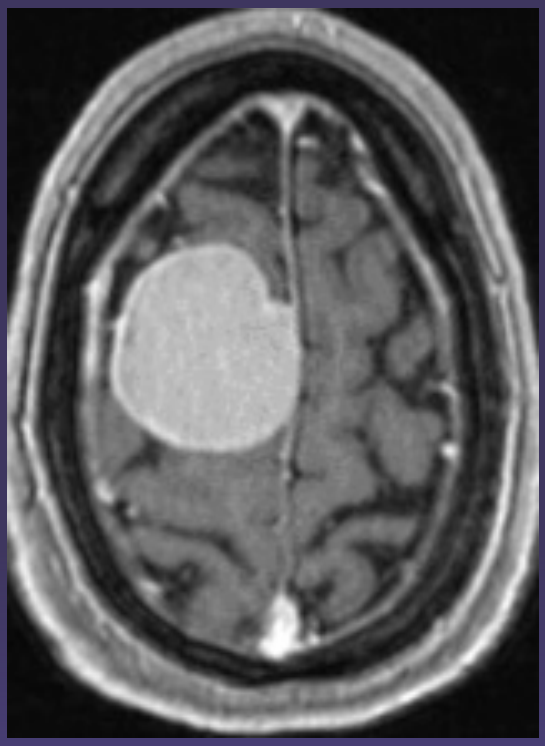

The Read

Volume 8

Northwestern Medicine®
Feinberg School of Medicine

Department of **Radiology**

Center for Translational Imaging Receives NIH Grant

Technology and Hardware Update

For over a decade, the Center for Translational Imaging (CTI) has been on the cutting edge of biomedical imaging research focusing on animal models of disease and supporting the publication of more than 160 peer-reviewed publications. It has accomplished this through collaborations with several medical schools and university departments across multiple disciplines, thanks in no small part to the ultra-high field 7T MRI system originally installed in 2010.

After more than ten years of reliable service, the Small Animal Laboratory, led by Dr. Daniele Procissi, recognized the need to upgrade the old MRI. Such an upgrade would guarantee operational reliability and, more importantly, offer more advanced imaging capabilities to the Northwestern biomedical research community.

Through a High-End Instrumentation NIH S10 mechanism, in 2023 Northwestern was awarded a grant for approximately $ 1.6 million to upgrade the old system to a state-of-the-art 7T Bruker Biospec MRI scanner. The new system will offer reliable and novel quantitative tools to investigate a broad range of animal disease models.

Preclinical research has played a critical role in advancing modern understanding of the biological processes underlying different diseases. Advancing this understanding and developing novel therapeutic approaches requires the ability to non-invasively detect and monitor disease progression and/or response to novel treatments.

Northwestern was awarded a grant for approximately $ 1.6 million to upgrade the old system to a state-of-the-art 7T Bruker Biospec MRI scanner.

The new 7T MRI scanner, in conjunction with the existing micro-PET system and high-resolution CT, will provide these new imaging capabilities in a preclinical research framework ideally suited to support advances in several biomedical research areas, and is expected to play a major role in advancing the institution's preclinical and translational molecular imaging program.

Cover image: Aggressive meningioma case: DNA methylation subtype hypermitotic meningioma.

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New Infrared Thermal Imaging Project Looks to Improve fMRI

Research Update

For decades, awake neurosurgery has been made possible through the creation and development of intraoperative functional mapping technology. Also known as awake craniotomies, these highly delicate operations rely on advanced imaging devices that allow surgeons to localize physiologic activity and create sophisticated maps of the brain, ensuring greater accuracy in the treatment of drug-resistant epilepsy, glioma, and neurovascular malformation. In the high-stakes field of resection surgeries, the ability to accurately identify and protect key functional areas is imperative to avoiding postoperative neurological deficits.

Currently, direct electrical stimulation (DES) is the most commonly used method of intraoperative surgical mapping, which identifies functionally critical brain regions so they are not resected. However, DES has low spatial resolution (~1 cm), may provoke seizures, and can only test one area at a time.

> Researchers hope to develop a mapping system capable of conducting real-time, thermal-based brain mapping during awake craniotomy operations.

To address these deficits, the Center for Translational Imaging's Neurological Department was awarded a NINDS R01 grant (R01NS116190) titled "High-resolution Infrared Thermal Imaging (ITI) for Simultaneous Functional Mapping of the Entire Craniotomy in Awake Patients." This project is overseen by co-PIs Dr. Todd Parrish of Radiology and Dr. Matthew Tate of Neurology and Neurological Surgery. It pilots a new method of intraoperative functional mapping based on infrared thermography. This new intraoperative mapping system boasts a significantly higher resolution than DES (~100 micron) and simultaneously monitors the entire exposed brain surface without risk for seizures.

This groundbreaking pilot project has multiple aims. Over time, researchers at Northwestern Radiology's Center for Translational Imaging (CTI) hope to develop a mapping system capable of conducting real-time, thermal-based brain mapping during awake craniotomy operations. They will also explore the temporal and spatial properties of the thermodynamic response to optimize the infrared mapping procedure.

The thermal response function (TRF) is the thermal equivalent of the hemodynamic response function (HRF) used in fMRI. Through modeling and high resolution (spatial and temporal) IR data, researchers will be able to estimate the thermal impulse response and use it to develop an efficient, multi-task mapping protocol. Finally, the project seeks to compare the two functional mapping methods (DES and infrared thermal imaging) to determine optimal synergy between them to provide the best information for the safest resection.

If successful, this project will create a novel method for intraoperative functional mapping awake neurosurgery, leading to more precise images of critical neural structures and, crucially, better outcomes for patients.

Nanopharmaceuticals for Image-Guided Cancer Medicine at Northwestern: A Look at the Biomaterials for Image-guided Medicine (BIGMed) Lab

Research Update | Dr. Arun Gupta (Senior Clinical Research Associate, BIGMed Lab, Radiology Department)

The Biomaterials for Image-guided Medicine (BIGMed) Lab was established at Northwestern University by Dr. Dong-Hyun Kim in September 2014. Since its establishment, BIGMed lab has focused on developing various state-of-the-art therapeutic/imaging carriers for the treatment of various cancers. Dr. Kim and his team have been synthesizing and exploiting novel micro/nanoparticles and their hybrid derivatives as vectors for image-guided medicine techniques. His lab is working closely with clinicians, medical scientists, biologists, and imaging professionals to translate these new therapeutic approaches using various multifunctional carriers, image guidance approaches, and diagnostic imaging techniques to the clinical setting. This research has the potential to effectively treat cancer and overcome the limitations of the current cancer treatment methods.

BIGMed lab members are known for their continuous hard work and dedication towards generating innovative ideas for cancer therapy research. Dr. Kim has been awarded with many NIH funded R21 and R01 projects especially for image-guided interventional cancer therapy and immune checkpoint inhibitor cancer therapy. Northwestern family would like to congratulate Dr. Kim and his team members for being awarded with their most recent NIH funded R01 project entitled "Local Tumoral Delivered Immune Checkpoint Blockades Immunotherapy and Radioembolization Combination Therapy of hepatocellular carcinoma."

Hepatocellular carcinoma (HCC) is the fifth most common malignancy in the world and the fourth leading cause of cancer death in the US. 90Y-RE can precisely deliver high doses of radiation to HCC, protecting healthy tissues, and avoiding side effects. 90Y-RE should be an ideal complement to immune checkpoint blockade (ICB) immunotherapy given that 90Y-RE induces immunogenic cell death. However, a low inhibition efficacy and the risk of autoimmune side effects of systemically administered ICB immunotherapy have been evidenced with moderate therapeutic outcomes and non-specific cytotoxic T cell expansion. Substantial research has investigated into how to best harness the antitumor potential of combination immunotherapies and how to direct immunotherapies at the tumor.

"Immunotherapy and Radioembolization Combination Therapy" R01 project will help Dr. Kim and his team to develop a powerful new approach for tumor directed local combinational aPD-L1 immunotherapy and 90Y-radioembolization (90Y-RE) for the treatment of HCC. Dr. Kim's lab proposes catheter-directed intra-arterial local infusion of anti-PD-L1 ICB antibody loaded Au supra-nanostructures (AuSN) in combination with 90Y-RE. Catheter directed local infusion of anti-PD-L1 with AuSN carriers will augment the localization of immunotherapy and immunogenic cell death to the targeted HCC permitting radiation-enhanced activation of the immune system for superior therapeutic outcomes. Proposed IA infused anti-PD-L1

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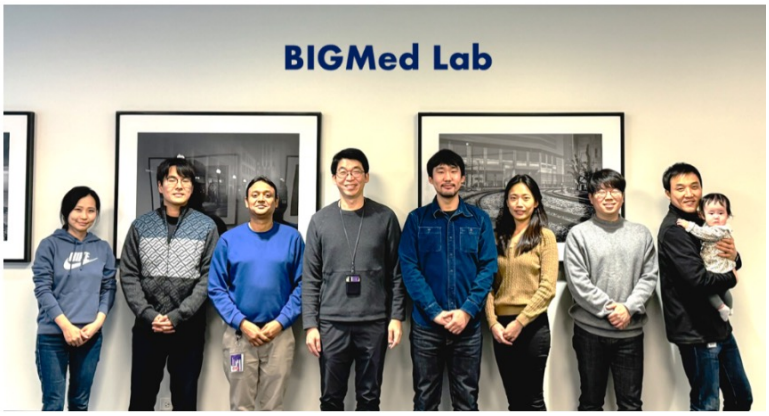


Nanopharmaceuticals for Image-guided Medicine (BIGMed) Lab cont'd

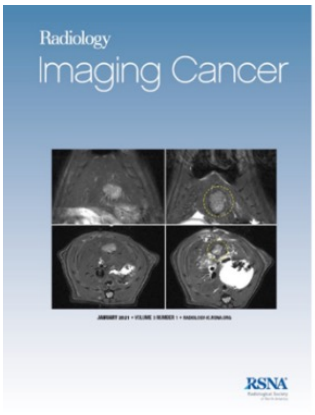
(continued from previous page)

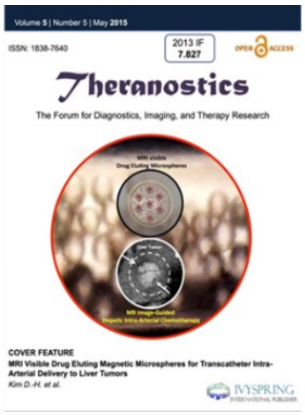
(ICB) loaded AuSN will permit efficient and targeted delivery of immunostimulatory anti-PD-L1 ICB molecules to allow an increase in the dosage and improved safety profile. CT visible AuSN and cross-sectional CT and MR image guidance should permit us to monitor/track/quantify the delivery of anti-PD-L1-AuSN to the targeted tumor tissues. Proposed image guided combination therapy will permit the unique advantage of potentially enhancing therapeutic efficacy of PD-L1 immunotherapy along with the immune stimulatory 90Y-RE therapy.

In addition to the above projects, BIGMed lab has been involved in various image-guided cancer medicine research projects based on interventional radiology approaches. Interventional radiology combining multimodality tracking and navigation tools to improve accuracy and outcome has gained huge importance in clinics and become crucial to care and treatment of patients. Dr. Kim and his team have been actively investigating the approaches to combine various interventional radiology therapeutics with multifunctional carriers. They specially design clinically applicable multifunctional carriers which have multimodal (MRI/CT/PET) imaging and therapeutic catalyst capabilities. Their newly developed carriers and image- guided interventional approaches will have more opportunities for innovative cancer therapy.

Another goal of BIGMed lab is to develop various theranostics radiopharmaceuticals conjugated with microparticles/nanoparticles. Nuclear Medicine Theranostics has been gaining importance in targeted cancer therapy and personalized medicine. Dr. Kim has started preclinical nuclear medicine theranostics in his BIGMed lab. He has been establishing radiopharmaceutical laboratory (Hot Lab) where his clinical research associates will handle varieties of radioisotopes (F-18, Ga-68, Cu-64, Lu-177, Y-90 etc.) and the state-of-the-art microparticles/nanoparticles to prepare wide range of novel radiotracers for PET and SPECT imaging for preclinical cancer therapy research.

There are more than ten researchers (post-doctoral researchers, visiting scholars, lab staff, and students) actively working in BIGMed lab under the dynamic supervision of Dr. Kim. More than 40 researchers have already graduated from BIGMed lab and are working in various prestigious universities around the globe (https://dhkimlab.weebly.com/members.html). BIGMed lab has published more than 100 papers in peer reviewed scientific journals (https://dhkimlab.weebly.com/publications.html). Numerous research papers of BIGMed lab have been featured as cover papers of many reputed journals. Their transcatheter arterial therapy projects are the primary research area of BIGMed Lab. Their papers have been featured in the interdisciplinary journals such as Radiology: Cancer Imaging (2021), Theranostics (2015), and Advanced Healthcare Materials (2023).





Emergency Radiology Continues to Expand

Clinical Update

Northwestern Radiology's newest clinical section, Emergency Radiology, has continued to gain traction since starting out a few years ago. Additions to coverage of the NMH flagship location in downtown Chicago as well as expansion within the Northwestern enterprise are only a couple of the ways Emergency Radiology is moving forward.

Emergency radiologists have a unique role given the patients they serve. "Emergency radiology cares for patients that are acutely ill or injured with life or limb threatening conditions," says Section Chief Samir Abboud. Results are needed within minutes or seconds due to the intensity of these situations. According to Abboud, the skillset for these radiologists includes "providing medically sound services and data rapidly" – a type of service he calls "actionable care."

Actionable care also requires quality and consistency. As Emergency Radiology adds radiologists, they are also able to extend service to partner hospitals throughout the Northwestern Medicine system. "Our goal," Abboud says on a phone call after a night shift, "is to provide radiology care to the level that is expected of someone at Northwestern hospital. At partner sites, patients currently might get a third-party service. Our patients deserve consistency and top-tier care regardless of which door they walk through and what time they walk through it."

Because emergency radiologists work all hours, wellness is also a top priority for this section. "We are a family-friendly division," Abboud says. Shifts around the clock and high-stress situations require attention to physician burnout and health. The department has also introduced a number of wellness initiatives for faculty in recent years to address these issues. Abboud emphasized, "We take care for ourselves and our families seriously."

The section recently added a sixth radiologist to the team. They aim to have ten radiologists by fall 2024. This will allow expansion into partner hospitals such as Lake Forest and the Northwestern region including Woodstock and Huntley. This section is making fast progress to achieve their goals to provide excellent patient care throughout Northwestern Medicine.

Emergency Radiology Section Chief Samir Abboud

Research Day Fosters Conversations

Research Update

The annual Radiology Research Day on Wednesday, May 22nd celebrated scholarly activities pursued by residents, fellows, research associates and post-doctorates within the department. The event highlighted the importance of research as a cornerstone for ongoing education and advancements in radiology.

Attendees learned about research projects through both oral and poster presentations, which included basic science, translational, and clinical research.

Northwestern graduate Dr. Osman Ahmed gave the keynote address, talking about his path to becoming an interventional radiologist. He also presented a new technique for treating osteoarthritis.

Drs. Amir Borhani and Ahsun Riaz accepted Research Mentor Awards.

Diego Hipolito Canario, Ahmed Gabr, Ahsun Riaz

Diego Hipolito Canario, Ahmed Gabr, Ahsun Riaz

Osman Ahmed

Mariam Goreish

Melika Shafeghat

Clear Evidence of How HIV Affects The Brain

Research Update

HIV-associated neurocognitive disorder develops in 30-50% of patients, despite successful antiretroviral therapy. The disorder causes symptoms such as problems with memory, motor control, and verbal fluency. Dr. Yufen Jennie Chen presented her findings on research on this disorder at the Third Coast Center for AIDS Research (CFAR) pilot awards seminar in October 2023. The CFAR pilot award funds preliminary studies in HIV-related research that will lead to new NIH grant submissions.

Dr. Chen's CFAR project utilized the dataset collected for the Chicago Early HIV Infection Study (Mentor: Ann Ragin), which included neuroimaging, neurocognitive and blood measures in HIV participants with an average infection duration of one year. The study assessed people living with HIV over a two-year period.

Changes in the gray matter of a collection of brain regions in the early infection period of HIV patients led to abnormal changes in brain activity two years later

MRI exams typically collect data on aspects of brain health such as functional activity, brain volume (brain cell health) and structural connectivity. But traditional analysis tends to process these datasets separately, without looking for interactions between these datasets. Dr. Chen's project uses a new data fusion technique that inspects these different datasets simultaneously to reveal both dataset-specific characteristics, such as abnormal brain activity, and interactions between datasets, such as the breakdown of white matter tracts leading to abnormal brain activity in multiple regions connected by those tracts.

Using this method, Dr. Chen found changes in the gray matter of a collection of brain regions in the early infection period of HIV patients that led to abnormal changes in brain activity two years later. The pattern of gray matter changes was also associated with CD4 nadir, a measure of immune suppression that is an important predictor of neurocognitive impairment in HIV, and digit symbol test score, a measure sensitive to early changes in cognitive function in HIV infection.

Dr. Chen also inspected the data with graph theory, which is a mathematical model that studies pairwise relationship between objects. When applied to brain imaging, graph theory uses the relationship between brain regions to compute metrics that tell us about how networks (brain regions that serve similar

functions or are physically connected by white matter tracts) are organized and interact with each other. This work showed that the brains of HIV patients have reduced efficiency (increase path length/distance for information to travel between brain regions) that manifests soon after infection and persists two years after infection. Brain regions with longer path length also changed over the two years, indicating significant network reorganization as the infection progresses.

Taken together, these results may help researchers understand HIV-associated neurocognitive disorder better. The hope is that such findings will improve the management and treatment of cognitive decline in HIV patients.

Welcome to the New and Improved Northwestern Medicine Vein Center

Amanda Vlcek, MHA, LCSW | Practice Manager | NMG Vein Center

The Northwestern Medicine Vein Center in downtown Chicago is brand new. We moved into our beautiful location on Friday, July 21, 2023, with our first patients seen on Monday, July 24. Our clinic had significant growth in in 2023 due to improved patient access in our relocation in the Lavin Family Pavilion.

Our office was designed with the NM "Patients First" vision in mind. Our waiting area has an amazing view of the Chicago lakefront, a relaxing spa-like feel, and we have wonderful neighbors in the Dermatologic Surgery and Plastic Surgery Departments. This location expanded our clinic to include six patient exam rooms, four outpatient procedure rooms, and four ultrasonography rooms.

We are one of the only NM outpatient clinics that can provide imaging the same day for most new patients. Our interventional radiologists and vascular surgeons can provide accurate treatment plans in one visit! We can also perform most of our minimally invasive outpatient procedures right in-office.

Our team diagnoses and treats vein diseases, including but not limited to venous insufficiency, pelvic congestion syndrome, May-Thurner Syndrome, varicose veins, and cosmetic spider veins.

One of our most popular procedures is Cosmetic Sclerotherapy. Although this procedure is not covered by insurance, it allows our patients to receive treatment for spider veins, the bluish-purple veins that appear on the surface of the legs. The treatment we offer is safe, performed by skilled staff, causes only minor discomfort, does not adversely affect blood circulation, and makes the legs look fabulous! Each treatment is $400 per one-hour flat rate session.

A discount for Northwestern Medicine employees is available. Please call 312-695-8346 to make an appointment for evaluation.

Have an idea for the newsletter or a comment on this issue?
Contact us at radiology@northwestern.edu

Is the K99 the Right Grant for You? In Conversation with Drs. Suvai Gunasekaran and Laleh Golestani Rad

Grant Opportunities

Suvai Gunasekaran

For graduate students and postdocs, how do you find the right path? If you apply for a grant, which one?

Two researchers, Dr. Suvai Gunasekaran and Dr. Laleh Golestani Rad, have benefited from NIH K99 grants.

K awards are issued by the NIH called Research Career Development Awards. They provide a funded opportunity for future researchers to train at the undergraduate, graduate, and postdoctoral levels. NIH offers fifteen different K awards for citizens and non-citizens.

K99s, called Pathway to Independence Awards, have two parts: the two-year mentored K99 portion and the three-year independent R00 part to be applied for once the awardee has secured a research position.

Gunasekaran is a postdoc in Dr. Daniel Kim's lab who was awarded an NHLBI K99 in 2022. Rad, who was awarded an NIBIB K99 in 2016 while at Harvard, joined Northwestern BME/ Radiology faculty in 2018 and completed the R00 portion of the project at NU.

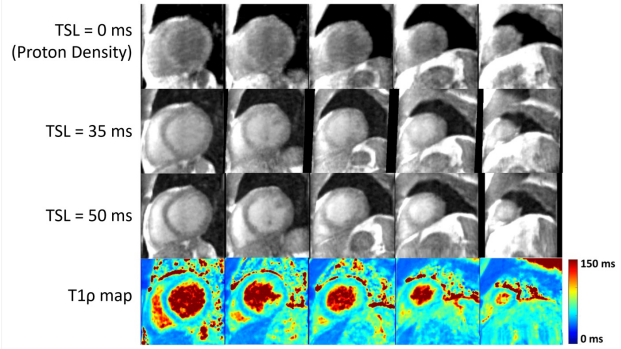
Gunasekaran's project is titled "Non-contrast 3D T1r Mapping for Myocardial Fibrosis Quantification of Pediatric Cardiomyopathy Patients" (K99HL161469). This project measures myocardial fibrosis in pediatric patients. This method provides non-contrast, free-breathing, whole-heart imaging – going beyond current limited special images in MRI that also involve contrast and anesthesia. We asked her a few questions.

How did you come to imaging in graduate school?

I was a Biomedical Engineering graduate student at Northwestern. I started in a lab studying drug delivery for people with HIV, but I then met Dr. Dan Kim, who was new faculty at NU at that time, and he asked if I was interested in joining his lab. That kind of switch can be hard, and imaging was completely new to me. I had no coding skills. I was starting from nothing, but Dr. Kim was very supportive and encouraging.

I realized radiology is a good field for me. I like having an impact and imaging research does that because it is translational, technical, and interdisciplinary. For the K99, I have worked with patients as well as collaborated with cardiologists, industry reps from Siemens, and clinical faculty at Lurie Hospital.

What helped me get more involved with the radiology community was joining the Radiology: Cardiothoracic Imaging Trainee Editorial Board, which I discovered through conferences. This board is for MDs in training and postdocs and provides great research training and access to leaders in the field. It opened doors for me.



Why did you choose the K99?

During my PhD, I wasn't sure about continuing in research because I hadn't really felt successful. I didn't get as many conference abstracts accepted as talks – things like that. Academia seemed daunting. Imposter syndrome is real! I was also interested in science policy and considered the AAAS Science & Technology Policy Fellowship and the Presidential Management Fellowship (PMS).

But Dr. Kim was very encouraging as a mentor. He told me it's okay to feel uncertain when starting in academia. Then I started seeing success, like receiving a Northwestern TL1 grant. Also, the mentors in Radiology are not just nice people and strong researchers but have a rich life in the radiology community. This inspired me to try academia.

(Continued on next page)

Is the K99 the Right Grant for You? In Conversation with Drs. Suvai Gunasekaran and Laleh Golestani Rad

Grant Opportunities

(From previous page)

When I accepted a postdoc position in Dr. Kim's lab, he recommended I apply for a K99.

When applying for the grant, it helped to have example grants from others with K awards. If you're interested in applying, plan early and talk to the research team! They will be crucial in submitting the proposal.

How has the K99 impacted your career?

I'm happy to say I will be transferring to Cedars-Sinai in Los Angeles to start a faculty position this summer.

We also talked to Dr. Rad whose project – "Patient-adjustable MRI technology for high-resolution imaging of deep brain stimulation" (K99/R00EB021320) – developed technology that allows Parkinson's patients with deep brain stimulation implants to undergo high-resolution MRI safely. DBS is a procedure that implants electrodes in the brain to treat symptoms of Parkinson's disease. MRI can be very useful for placement and monitoring of the electrodes, but it is not fully accessible to patients with DBS implants because of safety concerns. The technology developed through this research allows these patients to access high-resolution MRI for the first time.

How did you come to imaging in graduate school?

My path to imaging was a bit of a twist. My PhD was in computational electromagnetics, so imaging wasn't on my radar initially. But I've always been keen on applying my work to biomedical stuff. As my PhD was wrapping up, I started looking for postdoc options and got a grant from the Swiss National Science Foundation. This was a game-changer because it let me explore fields where I had no background. I was searching for something that blended my love for electromagnetics with biomedical applications, and that's how I landed a spot in the Department of Medical Physics at the University of Toronto. That's where I really got into medical imaging and MRI. It was a new world for me, but it clicked with my interests perfectly.

Why did you choose the K99?

When it came to choosing the K99, my decision was pretty straightforward: it was mostly due to my visa status. A lot of the training grants out there are restricted to US citizens or permanent residents, and I didn't fit that bill. So, the K99 was one of the few options I could go for. At that time, I was at a crossroads in my career, trying to figure out if I should stick with academia or jump into the industry. I figured applying for the K99 was a good test. I told myself, let's give this a shot, and if it doesn't work out, I'd know I gave academia a fair chance and wouldn't have any regrets moving on to something else.

Laleh Golestani Rad

How has the K99 impacted your career?

Reflecting on the impact of the K99 grant on my career, its significance cannot be overstated. Securing this grant directly facilitated my promotion to junior faculty at the Martinos Center for Biomedical Imaging, a milestone unlikely to have been achieved otherwise. This advancement in my career trajectory crucially enabled me to pursue further independent grants, opportunities that were not accessible to me as a postdoc. Leveraging this new position, I successfully applied for NIH R03 grants. These grants not only provided the means to hire research assistants, enhancing our research capacity, but also generated substantial data. This, in turn, laid the groundwork for additional grant applications. In essence, the K99 grant initiated a positive, cascading effect, profoundly shaping my future career path and research endeavors.

Both these researchers found critical support for their projects and careers with K99 grants. If you think this grant sounds like a fit for you, please contact our research administration team to get started.

Hill Artificial Intelligence Project Receives ASNR Foundation Grant Funding

Clinical Update

In April 2023, the American Society of Neuroradiology (ASNR) awarded a one-year Foundation Grant to fund Dr. Virginia Hill's project titled, "Augmented Intelligence Analysis of Meningioma MRIs According to DNA Methylation Subgroups, Molecular Markers, and Copy Number Variants." The Foundation of the American Society of Neuroradiology awards grants "to promote research, education, and innovation in neuroradiology that will advance clinical practice and improve patient outcomes."

"Meningiomas are the most common primary intracranial tumor," says Dr. Hill, PI of the project and Assistant Professor in the Neuroradiology section at Northwestern. "0.9%-1% of the general population will have a meningioma on a brain MRI exam."

Unfortunately, aggressive and non-aggressive meningiomas can have identical MRI appearances, making it difficult to weigh the benefits and risks of watchful waiting versus surgical resection, and necessitating frequent imaging follow-up to determine how quickly the tumor is growing. Machine learning, however, can detect subtle differences in an imaging appearance that are subvisual to a radiologist and may offer ways to predict an individual tumor's behavior and inform a personalized treatment approach.

"More accurate prediction of a meningioma's future behavior is essential to balance the risk of progression against that of surgical resection or radiation," Hill says.

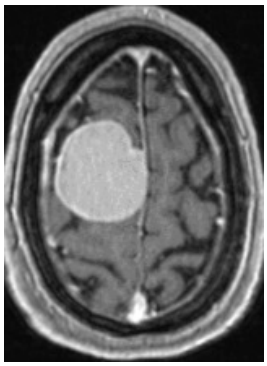
This one-year project will see if imaging findings on conventional MRI can be used to non-invasively identify and classify meningiomas into their three established DNA methylation subtypes. Each DNA methylation subtype has potentially targetable biology and differs in the aggressiveness of meningioma behavior. This project will also utilize machine learning to detect cues the human eye cannot see to predict the DNA methylation type, as well as molecular features and copy number variations.

Hill says that annual ASNR conferences have played a significant role in her developing interest in using machine learning to quantify imaging features, which is the focus of her research now. "My true love is using AI to analyze brain tumors," Hill says. "I have started an AI in Brain Tumors Working group with regular attendance by approximately ten multidisciplinary faculty and students every Thursday afternoon. Engineering professors and students, neurosurgeons, radiation oncologists, and neuroradiologists as well as residents and fellows have all attended this meeting to learn as much as possible about AI and brain tumors and collaborate on projects such as this meningioma study."

"My true love is using AI to analyze brain tumors," Hill says. "I have started an AI in Brain Tumors Working group with regular attendance…every Thursday."

The project reflects Hill's desire to work with the world-class physicians, students, and trainees here at Northwestern. Several faculty are collaborating on this project, including Dr. Mark Youngblood in Neurological Surgery, Dr. Stephen Magill in Neurological Surgery, Dr. Sean Sachdev in Radiation Oncology, Dr. Rimas Lukas in Neuro-Oncology, Dr. Todd Parrish in Radiology and Biomedical Engineering, Dr. Aggelos Katsaggelos in Electrical and Computer Engineering, and Dr. Craig Horbinski in Neuropathology and Neurosurgery.

With these findings, Hill hopes to start a lab using AI to analyze tumor images in the long term. She also hopes this study will lead to future funding for more expanded studies. She says, "Non-invasive, accurate prediction could allow precision in the choice of chemotherapy or radiation, dramatically changing the current standard practice that fails to leverage our growing understanding of meningioma biology."



Merlin-intact meningioma example

NM Northwest Region Fully Operational in the Chicagoland Area

Clinical Update | Phil Gilroy, MD

On November 1, 2023 Northwestern Medicine (NM) and McHenry Radiologists and Imaging Associates, SC (MRIA) advanced to the next step in a several years-long journey towards closer collaboration in delivering medical imaging services to patients and providers in the NM Northwest Region (NWR) hospitals and outpatient sites.

"The Regional Health Network Northwestern has many radiology groups working together while working with the downtown facilities," Dr. Ankur Garg, a co-leader in this project said.

MRIA had been operating in close alignment as an independent radiology practice with the legacy health system (Centegra) which operated various McHenry County facilities including Northwestern Medicine Huntley, McHenry, and Woodstock hospitals and outpatient sites since 1993. In 2018 NM formally acquired this local network and continued the relationship with MRIA.

As the leader of the independent practice, Phil Gilroy, M.D., and his practice partners continued their tradition of a strong patient-centered approach to delivery of their medical imaging professional services under Northwestern. This included a staffing commitment to providing a broad range of both diagnostic and interventional/therapeutic services directed to the support of growing clinical service lines and the developing health needs of the local community.

The collaboration with NM developed closer over the next few years as NM system medical imaging leadership under James Carr, MD, Chair Department of Radiology, together with MRIA and both NMH and local NWR operational leaders explored ways to optimize clinical processes across the system. As part of this journey substantial attention was directed towards gaining understanding of the differences in the way community-based radiology and academic-based radiology delivered care and to the ways the strengths of each model could be leveraged for a better product in terms of quality, accuracy, timeliness, and accessibility.

When the nationwide pandemic hit, many of these processes, understandably, were short-circuited in favor of the exigencies demanded by the situation but progress did continue. In this regard certain initiatives such as imaging protocol standardization, common reporting templates, and staffing collaborations, among others have, nonetheless, made and continue to make significant advances.

> Part of the journey was gaining an understanding of the differences in how community-based radiology and academic-based radiology delivered care.

Unfortunately, the pandemic also became an inflection point in the nationwide shortage of physicians. Professional staffing shortages accelerated, radiology staffing being among the most severely stressed, and became the greatest headwind impeding progress in these integration efforts. Coming out of the pandemic, MRIA found itself struggling with recruitment and experiencing unsustainable staffing turnover for the first time in its history.

Recognizing this vulnerability, MRIA and NM began discussions this past year to move closer together by having the practice join Northwestern Medical Group. Both parties recognized not only the acute need to do so but also the great synergies which could be achieved by doing this.

The primary benefit of this collaboration is greater coverage for patients across the Chicagoland area. Blair Faber, Administrator for the Department of Radiology, noted that this work creates a larger coverage area and gives the network many options to provide subspecialty care. "It's important that we're able to continue to provide these services in the Northwest Region with quality radiologists," he said.

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