i>[Invited Lecture]</i>
2009	Boston, MA	Renal Cell Carcinoma: Surgical Management at Massachusetts General Hospital. Exchange Experience Program on Renal Cancer <i>[Invited Lecture]</i>
2009	Las Vegas, NV	Faculty (CME Course): Maximizing Bone Health for Patients With Prostate Cancer: Establishing the "Who, What, Why & How?" <i>[Invited Lecture]</i>
2009	Scottsdale, AZ	Faculty (CME Course): Maximizing Bone Health for Patients With Prostate Cancer: Establishing the "Who, What, Why & How?" <i>[Invited Lecture]</i>
2010	San Francisco, CA	Faculty (CME Course): Master Class on Integrating Novel Antiresorptive Agents into the treatment of Prostate Cancer. <i>[Invited Lecture]</i>
2010	Boston, MA	Faculty (CME Course): Trauma and Critical Care Symposium – Penile and Genitalia Trauma. <i>[Invited Lecture]</i>
2011	Boston, MA	Faculty (CME Course): Society of Translational Oncology Prostate Cancer Symposium – Prostate Cancer: Progress and Promise
2011	Cambridge, MA	Faculty (CME Course): Primary Care Internal Medicine: Principles & Practice – Case Studies in Urology <i>[Invited Lecture]</i>
2012	Washington, DC	Society of Urologic Oncology – December, 2012: To biopsy or not to biopsy: Results of 1000 renal mass biopsies at a single institution
2013	New Orleans, LA	Faculty – World Congress of Endourology (Industry Sponsored Symposium) - 3D Laparoscopic Urology: Surgical Techniques and Hands-On
2013	Chicago, IL	Faculty (CME Course): Radiologic Society of North America – Refresher course: Small renal mass (T1a) – the case for resection
2014	Cambridge, MA	Faculty (CME Course): Primary Care Internal Medicine: Principles & Practice – Male Urology <i>[Invited Lecture]</i>
2014	Boston, MA	Faculty (CME Course): 17th Biennial Urologic Cancer Course – Bladder Cancer Biomarkers
2014	Chicago, IL	Faculty (CME Course): Radiologic Society of North America – Refresher course: Small renal mass (T1a) – the case for resection
2015	New Orleans, LA	Society of Urologic Oncology, May 2015 – Primary Penile Sparing: Treatment Approaches
2015	Chicago, IL	Faculty (CME Course): Radiologic Society of North America – Refresher course: Small renal mass (T1a) – the case for resection
2016	San Francisco, CA	Myriad Genetics, Inc. Advisory Board on Renal Cell Carcinoma – Evaluation of CCP Score Genomic Signature in Renal Cell Carcinoma
2016	Boston, MA	Faculty: World Conference on Interventional Oncology – Partial Nephrectomy Remains the Gold Standard
2016	Baltimore, MD	Faculty (CME Course): UroTrack – Renal Mass Biopsy Debate - Pro
2016	Boston, MA	Faculty (CME Course): 18th Biennial Urologic Cancer Course – Role of Biomarkers in Diagnosis and Followup of Bladder Cancer

2016	Boston, MA	Faculty: First Global Summit on Precision Diagnosis for Prostate Cancer – Imaging Tools in a Population of Men With Proven Prostate Cancer: Clinical Case Presentations.
2017	Boston, MA	Faculty: AdMeTech Second Global Summit on Precision Diagnosis for Prostate Cancer - Precision Oncology and Advanced Prostate Cancer: Genomic Testing.
2018	Dallas, TX	Advanced Urology Fellows Course: Identification, Resection & Treatment of Non-Muscle Invasive Bladder Cancer –Complications and Management of TURBT
2018	San Francisco, CA	Course Director and Faculty: AUA Course – Trimodality Therapy for Management of Muscle Invasive Bladder Cancer
2018	Boston, MA	Faculty (CME Course): 18th Biennial Urologic Cancer Course – Role of Biomarkers in Diagnosis and Followup of Bladder Cancer

#### **International Invited Presentations and Courses**

2011	Mallorca, Spain	5 <sup>th</sup> International Urology Forum – The Potential of Nanoparticle Enhanced Imaging in the Accurate Detection of Lymph Node Metastases [ <i>Invited Lecture</i> ]
2012	Mallorca, Spain	6 <sup>th</sup> International Urology Forum – Renal Mass Biopsy [ <i>Invited Lecture</i> ]
2016	Tel Aviv, Israel	Faculty: Friends of Israel Urology Symposium – Nephron sparing surgery for multiple renal tumors [ <i>Invited Lecture</i> ] Partial Nephrectomy: How I do it with less than 20 minutes warm Ischemia time [ <i>Invited Lecture</i> ] Session Chair: Oligometastases in Prostate Cancer
2017	Hachioji, Japan	Olympus Corporation - Future of Urologic Surgery [ <i>Invited Lecture</i> ]
2018	Santo Domingo, Dominican Republic	Latin America Prostate Cancer Summit – Management of Patients post-radical prostatectomy [ <i>Invited Lecture</i> ] Management of Hormone Sensitive Prostate Cancer [ <i>Invited Lecture</i> ]
2018	Tel Aviv, Israel	Faculty: Friends of Israel Urology Symposium – Active Surveillance for Prostate Cancer in Young Men [ <i>Invited Lecture</i> ] Trimodality Therapy for Muscle Invasive Bladder Cancer [ <i>Invited Lecture</i> ]

## **Report of Clinical Activities and Innovations**

### **Current Licensure and Certification**

2002           Diplomate, National Board of Medical Examiners  
 2004           Massachusetts Registered Physician

### **Practice Activities**

Urology/Urologic Oncology, Laparoscopy and Endourology      Massachusetts General Hospital  
 Attending Urologic Surgeon, Polycystic Kidney Disease Clinic   Massachusetts General Hospital

## **Report of Technological and Other Scientific Innovations**

### **Patents**

1. Zetter BR, Feldman AS, McDougal WS. Methods for diagnosis and prognosis of epithelial cancers. U.S. provisional Patent Application. 2006 Mar 8.
  - Potential use of biomarkers as diagnostic or prognostic markers in bladder cancer. These are currently under investigation and are not yet being used in clinical care
  - My contribution was and is the discovery and analysis of the patented biomarkers

## **Report of Education of Patients and Service to the Community**

### **Activities**

1996-1998    Director (1997-1998) Volunteer (1996-1997), Creating Our Future Program - Worcester Family Health and Social Services Center

### **Educational Material for Patients and the Lay Community:**

2010           **Feldman AS.** Essay on Prostate Cancer. CBS Cares: Prostate Cancer Campaign. cbscares.com.

2011           **Feldman AS.** Essay on Testicular Cancer. CBS Cares Valentine's Day Campaign on Testicular Cancer. cbscares.com.

2011           **Feldman AS.** Patient information: Blood in the urine (hematuria) in adults. UpToDate 19.3. October 14, 2011.

2014           **Feldman AS.** Prostate Cancer: Screening, Management and Controversy. Lecture given at Temple Beth Avodah, Newton, MA.

2015           **Feldman AS.** Prostate Cancer: Screening and Awareness. Lecture given at Leon De Juda Church, Boston, MA.

2015 **Feldman AS.** Prostate Cancer: Screening, Diagnosis and Treatment. Lecture given at The 7<sup>th</sup> Annual Prostate Cancer Awareness Day. Massachusetts State House, Boston, MA.

## **Report of Scholarship**

### **Peer Reviewed Publications in print or other media:**

#### **Research Investigations:**

1. Eisner BH, **Feldman AS**, Chapin BF, Dretler SP. "Blind coning"--using the Stone Cone for removal of intramural ureteral calculi. *Urology*. 2007;69(4):773-5.
2. Banyard J, Bao L, Hofer MD, Zurakowski D, Spivey KA, **Feldman AS**, Hutchinson LM, Kuefer R, Rubin MA, Zetter BR. Collagen XXIII expression is associated with prostate cancer recurrence and distant metastases. *Clin Cancer Res*. 2007;13(9):2634-42.
3. **Feldman AS**, Banyard J, Wu C-L, McDougal WS, Zetter BR . Cystatin B as a tissue and urinary biomarker of bladder cancer recurrence and disease progression. *Clin Cancer Res*. 2009;15(3):1024-31.
4. Tanrikut C, **Feldman AS**, Altemus M, Paduch DA, Schlegel PN. Adverse effect of paroxetine on sperm. *Fertility and Sterility*. 2009. June 10, Epub ahead of print.
5. Kubota K, Anjum R, Yu Y, Kunz RC, Andersen JN, Kraus M, Keilhack H, Nagashima K, Krauss S, Paweletz C, Hendrickson RC, **Feldman AS**, Wu CL, Rush J, Villen J, Gygi SP. Sensitive multiplexed analysis of kinase activities and activity-based kinase identification. *Nature Biotechnology*. 2009; 27(10): 933-40.
6. Pandharipande PV, Gervais DA, Hartman RI, Harisinghani MG, **Feldman AS**, Mueller PR, Gazelle GS. [Renal mass biopsy to guide treatment decisions for small incidental renal tumors: a cost-effectiveness analysis](#). *Radiology*. 2010; 256(3):836-46.
7. Coen JJ, **Feldman AS**, Smith MR, Zietman AL. [Watchful waiting for localized prostate cancer in the PSA era: what have been the triggers for intervention?](#) *BJU Int*. 2010 Sep 22. Epub ahead of print.
8. Psutka SP, **Feldman AS**, Rodin D, Olumi AF, Wu CL, McDougal WS. Men With Organ-confined Prostate Cancer and Positive Surgical Margins Develop Biochemical Failure at a Similar Rate to Men With Extracapsular Extension. *Urology*. 2011 Mar 14. [Epub ahead of print]
9. **Feldman AS**, McDougal WS. Long Term Outcome of Excisional Organ Sparing Surgery for Carcinoma of the Penis. *J Urol*. 2011 Oct;186(4):1303-7.
10. Fernandez CA, Milholland JM, Zwarthoff EC, **Feldman AS**, Karnes JR, Shuber AP. A noninvasive multi-analyte diagnostic assay: combining protein and DNA markers to stratify bladder cancer patients. *Research and Reports in Urology*. 2012 Feb 22. [EPub]

11. Gershman B, Zietman AL, **Feldman AS**, McDougal WS. Transperineal Template-Guided Prostate Biopsy for Patients with Persistently Elevated PSA and Multiple Prior Negative Biopsies. *Urol Oncol*. 2013 Oct;31(7):1093-7.
12. \*Psutka SP, \***Feldman AS**, McDougal WS, McGovern FJ, Mueller P, Gervais DA. Long-Term Oncologic Outcomes After Radiofrequency Ablation for T1 Renal Cell Carcinoma. *Eur Urol*. 2013 Mar;63(3):486-92.  
\*Co-first Authorship
13. Leung CP1, Klausner AP, Habibi JR, King AB, **Feldman A**. Audience response system: a new learning tool for urologic conferences. *Can J Urol*. 2013 Dec;20(6):7042-5.
14. Xu R, Horick N, McGovern FJ, Dahl DM, **Feldman AS**, Blute ML, Olumi AF, Michaelson MD. Prognostic significance of indeterminate lung nodules in renal cell carcinoma. *Urol Oncol*. 2014 Apr;32(3):355-61.
15. Sheth RA, **Feldman AS**, Walker TG. Renoduodenal Fistula After Transcatheter Embolization of Renal Angiomyolipoma. *Cardiovasc Intervent Radiol*. 2014 Apr 11. [Epub ahead of print]
16. Pollock CB, McDonough S, Wang VS, Lee H, Ringer L, Li X, Prandi C, Lee RJ, **Feldman AS**, Koltai H, Kapulnik Y, Rodriguez OC, Schlegel R, Albanese C, Yarden RI. Strigolactone analogues induce apoptosis through activation of p38 and the stress response pathway in cancer cell lines and in conditionally reprogramed primary prostate cancer cells. *Oncotarget*. 2014 Apr 2. [Epub ahead of print]
17. Yang P, Cornejo KM, Sadow PM, Cheng L, Wang M, Xiao Y, Jiang Z, Oliva E, Jozwiak S, Nussbaum RL, **Feldman AS**, Paul E, Thiele EA, Yu JJ, Henske EP, Kwiatkowski DJ, Young RH, Wu CL. Renal Cell Carcinoma in Tuberous Sclerosis Complex. *Am J Surg Pathol*. 2014 May 14. [Epub ahead of print]
18. Hedgire SS, Tabatabaei S, McDermott S, **Feldman A**, Dahl DM, Harisinghani MG. Diversion ahead: imaging appearance of urinary diversions and reservoirs. *Clin Imaging*. 2014 Jul-Aug;38(4):418-27.
19. Rodríguez D, Preston MA, Barrisford GW, Olumi AF, **Feldman AS**. Clinical features of leiomyosarcoma of the urinary bladder: Analysis of 183 cases. *Urol Oncol*. 2014 Oct;32(7):958-65.
20. Siddiqui MM, Heney NM, McDougal WS, Feldman AS (2015) Disparities in overall and urothelial carcinoma specific mortality associated with healthcare insurance status. *Bladder* 2(1):e10. doi: 10.14440/bladder.2015.39. *Accepted for publication*.
21. Ringer L, Sirajuddin P, Tricoli L, Wayne S, Choudhry MU, Parasido E, Sivakumar A, Heckler M, Naeem A, Abdelgawad I, Liu X, **Feldman AS**, Lee RJ, Wu CL, Yenugonda V, Kallakury B, Dritschilo A, Lynch J, Schlegel R, Rodriguez O, Pestell RG, Avantiaggiati ML, Albanese C. The induction of the p53 tumor suppressor protein bridges the apoptotic and autophagic signaling pathways to regulate cell death in prostate cancer cells. *Oncotarget*. 2014 Nov 15;5(21):10678-91



22. Hanske J, Sanchez A, Schmid M, Meyer CP, Abdollah F, **Feldman AS**, Kibel AS, Sammon JD, Menon M, Eswara JR, Noldus J, Trinh QD. A Comparison of 30-Day Perioperative Outcomes in Open Versus Minimally Invasive Nephroureterectomy for Upper Tract Urothelial Carcinoma: Analysis of 896 Patients from the American College of Surgeons-National Surgical Quality Improvement Program Database. *J Endourol*. 2015 Jun 11. [Epub ahead of print]
  23. Hanske J, Sanchez A, Schmid M, Meyer CP, Abdollah F, Roghmann F, **Feldman AS**, Kibel AS, Sammon JD, Noldus J, Trinh QD, Eswara JR. Comparison of 30-day perioperative outcomes in adults undergoing open versus minimally invasive pyeloplasty for ureteropelvic junction obstruction: analysis of 593 patients in a prospective national database. *World J Urol*. 2015 May 13. [Epub ahead of print]
  24. Huang J, **Feldman AS**, Dong L, Cornejo K, Liu Q, Dahl DM, Wu S, Blute ML, Huang Y, Wu CL. Preoperative Anemia as an Independent Prognostic Indicator of Papillary Renal Cell Carcinoma. *Clin Genitourin Cancer*. 2015 May 4. pii: S1558-7673
  25. Rodríguez D, Cornejo KM, Sadow PM, Santiago-Lastra Y, **Feldman AS**. Myopericytoma tumor of the glans penis. *Can J Urol*. 2015 Jun;22(3):7830-3.
  26. \*Preston MA, \***Feldman AS**, Coen JJ, McDougal WS, Smith MR, Paly JJ, Carrasquillo R, Wu CL, Dahl DM, Barrisford GW, Blute MB, Zietman AI. Active surveillance for prostate cancer: need for intervention and survival. *Urol Oncol*. 2015 Jun 6. pii: S1078-1439
- \*Co-first Authorship
27. Sanchez A, Rodríguez D, Allard CB, Bechis SK, Sullivan RJ, Boeke CE, Kuppermann D, Cheng JS, Barrisford GW, Preston MA, **Feldman AS**. Primary genitourinary melanoma: Epidemiology and disease-specific survival in a large population-based cohort. *Urol Oncol*. 2015 Dec 28. [Epub ahead of print]
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