Image-Guided Cancer Therapy Research Program

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**Vision:**

Local-regional tumor control and reduced toxicities through research and development of advanced image-guided focal cancer treatments.
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Mission:

- Empower multidisciplinary teams of physicians and scientists to address clinical challenges and technology barriers using resources of the Program to drive the translation of innovative science directly to patient care.
- Enable the development of innovative new approaches that are more effective, less invasive, and more economical.
- Facilitate commercialization of developed technologies to improve cancer care globally.
Integration of the Program at MD Anderson
Aims

- Highly translational – Driven by clinical problems
- Provide resources (cores) for investigators
- Priority: Commercialization & Industry Collaborations
- Synergistic with other MD Anderson Centers
- Provide training for Clinicians and Scientists
MD Anderson

Diagnostic Imaging

Advanced Technology

Correlative Pathology

Data Sharing

Visualization

Computational Modeling

Imaging

Imaging Guided Cancer Therapy Research

Radiation Oncology

Surgery
Already a large capital investment by MD Anderson
~$25M in capital equipment for image guided therapy

MR-linac - 1st in the USA, integrated MR imaging with radiation delivery

BrainSuite - 1st in the world, intra-operative MRI and surgical navigation system

Myabi MR/X-ray Suite in Interventional Radiology

Advanced MR & PET/MR
Strategic Goals

1. Develop and validate novel imaging to identify and target the tumor while avoiding normal tissue
   a. Use advanced imaging approaches to better resolve tumor and normal tissue anatomic relationships, tumor heterogeneity, biology, and function for better tumor targeting.
   b. Understand normal tissue function and response to therapy
   c. Validate imaging phenotypes by correlative pathology
   d. Develop novel imaging agents for both planning and intervention in collaboration with CABI
Advanced Tumor Targeting: Image Guided Lung Therapy

**Functional Avoidance**

Advanced Pre-Tx Imaging
Function & Tumor

Normalized SPECT V

Improved integration of image-based information, updates to patient model prior to re-imaging with uncertainty assessment

**Adaptive Radiotherapy**

In-Room Integrated Imaging & Navigation
Increasing Access to Minimally Invasive Surgery

Collaborations with David Rice, MD (Surgery), Guillaume Cazoulat, PhD and Osama Mawlawi, PhD (Imaging Physics)
Correlative Pathology: Validating Imaging Signals

Advanced Pre-Tx Imaging Function & Tumor

Clinical Findings: MRI alone is not sufficiently accurate to define boundaries for tumor-targeted salvage even with addition of an uncertainty margin.
Sensitivity: 0.3-0.8, (0.6-1.0 with 5 mm expansion)
Specificity: 0.9 (0.7-0.9 with 5 mm expansion)

Strategic Goals

2. Advance in-room integration of imaging to reduce uncertainties in executing the planned intervention
   a. Rapid imaging for ‘real-time’ interventional updates and guidance
   b. Anatomical modeling to integrate planning images into the interventional space
   c. Intelligent visualization to inform clinician of the current status of the patient
   d. Establish infrastructure to accurately understand delivered local therapy and outcomes
Anatomical modeling: Integrate planning images into interventional space

Improved integration of image-based information, updates to patient model prior to re-imaging with uncertainty assessment

Collaborations with Jeff Weinberg, MD (Surgery), Caroline Chung, MD (Rad Onc), Jason Stafford, PhD (Imag Phys), Jason Johnson, MD (Diag Rad), Jihong Wang, PhD (Ther Phys)
Strategic Goals

3. Achieve clinical impact: significantly improve the local control and quality of life of cancer patients through image guided cancer therapy
   a. Improve communication of information and data between clinicians and interventional platforms
   b. Prospectively collect delivered intervention and outcomes data
   c. Enable streamlined data sharing to promote big data science
   d. Optimize use and allocation of technology and resources
Role of the Program

- Create a community of IGTx clinicians and scientists
- Create additional momentum for research funding (grants, industry collaboration, etc)
- Coordinate and add resources to facilitate multi-disciplinary research
- Identify the expertise and pair them for research
- Identify clinical problems needing IG – and – identify multidisciplinary uses of existing IG
- Seminars to set up collaborations
Opportunity for Investigators

• Developed image analysis and analytics
  • Avoid reinventing the wheel and spending research time developing the ‘support’ tools for your investigation

• Multi-disciplinary collaboration
  • Rad Onc ↔ Surgery ↔ Interv Radiology
  • Collaborative initiatives to discover solutions we can’t alone
  • Out of the box questions to drive new research

• Practical
  • Access to fractional FTEs of research staff for small grants
What are we actively working on right now…

- Hired a research faculty with expertise in image analysis, segmentation, and anatomical modeling (Guillaume Cazoulat, PhD), additional post-doc recruiting ongoing
- Establishing foundation/development office relationships for fundraising
- Building the correlative pathology lab
- Purchasing a small animal IGT irradiator
- Purchased site license for Altair HyperWorks (FEM/FEA/analysis suite)
- Constructing the interventional simulation suite with image guided navigation
- Setting up anatomical site-based seminars – watch for these starting in October!
- Writing grants
Summary

• Opportunity for a unique, collaborative environment to provide efficient translation of knowledge and tools across all therapeutic interventions.

• Development of a platform to provide technology core, computational platforms, and integration with databases to improve the efficiency and commercialization potential of translational science.

• Leverage the multi-disciplinary program for additional philanthropic, industry, and government funding.

• Expectation of meaningful clinical impact in the next 3-5 years resulting from clinical trials that can begin within the next year.