

# Stanford

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## Chirag Patel, MD, PhD

Clinical Assistant Professor, Neurology & Neurological Sciences

### CLINICAL OFFICES

- **Stanford Cancer Center Neuro-Oncology Clinic**

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MC 6510

Stanford, CA 94305

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### Bio

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### CLINICAL FOCUS

- Cancer (Neuro-Oncology)
- Clinical Trials
- Immunotherapy
- Molecular/PET Imaging
- Neuroimaging
- Neurology
- Tumor Treating Fields (TTFields)

### ACADEMIC APPOINTMENTS

- Clinical Assistant Professor, Neurology & Neurological Sciences
- Member, Stanford Cancer Institute

### HONORS AND AWARDS

- Dee S. and Patricia Osborne Endowed Scholarship in the Neurosciences, University of Texas MD Anderson Cancer Center UTHealth Graduate School of Biomedical Sciences
- Diversity Recognition Award, Johns Hopkins University Diversity Leadership Council
- Honors Scholar in Medical Education, Stanford University School of Medicine Teaching and Mentoring Academy
- Martin Luther King, Jr. Award for Community Service, Johns Hopkins University
- Palatucci Advocacy Leadership Forum, American Academy of Neurology
- Student Travel Stipend Award, World Molecular Imaging Congress
- Young Investigator Palatucci Research Award, California Neurology Society
- Young Investigators Forum in Neuro-Oncology, Society for Neuro-Oncology (SNO) and WebMD/prIME Oncology

## **BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS**

- Steering Committee Member, Brain Tumor Working Group (BTWG) of the Physical Sciences Oncology Network (PSON) / Cancer Systems Biology Consortium (CSBC) (2019 - present)
- Associate Member Council (AMC), American Association for Cancer Research (AACR) (2018 - 2020)
- Member, American Association for Cancer Research (AACR) (2016 - present)
- Member, Society for Neuro-Oncology (SNO) (2014 - present)
- Member, American Physician Scientists Association (APSA) (2005 - present)
- Member, American Academy of Neurology (AAN) (2005 - present)
- Member, Sigma Xi (2005 - present)

## **PROFESSIONAL EDUCATION**

- Clinical Fellowship, Stanford University School of Medicine Department of Neurology & Neurological Sciences , Neuro-Oncology
- Postdoctoral Fellowship, Stanford University School of Medicine Department of Radiology , Multimodal Molecular Imaging
- Residency, University of California at Los Angeles David Geffen School of Medicine Department of Neurology , Adult Neurology
- Internship, East Tennessee State University James H. Quillen College of Medicine Department of Internal Medicine , Internal Medicine
- MD, University of Texas at Houston John P. and Kathrine G. McGovern Medical School , Medicine
- PhD, University of Texas MD Anderson Cancer Center UTHealth Graduate School of Biomedical Sciences , Biomedical Sciences
- MSE, Johns Hopkins University G.W.C. Whiting School of Engineering , Biomedical Engineering
- BS, Johns Hopkins University G.W.C. Whiting School of Engineering , Biomedical Engineering (concentration in Electrical and Computer Engineering)

## **COMMUNITY AND INTERNATIONAL WORK**

- Arbor Free Clinic Specialty Service (Neurology), Menlo Park VA Hospital
- Clinical Neurology Clerkship Bedside Teaching, Stanford Hospital
- Stanford Science Penpals

## **LINKS**

- Get a Second Opinion: <https://stanfordhealthcare.org/second-opinion/overview.html>

## **Research & Scholarship**

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### **RESEARCH INTERESTS**

- Brain and Learning Sciences
- Research Methods

### **CURRENT RESEARCH AND SCHOLARLY INTERESTS**

Clinical Trials, Neuro-oncology, Tumor Treating Fields (TTFields), Molecular/PET Imaging, Neuroimaging, Immunotherapy

### **CLINICAL TRIALS**

- [18F]DASA-23 and PET Scan in Evaluating Pyruvate Kinase M2 Expression in Patients With Intracranial Tumors or Recurrent Glioblastoma and Healthy Volunteers, Recruiting
- Panitumumab-IRDye800 in Diagnosing Participants With Malignant Glioma Undergoing Surgery, Recruiting
- Whole Brain Radiation Therapy With Standard Temozolomide Chemo-Radiotherapy and Plerixafor in Treating Patients With Glioblastoma, Recruiting
- BPM31510 in Treating Patients With Recurrent High-Grade Glioma Previously Treated With Bevacizumab, Not Recruiting
- Hyperpolarized Carbon C 13 Pyruvate Magnetic Resonance Spectroscopic Imaging in Detecting Lactate and Bicarbonate in Participants With Central Nervous System Tumors, Not Recruiting

- INO-5401 and INO-9012 Delivered by Electroporation (EP) in Combination With Cemiplimab (REGN2810) in Newly-Diagnosed Glioblastoma (GBM), Not Recruiting

## PROJECTS

- (Research Grant; Role: Co-Principal Investigator) Development of Novel Molecular Imaging Agents for Visualization of Cytotoxic T-cells and evaluation of CAR-T cell therapy in preclinical models of GBM - Stanford Chemistry, Engineering & Medicine for Human Health (ChEM-H) Postdocs at the Interface Seed Grant (August 1, 2019 - July 31, 2020)
- (Research Grant; Role: Principal Investigator) Hypoxia Inducible Factor-1 $\alpha$  and Sirtuin Inhibition in Glioblastoma in Conjunction with Tumor Treating Fields - American Brain Tumor Association Basic Research Fellowship supported by the Ryan J. Hanrahan Memorial (July 1, 2017 - June 30, 2019)
- (Research Grant; Role: Principal Investigator) Hypoxia Inducible Factor-1 $\alpha$  and Sirtuin Inhibition in Glioblastoma - Stanford Cancer Institute Fellowship Award for Cancer Research (July 1, 2017 - June 30, 2018)
- (Research Grant; Role: Investigator) Translational Neuroscience Training Grant at Stanford University School of Medicine (Department of Neurosurgery) - NIH NINDS Research Education Grant (R25) Program for Residents and Fellows in Neurology, Neurosurgery, Neuropathology, and Neuroradiology (July 1, 2016 - June 30, 2017)
- (Research Grant; Role: Principal Investigator) 18F-FDOPA PET-Guided Surveillance and Treatment of Gliomas - American Medical Association Foundation Research Seed Grant (April 1, 2015 - June 30, 2016)
- (Research Grant; Role: Investigator) Translational Neuroscience Training Grant at UCLA David Geffen School of Medicine (Department of Neurology) - NIH NINDS Research Education Grant (R25) Program for Residents and Fellows in Neurology, Neurosurgery, Neuropathology, and Neuroradiology (July 1, 2015 - June 30, 2016)

## Teaching

### GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Oncology (Fellowship Program)

## Publications

### PUBLICATIONS

- **Evaluation of Glycolytic Response to Multiple Classes of Anti-glioblastoma Drugs by Noninvasive Measurement of Pyruvate Kinase M2 Using [18F]DASA-23.** *Molecular imaging and biology : MIB : the official publication of the Academy of Molecular Imaging*  
Beinat, C., Patel, C. B., Xie, Y., Gambhir, S. S.  
2019
- **Nanomedicine for Spontaneous Brain Tumors: A Companion Clinical Trial.** *ACS nano*  
Arami, H., Patel, C. B., Madsen, S. J., Dickinson, P. J., Davis, R. M., Zeng, Y., Sturges, B. K., Woolard, K. D., Habte, F. G., Akin, D., Sinclair, R., Gambhir, S. S.  
2019
- **Positron emission tomography reporter gene strategy for use in the central nervous system** *PNAS*  
Haywood, T., Beinat, C., Gowrishankar, G., Patel, C. B., Alam, I. S., Murty, S., Gambhir, S. S.  
2019
- **Engineered immune cells as highly sensitive cancer diagnostics.** *Nature biotechnology*  
Aalipour, A., Chuang, H. Y., Murty, S., D'Souza, A. L., Park, S. M., Gulati, G. S., Patel, C. B., Beinat, C., Simonetta, F., Martini, I., Gowrishankar, G., Robinson, E. R., Aalipour, et al  
2019
- **The characterization of 18F-hGTS13 for molecular imaging of xC<sup>-</sup> transporter activity with positron emission tomography.** *Journal of nuclear medicine : official publication, Society of Nuclear Medicine*  
Beinat, C., Gowrishankar, G., Shen, B., Alam, I. S., Robinson, E., Haywood, T., Patel, C. B., Azevedo, E. C., Castillo, J., Ilovich, O., Koglin, N., Schmitt-Willich, H., Berndt, et al  
2019
- **Dosimetry Prediction for Clinical Translation of 64Cu-Pembrolizumab ImmunoPET Targeting Human PD-1 Expression.** *Scientific reports*  
Natarajan, A., Patel, C. B., Habte, F., Gambhir, S. S.  
2018; 8 (1): 633
- **A Novel Engineered Small Protein for Positron Emission Tomography Imaging of Human Programmed Death Ligand-1 : Validation in Mouse Models and Human Cancer Tissues** *Clinical Cancer Res*

- Natarajan, A., Patel, C. B., Ramakrishnan, S., Panesar, P. S., Long, S. R., Gambhir, S. S.  
2018
- **Molecular imaging of pyruvate kinase M2 (PKM2) with [18F]DASA-23 detects temozolomide- and tumor treating fields (TTFields)-induced changes in glycolysis in preclinical models of glioblastoma** *World Molecular Imaging Congress*  
Patel, C. B., Beinat, C., Xie, Y., Haywood, T., Murty, S., Chang, E., Gambhir, S. S.  
2018
  - **A novel metabolic PET tracer strategy to determine early effects of Tumor Treating Fields (TTFields)** *Society for Neuro-Oncology (SNO) 23rd Annual Meeting*  
Patel, C. B., Beinat, C., Xie, Y., Haywood, T., Murty, S., Chang, E., Gambhir, S. S.  
2018
  - **Tumor Treating Fields Increases Membrane Permeability in Glioblastoma Cells** *Cell Death Discovery*  
(equal contribution) Chang, E., (equal contribution) Patel, C. B., Pohling, C., Young, C., Song, J., Flores, T., Zeng, Y., Joubert, L. M., Arami, H., Natarajan, A., Sinclair, R., Gambhir, S. S.  
2018; 4
  - **18F-FDOPA PET and MRI characteristics correlate with degree of malignancy and predict survival in treatment-naïve gliomas: a cross-sectional study.** *Journal of neuro-oncology*  
Patel, C. B., Fazzari, E., Chakhoyan, A., Yao, J., Raymond, C., Nguyen, H., Manoukian, J., Nguyen, N., Pope, W., Cloughesy, T. F., Nghiemphu, P. L., Czernin, J., Lai, et al  
2018
  - **A single demyelinating attack is enough to limit brain growth in children.** *Neurology*  
Hacohen, Y., Patel, C. B., Hintzen, R.  
2017
  - **Southern California neuroinvasive West Nile virus case series.** *Neurological Sciences*  
Patel, C. B., Trikamji, B. V., Mathisen, G. E., Mishra, S. K.  
2017
  - **Movements Here Today, Gone Tomorrow: Images in Clinical Neurology Case of Hyperglycemic Hemichorea.** *The Neurohospitalist*  
Chang, T. S., Patel, C. B., Keener, A. M., Keselman, I., Jamal, N. I.  
2017; 7 (3): 150
  - **Synergistic inhibition of glioma cell proliferation by Withaferin A and tumor treating fields.** *Journal of neuro-oncology*  
Chang, E., Pohling, C., Beygui, N., Patel, C. B., Rosenberg, J., Ha, D. H., Gambhir, S. S.  
2017
  - **Natural Language Processing-Enabled and Conventional Data Capture Methods for Input to Electronic Health Records: A Comparative Usability Study.** *JMIR medical informatics*  
Kaufman, D. R., Sheehan, B., Stetson, P., Bhatt, A. R., Field, A. I., Patel, C., Maisel, J. M.  
2016; 4 (4)
  - **MRI Ventral Nerve Root Enhancement in Five Patients Presenting With Extremity Weakness Secondary to Neuroinvasive West Nile Virus.** *Journal of clinical neuromuscular disease*  
Patel, C. B., Trikamji, B., Mathisen, G., Yim, C., Zipser, B., Mishra, S.  
2016; 18 (1): 41-43
  - **Multiple calcifying pseudoneoplasms of the neuraxis (MCAPNON): Distinct entity, CAPNON variant, or old neurocysticercosis?** *Neuropathology : official journal of the Japanese Society of Neuropathology*  
Abdaljaleel, M., Mazumder, R., Patel, C. B., Im, K., Pope, W., Liau, L. M., Vinters, H. V., Yong, W. H.  
2016
  - **Xenon exposure in the neonatal rat brain: effects on genes that regulate apoptosis** *MINERVA ANESTESIOLOGICA*  
Cattano, D., Valleggi, S., Cavazzana, A. O., Patel, C. B., Ma, D., Maze, M., Giunta, F.  
2011; 77 (6): 571-578
  - **Diagnostic nuclear medicine in the ED** *AMERICAN JOURNAL OF EMERGENCY MEDICINE*  
Amini, B., Patel, C. B., Lewin, M. R., Kim, T., Fisher, R. E.

2011; 29 (1): 91-101

- **Developing a Novel Therapeutic Game for Children with Autism Spectrum Disorder** *First AMA-IEEE Conference on Medical Technology*  
Po, M. J., Lin, R., Chen, B., Patel, C. B., Awon, J., Allen, L., Lantz, J., Gerber, A. J.  
2010
- **Consider using diffusion tensor imaging in Geron phase I trial.** *AJNR. American journal of neuroradiology*  
Patel, C. B.  
2009; 30 (7): E97-?
- **Letter by Patel Regarding Article, "A Primer in Longitudinal Data Analysis"** *CIRCULATION*  
Patel, C. B.  
2009; 120 (4): E25-E25
- **Effect of VEGF Treatment on the Blood-Spinal Cord Barrier Permeability in Experimental Spinal Cord Injury: Dynamic Contrast-Enhanced Magnetic Resonance Imaging** *JOURNAL OF NEUROTRAUMA*  
Patel, C. B., Cohen, D. M., Ahobila-Vajjula, P., Sundberg, L. M., Chacko, T., Narayana, P. A.  
2009; 26 (7): 1005-1016
- **Blood-spinal cord barrier permeability in experimental spinal cord injury: dynamic contrast-enhanced MRI** *NMR IN BIOMEDICINE*  
Cohen, D. M., Patel, C. B., Ahobila-Vajjula, P., Sundberg, L. M., Chacko, T., Liu, S., Narayana, P. A.  
2009; 22 (3): 332-341
- **Angiopoietin-1 Reduces Blood-Spinal Cord Barrier Permeability and Lesion Volume in the Acute Phase of Spinal Cord Injury: MRI and Histological Studies** *Second Joint Symposium of The International & National Neurotrauma Societies*  
Patel, C. B., Narayana, P. A.  
2009: A-28
- **Sinusoidal modeling of ictal activity along a thalamus-to-cortex seizure pathway I: New coherence approaches** *ANNALS OF BIOMEDICAL ENGINEERING*  
Sherman, D. L., Patel, C. B., Zhang, N., Rossell, L. A., Tsai, Y. C., Thakor, N. V., Mirski, M. A.  
2004; 32 (9): 1252-1264
- **Prediction of PTZ-induced seizures using wavelet-based residual entropy of cortical and subcortical field potentials** *IEEE TRANSACTIONS ON BIOMEDICAL ENGINEERING*  
Paul, J. S., Patel, C. B., Al-Nashash, H., Zhang, N., Ziai, W. C., Mirski, M. A., Sherman, D. L.  
2003; 50 (5): 640-648
- **Wilms' tumor suppressor gene (WT1) is expressed in primary breast tumors despite tumor-specific promoter methylation** *CANCER RESEARCH*  
Loeb, D. M., Evron, E., Patel, C. B., Sharma, P. M., Niranjana, B., Buluwela, L., Weitzman, S. A., Korz, D., Sukumar, S.  
2001; 61 (3): 921-925

## PRESENTATIONS

- Identification of a new mechanism for how tumor treating fields affect tumor cells - American Association for Cancer Research (AACR) 2019 Annual Meeting, Session ADT16 - Tumor Treating Fields: A Fourth Modality in Cancer Treatment (April 2, 2019 - April 2, 2019)