



July 2025

NOTE FROM THE CHAIR



Neurosurgery Chair
John A. Jane, Jr, MD

On behalf of the entire Department of Neurosurgery, I welcome you to our Neurosurgery Newsletter. Within the Newsletter, we celebrate just some of our recent achievements which have education initiatives of the previous residents and faculty. Our faculty are leading clinical excellence in Neurosurgical Oncology, Spine, Vascular, Skull Base, Pediatrics, and Functional. We will continue to provide excellent care to our community and seek to become a regional destination site for complex neurosurgical care. We look forward to keeping you updated over the upcoming year and beyond.

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DEPARTMENT NEWS- Fall 2024/ Spring 2025

- Research has resulted in 4 patents of novel innovations, 17 grants, and 5 clinical trials; as well as the expansion of research within the Department to include two full time employees and an internship program in addition to our collaborators in academia and industry
- Efforts have focused to improve subspecialty care by fellowship-trained neurosurgeons leading specialty care teams in Complex Spine, Vascular, Pituitary, Functional, Oncologic, Pediatrics and Skullbase care
- Josh Cuoco, DO our neurosurgery graduate this year, will be returning to us as an attending after completing his year long endovascular fellowship at Ohio State

NEW CANCER CENTER –



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Model of new Carilion Taubman Cancer Center

Beginning in October 2024 work began on the new Carilion Taubman Cancer Center, a state-of-the-art six-story facility located on the Virginia Tech Carilion Health Sciences and Technology Campus at Riverside Circle. The building will replace Carilion's 41-year-old cancer facility on South

Jefferson Street and provide patients with access to a broader array of advanced clinical trials and cutting edge research facilitated through strategic partnerships with Blue Ridge Cancer Care and Virginia Tech, which is deepening its commitment to cancer research in Roanoke and across the university. Carilion's oncology program also will expand to include support services, such as nurse navigators to shorten the time from diagnosis to treatment, and specialized oncology social workers and mental health therapists, and dedicated chaplains.

Carilion Neurosurgery will be joining in the expansion of cancer treatment in the new center. Dr. Cara Rogers is slated to head the new Neuro-Oncology Division. Joining her this fall is a dedicated neuro-oncologist from Department of Neurology to become the central physician coordinating each patient's treatment plan, collaborating with Blue Ridge Cancer, Carilion Clinic and other locations convenient to patients' home.



Cara Rogers, DO

The Carilion Taubman Cancer Center is projected to open in 2027.

RESIDENT EDUCATION- Visiting Scholars

The resident education program has undergone significant development over the past three years. Recognizing the invaluable training offered through



cadaveric dissection and prosection, residents now participate in six guided cadaver labs throughout the year covering both cranial and spinal approaches. These sessions are directed by rotating Virginia Tech Carilion (VTC) Neurosurgery faculty and now include a concurrent microvascular reconstruction component to enhance technical exposure.

Additionally, we have established the VTC Department of Neurosurgery Skullbase lab, directed by Dr. Eric Marvin, DO. This lab emphasizes atlas - guided based skull base dissections. The lab is supported by the Neurosurgical Education Fund and is fully equipped with three cranial or spinal stations, two operative microscopes and a full complement of electric drills, hand tools and microdissectors.

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Our program also benefits from strategic partnership with industry sponsors, enabling us to host one to two clinical Visiting Scholars each year. In the fall, a Visiting Scholar is selected by the faculty and delivers a didactic lecture along with a board-style discussion, featuring cases selected and presented by VTC senior residents. In the spring the graduating Chief Resident selects a Visiting Scholar who offers a case-focused dinner seminar, followed by an operative techniques lecture and guided cadaveric dissection. This academic year included recent visiting scholar Dr. Robert Starke, MD from University of Miami. Dr. Starke is the Associate Professor with Tenure of Clinical Neurosurgery & Neuroradiology & Neurosciences & Pharmacology, Co-Director of Endovascular Fellowship, Co-Director of Endovascular Neurosurgery, Director of the Angioma Alliance Overall Center of Excellence for Cavernous Malformations - Only Center of Overall Excellence in Florida and 1 of 12 Centers in US and the Cerebral Aneurysm Initiative. He has extensive expertise in cerebrovascular disease, neuro-oncology, and Hereditary Hemorrhagic Telangiectasia. He was awarded the Codina Kadre Endowed Chair in Neurosurgery and University of Miami Senior Faculty Researcher of the Year. Dr. Starke presented information on his road to research funding in neurosurgery and shared interesting case studies from his practice.

NEW THERAPY OFFERED- 1ST IN VIRGINIA

Carilion Clinic First in Virginia to Offer Innovative Therapy to Restore Upper Limb Function Post Stroke



In May 2024 Carilion Clinic Neurosurgery achieved a milestone becoming the first center in Virginia to implant Vivistim®, a novel device designed to enhance arm and hand function in stroke patients. Approved by the FDA in 2021, Vivistim® treats moderate to severe upper extremity motor deficits associated with chronic ischemic stroke – a condition resulting from prolonged interruption of cerebral blood flow, often accompanied by persistent neurological impairment. This therapy combines vagus nerve stimulation (VNS) paired with occupational therapy to support neuroplasticity and motor recovery.

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"We are proud to be the first treatment center in the state to offer this groundbreaking solution for stroke survivors with impaired hand and arm function," said Mark Witcher, M.D., Ph.D., neurosurgeon. "Paired VNS Therapy can revive hope for stroke survivors even years after their initial recovery efforts plateau."



Clinical research on Vivistim® demonstrated that when paired with occupational therapy, the vagus nerve stimulation (VNS) can lead to two to three times greater improvement in hand arm function improvement for stroke survivors compared to therapy

alone. This breakthrough therapy reflects Carilion's ongoing commitment to expanding access to cutting edge neuroscience treatments and improving quality of life for individuals affected by neurological disorders.

To view the complete news article please visit, [Carilion Clinic First in Virginia to Offer Innovative Therapy to Restore Upper Limb Function Post Stroke](#) .

<https://www.carilionclinic.org/stroke-recovery#paired-vns-therapy-for-stroke>

GLOBAL INITIATIVES



The Carilion Clinic Department of Neurosurgery has initiated international partnerships with Bir Hospital (National Academy of Medical Sciences), a highly regarded public hospital in Kathmandu, Nepal, deriving the majority of health care funding from government sources. Bir hospital has a very well-respected neurosurgical training program and provides excellent care to a very large population with diverse neurosurgical needs.

We are making a concerted effort to expand the neurosurgical options available to these populations through direct and indirect surgical involvement. Our students, residents, and attendings travel to Kathmandu, providing surgical care to Nepali patients while teaching their counterparts techniques and skills utilized at VTC Neurosurgery focused on Functional and Complex Spine surgery. Our hosting partners also share their expertise in specific diagnostic pathologies that have a high incidence rate not typically found in the southeastern U.S., as well as their unique health care resources and insights into patient care. Together, this equal exchange of information, skills and patient care will be vital to improving both our understanding of unique pathologies as well as the skills needed to treat certain populations. Our trips to Nepal take place in April each year, and our efforts are funded by the Neurosurgical Education Fund and private donations. We continue to seek industry partners to support our efforts. Our most recent experience was presented at the Global Neurosurgery Forum hosted by Harvard University and the AANS in April in Boston, MA. We have been asked to help sponsor and co-plan an international neurosurgical conference near Everest Base Camp in Fall of 2026. More exciting details to come!

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RESEARCH

Over the past three years, the Department of Neurosurgery has significantly expanded its engagement in collaborative research initiatives and partnerships with academic institutions nationwide, as well as industry partners.

The department's research strategy has shifted to be a more clinically relevant model with translationally focused research, aligning scientific inquiry with direct therapeutic impact. Current projects span the fields of chemistry, biomedical engineering, developmental biology, neuroscience, chemical engineering, and computer modeling. Highlighted are a few grant funded projects that already have revealed promising data for future treatment development helping advance the department's mission to translate discovery into clinical innovation.

Patient-Derived Tissue-Engineered Systems With Physiological Flow to Study Glioblastoma aka The Munson Study



PI: Mark Witcher, M.D., Ph.D, Collaboration with Jenny Munson, Ph.D., Virginia Tech

Glioblastoma (GBM) remains one of the most aggressive and treatment-resistant forms of brain cancer. Despite the introduction of temozolomide chemotherapy in 2005, which marked a major advancement in patient survival and care, therapeutic progress for GBM has largely stagnated in the recent years. Current treatment options yield limited improvements in long-term outcomes, underscoring the urgent need for innovative approaches.

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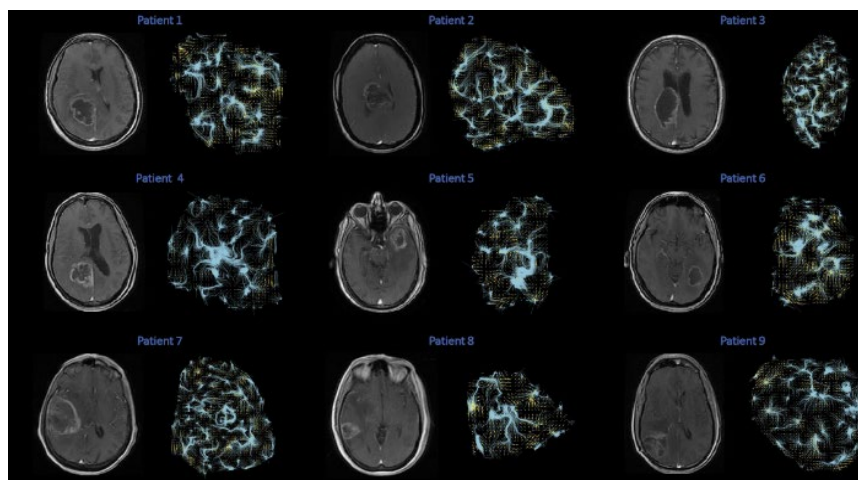
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Participant tumor and CSF flow

Most studies of GBM in research labs have focused predominately on the tumor cells, often neglecting the tumor's microenvironmental characteristics. To enhance our experiments and the relevance of our results, we have developed a new

study system—the tumor microenvironment (TME)—where we integrate GBM tumor cells with non-cancerous brain cell populations, recapitulating critical cellular interactions that occur in vivo.

In this project, we will collect the brain tumor tissues and cerebrospinal fluid (CSF) from patients undergoing surgical resection—specimens that would otherwise be discarded. We will generate patient-derived TME samples with cells isolated, then subject the samples in the lab to the standard treatment that patients typically receive for GBM. We will measure the response of the treated samples and compare the treatment-induced changes in the experimental samples with the course and outcome of the actual patient's GBM disease from clinical treatment after surgery.

By comparing the responses of the TME samples to the patient's outcome, we will determine if our TME sample system will be able to predict the patient's



response to treatment. At the conclusion of this study, we plan to propose a clinical trial in which our model can inform post-surgery treatment for GBM (chemotherapy and radiation) so that treating physicians can consider altering the patient's treatment with hopes of improving patient outcomes and course of disease.

Neurovascular Markers and Inflammatory Predictors in Patients with Traumatic Brain Injury (TBI)

PI: Eric Marvin, D.O.
Collaboration with Michelle Theus, Ph.D.; and Alicia Pickrell, Ph.D., Virginia Tech



Theus Lab analyzing patient samples

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TBI (traumatic brain injury) affects millions of patients annually, with the most cases being in children, young adults, the elderly, and active-duty military members. Despite how common it is and its ability to cause long-term health problems, our current treatments for TBI are very limited. By gaining a better understanding of the inflammatory (swelling) effects of TBI on the brain, we may identify possible therapeutic targets to reduce inflammation in the brain and cell death after injury. Antiviral drugs and FDA approved compounds that target antiviral proteins in the body called interferons in autoimmune disorders may be able to help TBI patients. Moreover, findings from our study may reveal a new protective marker present in the immune cells of juvenile patients that may be able to be used for therapeutic intervention in adult and aged patients.

In this study, we will study the genetic profile of whole blood and examine whether a virally induced interferon release occurs in humans after TBI. We hypothesize that TBI induces a genetic marker or sign in immune cells induced by circulating interferons in the blood serum of patients after injury depending on the age of the patient. Patient enrollment is nearing completion and early findings have led to the expansion of this investigation into two additional studies aiming at improving outcomes across demographic groups.



PET-based Imaging of High-Grade Gliomas using Gallium-labeled Prostate-Specific Membrane Antigen (PSMA)

PI: Mark Witcher, M.D., Ph.D.

Patients diagnosed with high-grade gliomas face a poor prognosis, with a mean survival time of just 12-18 months who undergo standard of care tumor resection and adjuvant therapy. However, treatment efficacy is frequently limited by factors such as tumor location, rapid progression, and high recurrence rate. Recurrent tumor can often be very difficult to distinguish using conventional gadolinium-

NEW WEBSITES

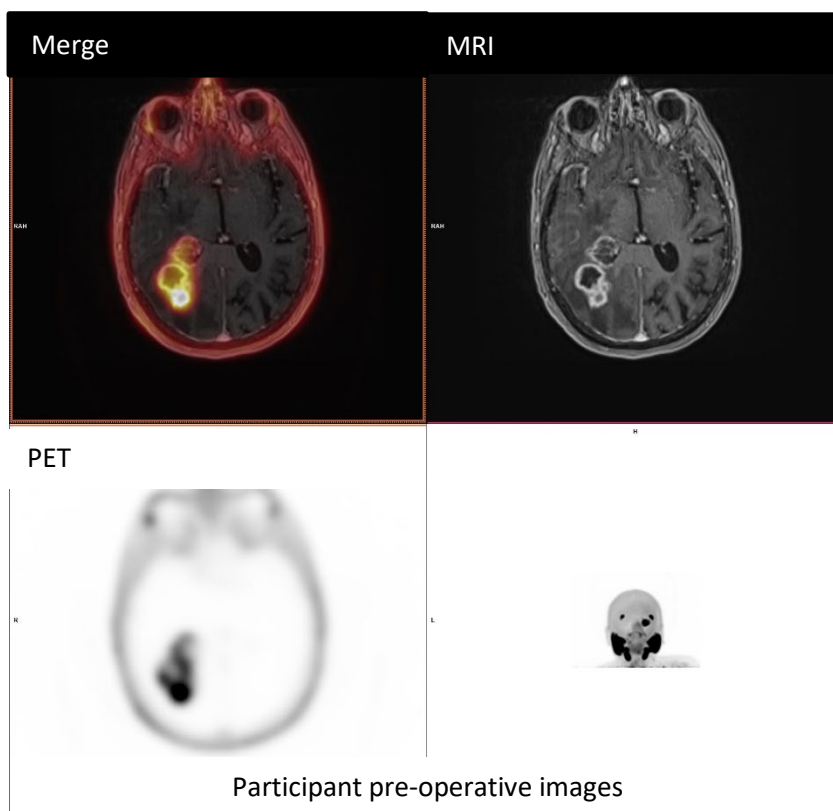
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based MRI imaging given its similarity in appearance to radiation-induced changes. Other imaging modalities, including PET (positron emission tomography), could play a significant role in the workup and treatment of these tumors. To this end, we must identify PET-based markers for use in imaging of high-grade gliomas. Gallium-labeled prostate-specific

membrane antigen (68Ga-PSMA) has demonstrated success as an effective target for studying high-grade gliomas and will be evaluated in this study to diagnose these tumors.

Patients in this pilot study will receive up to 3 doses of prostate-specific membrane antigen (PSMA) in conjunction with standard of care clinically-required serial MRI scans which are performed to monitor for tumor progression or recurrence. After images are obtained for all patients, they will be reviewed by a diagnostic radiologist at Carilion Roanoke Memorial Hospital. The primary



outcome measures we will obtain are the sensitivity and specificity of MRI vs ^{68}Ga -PSMA PET/CT in the diagnosis of high-grade gliomas and differentiation of tumor progression from treatment-related changes.

Patient enrollment is nearly complete. PSMA scans have shown remarkable distinction in both pre-operative and recurrence scans, as well as internal controls, demonstrating the ability to label GBM specifically. Based on current analysis, PSMA is showing reliability as a marker to distinguish recurrent glioblastoma.

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To learn more about our ongoing efforts, please visit [Neurosurgery Research | Carilion Clinic](#)

REPOSITORY

Over the past two years, our research team has established the VTC Tissue Repository, a centralized biobank dedicated to the collection of central nervous system (CNS) tissues resected during neurosurgical procedures. These materials will be used to study the underlying mechanisms of neurosurgical disorders. Samples are housed locally at the Fralin Biomedical Research Institute and co-managed by VTC and Carilion staff. Participants voluntarily consent before their surgery to donate appropriate specimens (blood, tissue, CSF) that would already be collected but otherwise be discarded as waste.

To date, the repository has accrued over 300 samples and continues to expand rapidly. We have specimens from tumors, cerebrovascular and neurological conditions. If you are interested in learning more about samples available, please email Dr. Jordan Darden for more information.

RESIDENT SPOTLIGHT – Dr. Kristine Ravina



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Dr. Ravina is a neurosurgery resident with a special interest in vascular and skull base neurosurgery. Originally from Latvia, a small country by the Baltic Sea in Northern Europe but she is a well-traveled world citizen who has lived on both North American coasts as a former resident of Palo Alto, Los Angeles and Boston while pursuing her clinical and research interests. Dr. Ravina has completed a two-year post-doctoral fellowship in neuroscience at Stanford University and nearly three years of research work as a research associate at Neurorestoration Center, Keck School of Medicine, University of Southern California with focus on stroke, open vascular, epilepsy surgery and cerebral revascularization. She has also completed a two-year hands-on neurosurgery clinical pre-residency fellowship at Boston Medical Center. She is an accomplished inventor and scholar, credited with over 50 peer-reviewed research papers, numerous national and international conference abstracts, invited lectures, and successful NIH grant and patent applications.



Kristine Ravina, MD

In recognition of her exceptional experience, Kristine became the first resident Principal Investigator ever at Carilion Clinic this year. Her current research portfolio includes collaborative projects with Virginia Tech to develop novel drug delivery technology. She has also been awarded two Carilion Research Acceleration Program (RAP) grants and is awaiting the outcome of a multi-million dollar proposal submitted to the National Science Foundation.

Kristine also has graciously volunteered to run the new Residency Social Media accounts. Please visit us at the new Instagram page [@vtcneurosurgresidency](#).

UPCOMING EVENTS

Summer 2025 /Fall 2025

- New Academic Year Begins
- New Neurosurgical Resident Training Begins
- Medtronic mobile Spine Lab September 2025

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The Carilion Clinic/VTC Department of Neurosurgery has made tremendous advances over the past several years, building on a proud legacy well known to our Alumni. We plan to continue this trajectory but can do so only by relying on the resources available to our program. One of the best investments you can make in the value of our training program is a direct donation of support to our department. Several years ago, the Neurosurgical Education Fund was established to support the efforts to make this the best possible training program. This fund is managed by the Carilion Clinic Foundation, a 501c(3) tax-exempt organization set up to support the charitable work of Carilion's enterprises. We rely heavily on this fund for providing our cadaver labs, funding our Visiting Scholars and guest lecturers' programs, funding our international outreach work in Nepal, as well as supporting national and international resident travel for conference attendance. These efforts not only enrich the training experience of our program but continue to enhance the value and reputation of our Department. It is critical that we continue to replace the assets available in this invaluable resource. Support from our Alumni is critical to support our ongoing mission.

For those interested in giving, please go to www.CarilionFoundation.org/give and select Designation: Other -**Neurosurgery Education Fund**.