

Curriculum Vitae
Johns Hopkins University School of Medicine



Chetan Bettegowda, MD PhD

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DEMOGRAPHIC INFORMATION

Current Appointments

2019-Current Jennison and Novak Families Professor, Departments of Neurosurgery and Oncology
2021-Current Director, Khatib Brain Tumor Center
2020-Current Director, Physician Scientist Training Program Johns Hopkins University School of Medicine
2020-Current Medical Director, Ludwig Center for Cancer Genetics and Therapeutics, Johns Hopkins University
2016-Current Director of Meningioma Center, Johns Hopkins Medical Institute
2020-Current Director of Brain Metastasis Center, Johns Hopkins Medical Institute
2020-Current Co-Director, Trigeminal Neuralgia Center, Johns Hopkins Medical Institute
2018-Current Physician Advisor for Safety and Quality Improvement, Department of Neurosurgery
2018-Current Co-Director, Neurosurgical Brain Tumor Fellowship Program

Personal Data

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Education and Training

Undergraduate

1998 B.S., Biology & Religion (Double Major), Duke University, Durham, NC

Doctoral/Graduate

2005 M.D., Medicine, Johns Hopkins University School of Medicine, Baltimore, MD
2005 Ph.D., Cellular and Molecular Medicine, Johns Hopkins University School of Medicine

Postdoctoral

2005-2006 Intern, General Surgery, Johns Hopkins Hospital, Baltimore, MD
2006-2012 Resident, Neurosurgery, Johns Hopkins Hospital, Baltimore, MD
2009-2011 Research Fellow, Neuro-oncology, Johns Hopkins University School of Medicine

Professional Experience

2006-2012 Resident, Neurosurgery, Johns Hopkins Hospital
2011-2012 Chief Resident, Neurosurgery, Johns Hopkins Hospital
2012-2016 Assistant Professor of Neurosurgery and Oncology, Johns Hopkins University School of Medicine
2016-2019 Associate Professor of Neurosurgery and Oncology, Johns Hopkins University School of Medicine
2018-2019 Jennison-Nowak Families Endowed Associate Professor, Department of Neurosurgery
2019-Current Jennison-Nowak Families Endowed Professor, Department of Neurosurgery
2012-2020 Investigator, Ludwig Center for Cancer Genetics and Therapeutics, Johns Hopkins University
2020-Current Medical Director, Ludwig Center for Cancer Genetics and Therapeutics, Johns Hopkins University

PUBLICATIONS

H-Index: 46 16,887 citations

Original Research [OR]

1. Levin ED, **Bettegowda C**, Weaver T, Christopher NC. Nicotine-dizocilpine interactions and working and reference memory performance of rats in the radial-arm maze. *Pharmacol Biochem Behav.* 1998 Nov;61(3):335-40.
2. Levin ED, **Bettegowda C**, Blosser J, Gordon J. AR-R17779, and alpha7 nicotinic agonist, improves learning and memory in rats. *Behav Pharmacol.* 1999 Nov;10(6-7):675-80.
3. Dang LH, **Bettegowda C**, Huso DL, Kinzler KW, Vogelstein B. Combination bacteriolytic therapy for the treatment of experimental tumors. *PNAS.* 2001 Dec 18; 98(26):15155-60.
4. Traverso G, **Bettegowda C**, Kraus J, Speicher MR, Kinzler KW, Vogelstein B, Lengauer C. Hyper-recombination and genetic instability in BLM-deficient epithelial cells. *Cancer Res.* 2003 Dec 15;63(24):8578-81.
5. **Bettegowda C**, Dang LH, Abreams R, Huso DL, Dillehay L, Cheong I, Agrawal N, Borzillary S, McCaffery JM, Watson EL, Lin KS, Bunz F, Baidoo K, Pomper MG, Kinzler KW, Vogelstein B, Zhou S. Overcoming the hypoxic barrier to radiation therapy with anaerobic bacteria. *PNAS.* 2003 Dec 9;100(25):15083-8.
6. Dang LH*, **Bettegowda C***, Agrawal N, Cheong I, Huso D, Frost P, Loganzo F, Greenberger L, Barkoczy J, Pettit GR, Smith AB 3rd, Gurulingappa H, Khan S, Parmigiani G, Kinzler KW, Zhou S, Vogelstein B. Targeting vascular and avascular compartments of tumors with *C. novyi-NT* and Anti-Microtubule Agents. *Cancer Biol Ther.* 2004 Mar;3(3):326-37. (cover article, co-first authors)
7. Agrawal N, **Bettegowda C**, Cheong I, Geschwind JF, Drake CG, Hipkiss EL, Tatsumi M, Dang LH, Diaz LA Jr, Pomper M, Abusedera M, Wahl RL, Kinzler KW, Zhou S, Huso DL, Vogelstein B. Bacteriolytic therapy can generate a potent immune response against experimental tumors. *PNAS.* 2004 Oct 19;101(42):15172-7.
8. **Bettegowda C**, Foss CA, Cheong I, Wang Y, Diaz L, Agrawal N, Fox J, Dick J, Dang LH, Zhou S, Kinzler KW, Vogelstein B, Pomper MG. Imaging bacterial infections with radiolabeled 1-(2'-deoxy-2'-fluoro-beta-D-arabinofuranosyl)-5-iodouracil. *PNAS.* 2005 Jan 25;102(4):1145-50.
9. **Bettegowda C**, Foss CA, Cheong I, Wang Y, Diaz L, Agrawal N, Fox J, Dick J, Dang LH, Zhou S, Kinzler KW, Vogelstein B, Pomper MG. Imaging bacteriolytic therapy with I-125 FIAU. *PNAS.* 2005 Jan. 25; 102
10. Diaz LA Jr, Cheong I, Foss CA, Zhang X, Peters BA, Agrawal N, **Bettegowda C**, Karim B, Liu G, Khan K, Huang X, Kohli M, Dang LH, Hwang P, Vogelstein A, Garrett-Mayer E, Kobrin B, Pomper M, Zhou S, Kinzler KW, Vogelstein B, Huso DL. Pharmacologic and toxicologic evaluation of *C. novyi-NT* spores. *Toxicol Sci.* 2005 Dec;88(2):562-75.
11. **Bettegowda C**, Huang X, Lin J, Cheong I, Kohli M, Szabo SA, Zhang X, Diaz LA Jr, Velculescu VE, Parmigiani G, Kinzler KW, Vogelstein B, Zhou S. The genome and transcriptomes of the anti-tumor agent *Clostridium novyi-NT*. *Nat Biotechnol.* 2006 Dec;24(12):1573-80.
12. Cheong I, Huang X, **Bettegowda C**, Diaz LA Jr, Kinzler KW, Zhou S, Vogelstein B. A bacterial protein enhances the release and efficacy of liposomal cancer drugs. *Science.* 2006 Nov 24;314(5803):1308-11.
13. Plomp M, McCaffery JM, Cheong I, Huang X, **Bettegowda C**, Kinzler KW, Zhou S, Vogelstein B, Malkin AJ. Spore coat architecture of *Clostridium novyi NT* spores. *J Bacteriol.* 2007 Sep;189(17):6457-68.
14. Diaz LA Jr, Foss CA, Thornton K, Nimmagadda S, Endres CJ, Uzuner O, Seyler TM, Ulrich SD, Conway J, **Bettegowda C**, Agrawal N, Cheong I, Zhang X, Ladenson PW, Vogelstein BN, Mont MA, Zhou S, Kinzler KW, Vogelstein B, Pomper MG. Imaging of Musculoskeletal Bacterial Infections by [I] FIAU-PET/CT. *PLoS ONE.* 2007 Oct 10;2(10):e1007.
15. Farrag TY, Agrawal N, Sheth S, **Bettegowda C**, Ewertz M, Kim M, Tufano RP. Algorithm for safe and effective reoperative thyroid bed surgery for recurrent/persistent papillary thyroid carcinoma. *Head Neck.* 2007 Dec;29(12):1069-74.
16. Mehta V, **Bettegowda C**, Ahmadi SA, Berenberg P, Thomale UW, Haberl EJ, Jallo GI, Ahn E. Spinal Cord Tethering following Myelomeningocele Repair. *J Neurosurg Pediatr.* 2010 Nov;6(5):498-505.
17. Mehta V, **Bettegowda C**, Jallo GI, Ahn E. The Evolution of Surgical Management for Craniosynostosis. *Neurosurg Focus.* 2010 Dec;29(6):E5.
18. Parsons DW, Li M, Zhang X, Jones S, Leary RJ, Lin JC, Boca SM, Carter H, Samayoa J, **Bettegowda C**, Gallia GL, Jallo GI, Binder ZA, Nikolsky Y, Hartigan J, Smith DR, Gerhard DS, Fults DW, Vandenberg S, Berger MS, Marie SK, Shinjo SM, Clara C, Phillips PC, Minturn JE, Biegel JA, Judkins AR, Resnick AC, Storm PB, Curran T, He Y, Rasheed BA, Friedman HS, Keir ST, McLendon R, Northcott PA, Taylor MD, Burger PC, Riggins GJ, Karchin R, Parmigiani G, Bigner DD, Yan H, Papadopoulos N, Vogelstein B,

- Kinzler KW, Velculescu VE. The Genetic Landscape of the Childhood Cancer Medulloblastoma. *Science*. 2011 Jan 28;331(6016):435-9.
19. Mehta V, **Bettegowda C**, Amin A, El-Gassim M, Jallo GI, Ahn E. Impact of tethered cord release on symptoms of Chiari II malformation in children born with a myelomeningocele. *Childs Nerv Syst*. 2011 Jun;27(6):975-8.
 20. Heaphy CM, de Wilde RF, Jiao Y, Klein AP, Edil BH, Shi C, **Bettegowda C**, Rodriguez FJ, Eberhart CG, Hebbar S, Offerhaus GJ, McLendon R, Rasheed BA, He Y, Yan H, Bigner DD, Oba-Shinjo SM, Marie SK, Riggins GJ, Kinzler KW, Vogelstein B, Hruban RH, Maitra A, Papadopoulos N, Meeker AK. Altered Telomeres in Tumors with *ATRX* and *DAXX* Mutations *Science*. 2011 Jul 22;333(6041):425
 21. Agrawal N*, Frederick MJ*, Pickering CR*, **Bettegowda C***, Chang K, Li RJ, Fakhry C, Xie TX, Zhang J, Wang J, Zhang N, El-Naggar AK, Jasser SA, Weinstein JN, Treviño L, Drummond JA, Muzny DM, Wu Y, Wood LD, Hruban RH, Westra WH, Koch WM, Califano JA, Gibbs RA, Sidransky D, Vogelstein B, Velculescu VE, Papadopoulos N, Wheeler DA, Kinzler KW, Myers JN. Exome Sequencing of Head and Neck Squamous Cell Carcinomas Reveals Inactivating Mutations in *NOTCH1*. *Science*. 2011 Aug 26;333(6046):1154-7 (co-first author)
 22. **Bettegowda C**, Agrawal N, Jiao Y, Sausen M, Wood LD, Hruban RH, Rodriguez FJ, Cahill DP, McLendon R, Riggins G, Velculescu VE, Oba-Shinjo SM, Marie SK, Vogelstein B, Bigner D, Yan H, Papadopoulos N, Kinzler KW. Mutations in *CIC* and *FUBP1* Contribute to Human Oligodendroglioma. *Science*. 2011 Sep 9;333(6048):1453-5.
 23. Ononiwu C, Mehta V, **Bettegowda C**, Jallo G. Pediatric Spinal Glioblastoma Multiforme: Current Treatment Strategies and Possible Predictors of Survival. *Childs Nerv System*. 2012 May;28(5):715-20.
 24. Wolf A, Batra S, Bortoletto S, **Bettegowda C**, Amendola B, Blach L, Kleinberg L, Rigamonti D. Stereotactic radiosurgery of colorectal carcinoma brain metastasis: a multi-institutional experience. (2012); *Cureus*. 4(5) e: 46.
 25. Wolf A, Stall B, Batra S, Bortoletto S, **Bettegowda C**, Coy CR, Amendola B, Blach L, Kleinberg L, Rigamonti D. Gamma knife radiosurgery for melanoma brain metastases. (2012); *Cureus*. 4(5) e: 4
 26. Wolf A, Redmond JK, Bortoletto S, Batra S, **Bettegowda C**, Amendola B, Blach L, Kleinberg L, Rigamonti D. Gamma knife radiosurgery for breast cancer metastases to the brain: outcomes and prognostic factors from a large prospectively collected database. (2012); *Cureus*. 4(5): e: 43.
 27. Wolf A, Batra S, Bortoletto S, **Bettegowda C**, Amendola B, Blach L, Kleinberg L, Rigamonti D. Stereotactic radiosurgery for the treatment of brain metastases from non-small cell lung carcinoma: a multi-institutional experience. (2012); *Cureus*. 4 (4) e: 41.
 28. Jiao Y, Killela PJ, Reitman ZJ, Rasheed AB, Heaphy CM, de Wilde RF, Rodriguez FJ, Rosenberg S, Oba-Shinjo SM, Marie SK, **Bettegowda C**, Agrawal N, Lipp E, Pirozzi C, Lopez G, He Y, Friedman H, Friedman AH, Riggins GJ, Holdhoff M, Burger P, McLendon R, Bigner DD, Vogelstein BK, Meeker AK, Kinzler KW, Papadopoulos N, Diaz LA, Yan H. Frequent *ATRX*, *CIC* and *FUBP1* mutations refine the classification of malignant gliomas. *Oncotarget*. 2012 Jul;3(7):709-22.
 29. Husain H, Savage W, Grossman S, Ye X, Burger P, Everett, **Bettegowda C**, Diaz L, Blair C, Romans K, Holdhoff M. Pre-and Post-Operative Plasma Glial Fibrillary Acidic Protein Levels in Patients with Newly Diagnosed Gliomas. *J Neurooncol*. 2012 Aug;109(1):123-7.
 30. Woodworth GF, See A, **Bettegowda C**, Batra S, Jallo GI, Rigamonti D. Predictors of Surgery-Free Outcome in Adult Endoscopic Third Ventriculostomy. *World Neurosurg*. 2012 Sept-Oct;78(3-4):312-7.
 31. Jain A, Amin A, Jain P, Burger P, Jallo GI, Lim M, , **Bettegowda C**. Subependymoma: Clinical Features and Surgical Outcomes. *Neurol Res*. 2012 Sep;34(7):677-84.
 32. Agrawal N*, Jiao Y*, **Bettegowda C***, Hutfless, Wang Y, David S, Cheng Y, Twaddell W, Latt N, Shin E, Wang L, Wang LD, Ding I, Yang W, Velculescu V, Vogelstein B, Papadopoulos N, Kinzler K, Meltzer S. Comparative genomic analysis of esophageal adenocarcinoma and squamous cell carcinoma. *Cancer Discov*. 2012 Oct;2(10):899-905. (co-first author).
 33. **Bettegowda C**, Adogwa O, Mehta V, Chaichana K, Weingart J, Carson B, Jallo GI, Ahn E. Treatment of Choroid Plexus Tumors: A Twenty Year Single Institutional Experience. *J Neuros Pediatr*. 2012 Nov;10(5):398-405.
 34. Wolf AL, Batra S, Bortoletto P, Ruzevick, J, **Bettegowda C**, Coy S, Amendola BE, Blach L, Kleinberg L, Rigamonti D. Stereotactic Radiosurgery in Treatment of Cerebral Metastases: Histological Differences in Predictors of Survival. *Cureus*. 2013 Jan;5(1):e81.

35. Agrawal N, Jiao Y, Sausen M, Leary R, **Bettegowda C**, Roberts N, Bhan S, Ho A, Khan Z, Bishop J, Westra W, Wood L, Hruban R, Tufano R, Robinson B, Drale H, Toledo S, Toledo R, Morris L, Ghossein R, Fagin J, Chan T, Velculescu V, Vogelstein B, Kinzler K, Papadopoulos N, Nelkin B, Ball D. Exomic sequencing of medullary thyroid cancer reveals dominant and mutually exclusive oncogenic mutations in RET and RAS. *J Clin Endocr Metab*. 2013 Feb;98(2):E364-9.
36. Kinde I*, **Bettegowda C***, Wang Y*, Wu J, Agrawal N, Shih IM, Kurman R, Dao F, Levine DA, Giuntoli R, Roden R, Eshleman JR, Carvalho JP, Marie SK, Papadopoulos N, Kinzler KW, Vogelstein B, Diaz LA Jr. Evaluation of DNA from the Papanicolaou Test to Detect Ovarian and Endometrial Cancers. *Sci Transl Med*. 2013 Jan 9;5(167):167ra4. (co-first author).
37. **Bettegowda C**, Agrawal N, Jiao Y, Wang Y, Wood L, Rodriguez FJ, Hruban RH, Gallia GL, Binder ZA, Riggins CJ, Salmasi V, Riggins GJ, Reitman ZJ, Rasheed A, Keir S, Shinjo S, Marie S, McLendon R, Jallo G, Vogelstein B, Bigner D, Yan H, Kinzler KW, Papadopoulos N. Exomic Sequencing of Four Rare Central Nervous System Tumor Types. *Oncotarget*. 2013 Apr;4(4):572-83.
38. Killela PJ*, Reitman ZJ*, Jiao Y*, **Bettegowda C***, Agrawal N, Diaz LA, Friedman A, Friedman H, Gallia GL, Giovanella BV, Grollman AP, He TC, He Y, Hruban RH, Jallo GI, Meeker AK, Mertens F, Netto GJ, Rasheed BA, Riggins G, Rosenquist TA, Schiffman M, Shih IM, Theodorescu D, Torbenson MS, Velculescu V, Wang TL, Wentzensen N, Wood LD, Zhang M, McLendon RE, Bigner DD, Papadopoulos N, Kinzler K, Vogelstein B, Yan H. *TERT* promoter mutations occur frequently in gliomas and in a subset of tumors derived from cells with low rates of self-renewal. *PNAS*. 2013 Apr 9;110(15):6021-6. (co-first author).
39. Chaichana KL, Flores M, Acharya S, Sampognaro P, **Bettegowda C**, Rigamonti D, Weingart J, Olivi A, Gallia GL, Brem H, Lim M, Quinones-Hinojosa A. Survival and Recurrence for Patients Undergoing Surgery of Skull Base Intracranial Metastases. *J Neurol Surg B Skull Base*. 2013 Aug;74(4):228-35.
40. Fisher CG, Goldschlager T, Boriani S, Varga PP, Fehlings MG, Bilsky MH, Dekutoski MB, Luzzati A, Williams RP, Berven S, Chou D, Reynolds JJ, Quraishi NA, Rhines LD, **Bettegowda C**, Gokaslan ZL. A novel scientific method for rare and often neglected neoplastic conditions. *Evid Based Spine Care J*. 2013 Oct;4(2):160-2.
41. Sui IM, Ruzevick J, Zhao Q, Connis N, Jiao Y, **Bettegowda C**, Xia X, Burger PC, Hann CL, Gallia GL. Erlotinib inhibits growth of a patient-derived chordoma xenograft. *PLoS One*. 2013 Nov 15;8(11):378895.
42. Goodwin CR, Yang JX, **Bettegowda C**, Hwang B, James C, Biser A, Raza S, Bender M, Carson B, Lee JY, Lim M. Glycerol rhizotomy via a retrosigmoid approach as an alternative treatment for trigeminal neuralgia. *Clin Neurol Neurosurg*. 2013 Dec;115(12):2454-6.
43. Chaichana KL, Gadkaree S, Rao K, Link T, Rigamonti D, Purtell M, Browner I, Weingart J, Olivi A, Gallia G, **Bettegowda C**, Brem H, Lim M, Quinones-Hinojosa A. Patients undergoing surgery of intracranial metastases have different outcomes based on their primary pathology. *Neurol Res*. 2013 Dec;35(10):1059-69.
44. Liu G, **Bettegowda C**, Qiao Y, Staedtke V, Chan KW, Bai R, Li Y, Riggins GJ, Kinzler KW, Bulte JW, McMahon MT, Gilad AA, Vogelstein B, Zhou S, van Zijl PC. Noninvasive imaging of infection after treatment with tumor-homing bacteria using chemical exchange saturation transfer (CEST) MRI. *Magn Reson Med*. 2013 Dec;70(6):1690-8.
45. Chaichana KL, Rao K, Gadkaree S, Dangelmajer S, **Bettegowda C**, Rigamonti D, Weingart J, Olivi A, Gallia GL, Brem H, Lim M, Quinones-Hinojosa A. Factors associated with survival and recurrence for patients undergoing surgery of cerebellar metastases. *Neurol Res*. 2014 Jan;36(1):13-25.
46. **Bettegowda C***, Sausen M*, Leary RJ*, Kinde I*, Wang Y, Agrawal N, Bartlett BR, Wang H, Luber B, Alani RM, Antonarakis ES, Azad NS, Bardelli A, Brem H, Cameron JL, Lee CC, Fecher LA, Gallia GL, Gibbs P, Le D, Giuntoli RL, Goggins M, Hogarty MD, Holdhoff M, Hong SM, Jiao Y, Juhl HH, Kim JJ, Siravegna G, Laheru DA, Lauricella C, Lim M, Lipson EJ, Marie SK, Netto GJ, Oliner KS, Olivi A, Olsson L, Riggins GJ, Sartore-Bianchi A, Schmidt K, Shih IM, Oba-Shinjo SM, Siena S, Theodorescu D, Tie J, Harkins TT, Veronese S, Wang TL, Weingart JD, Wolfgang CL, Wood LD, Xing D, Hruban RH, Wu J, Allen PJ, Schmidt CM, Choti MA, Velculescu VE, Kinzler KW, Vogelstein B, Papadopoulos N, Diaz LA Jr. Detection of circulating tumor DNA in early- and late- stage human malignancies. *Sci Transl Med*. 2014 Feb 19;6(224):224ra24.
47. Chaichana KL, Acharya S, Flores M, Wijesekera O, Rigamonti D, Weingart JD, Olivi A, **Bettegowda C**, Gallia GL, Brem H, Lim M, Quinones-Hinojosa A. Identifying better surgical candidates among RPA class

- 2 patients who underwent surgery for intracranial metastases. *World Neurosurg.* 2014 Jul-Aug;82(1-2):e267-75.
48. Tung D, DeCrescenzo G, Welsch D, Cheung PH, **Bettegowda C**, Saha S. Evaluation of 1-(2-deoxy-2-fluoro-1-D-arabinofuranosyl)-5-iodouracil (FIAU) as an ex vivo bacterial detection agent. *World J Microbiol Biotechnol.* 2014 Aug 2.
 49. Roberts NJ, Zhang L, Janku F, Collins A, Bai RY, Staedtke V, Rusk AW, Tung D, Miller M, Roix J, Khanna KV, Murthy R, Benjamin RS, Helgason T, Szvalb AD, Bird JE, Roy-Chowdhuri S, Zhang HH, Qiao Y, Karim B, McDaniel J, Elpiner A, Sahora A, Lachowicz J, Phillips B, Turner A, Klein MK, Post G, Diaz LA Jr, Riggins GJ, Papadopoulos N, Kinzler KW, Vogelstein B, **Bettegowda C**, Huso DL, Varterasian M, Saha S, Zhou S. Intratumoral injection of Clostridium novyi-NT spores induces antitumor responses. *Sci Transl Med.* 2014 Aug 13;6(249):249ra111.
 50. Fisher CG, Goldschlager T, Boriani S, Varga PP, Rhines LD, Fehlings MG, Luzzati A, Dekutoski MB, Reynolds JJ, Chou D, Berven SH, Williams RP, Quraishi NA, **Bettegowda C**, Gokaslan ZL. An evidence-based medicine model for rare and often neglected neoplastic conditions. *J Neurosurg Spine.* 2014 Sep 5.
 51. Boriani S, Lo SF, Puvanesarajah V, Fisher CG, Varga PP, Rhines LD, Germscheid NM, Luzzati A, Chou D, Reynolds JJ, Williams RP, Zadnik P, Groves M, Sciubba DM, **Bettegowda C**, Gokaslan ZL; AOSpine Knowledge Forum Tumor. Aneurysmal Bone Cysts of the Spine: Treatment Options and Considerations. *J Neurooncol.* 2014 Oct;120(1):171-8.
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 53. Zhang M, Wang Y, Jones S, Sausen M, McMahan K, Sharma R, Wang Q, Belzberg AJ, Chaichana K, Gallia GL, Gokaslan ZL, Riggins GJ, Wolinsky JP, Wood LD, Montgomery EA, Hruban RH, Kinzler KW, Papadopoulos N, Vogelstein B, **Bettegowda C**. Somatic mutations of SUZ12 in malignant peripheral nerve sheath tumors. *Nat Genet.* 2014 Nov;46(11):1170-2.
 54. Williams R, Williams R, Sowman B, Boriani S, Varga PP, Luzzati A, Gokaslan ZL, Fehlings MG, Fisher, CG, Dekutoski MB, Rhines LD, Reynolds J, **Bettegowda C**, Kawahara N, Quariashi NA. Spinal osteoid osteoma: a multicentre retrospective cohort study comparison of results with appendicular osteoid osteoma. *Spine J.* 2015 Mar;15(3):401-408.
 55. Sciubba DM, Macki M, Bydon M, Germscheid NM, Wolinsky JP, Boriani S, **Bettegowda C**, Chou D, Luzzati A, Reynolds JJ, Szövérfi Z, Zadnik P, Rhines LD, Gokaslan ZL, Fisher CG, Varga PP. Long-term outcomes in primary spinal osteochondroma: a multicenter study of 27 patients. *J Neurosurg Spine.* 2015 Jun;22(6):583-8.
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63. Eseonu CI, Goodwin CR, Zhou X, Theodros D, Bender MT, Mathios D, **Bettegowda C**, Lim M. Reduced CSF leak in complete calvarial reconstructions of microvascular decompression craniectomies using calcium phosphate cement. *J Neurosurg*. 2015 Dec;123(6):1476-9.
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2. **Bettegowda C**, Huang J. Epidural Hematoma Evacuation. *In* Fundamentals of Operative Neurosurgery (Connolly E, McKhann G, Huang J, Choudhri T, eds.) Thieme. New York, NY. 2009.
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6. **Bettegowda C**, Amin A, Hoang S, Jallo G. Supratentorial Tumors. *In* Handbook of Neurosurgery (Rigamonti ed). Thieme. New York, NY. 2009.
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17. Papadimitriou K, **Bettegowda C**, Vrionis F. Molecular Genetics of Brain Tumors. Gliomas: Symptoms, Diagnosis and Treatment Options. (Wiranowska and Vrionis eds). Nova Science. Hauppauge, NY 2012.
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Case Reports [CR]

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2. **Mehta V, Bettgowda C, Singer HS, Ahn E.** Medullary Cistern Choroid Plexus Papilloma. *Childs Nerv Syst.* 2010 Dec;26(12):1825-9.
3. Bydon M, De la Garza-Ramos R, **Bettgowda C, Suk I, Wolinsky JP, Gokaslan ZL.** En Bloc Resection of a Giant Cell Tumor in the Sacrum via a Posterior-Only Approach Without Nerve Root Sacrifice: Technical Case Report. *Neurosurgery.* 2015 Sep;11 Suppl 3:E472-8.
4. **Bettgowda C, Shajari M, Suk I, Simmons O, Gokaslan ZL, Wolinsky JP.** Sublabial Approach for the Treatment of Symptomatic Basilar Impression in a Patient with Klippel-Feil Syndrome: A Case Report. *Neurosurgery (cover article).* 2011 Sep;69(1 Suppl Operative):ons77-82; discussion ons82.

Proceedings, Reports [PR]

1. Huse JT, Wallace M, Aldape KD, Berger MS, **Bettgowda C, Brat DJ, Cahill DP, Cloughesy T, Haas-Kogan DA, Marra M, Miller CR, Nelson SJ, Salama SR, Soffiatti R, Wen PY, Yip S, Yen K, Costello JF, Chang S.** Where are we now? And where are we going? A report from the Accelerate Brain Cancer Cure (ABC2) Low-grade glioma research workshop. *Neuro Oncol.* 2014 Jan;16(2):173-8.

FUNDING

Extramural Sponsorship

Current

- | | |
|------------------|---|
| 7/1/19-6/30/21 | MRgFUS-enabled non-invasive interrogation of malignant glioma via circulating tumor DNA
NINDS R21NS113016-01
\$275,000 Total: \$453,530
Role: co-PI (co-PI Woodworth), 10%; Major Goals: The goal is test whether MR guided focused ultrasound can increase the release of circulating tumor DNA in malignant gliomas. |
| 9/1/18-8/31/23 | Earlier Detection of Cancers using Non-Plasma Based Liquid Biopsies
NCI U01CA230691-01
\$2,472,205 Total: \$3,691,489
Role: Project Co-PI, 15%; Major Goals: Develop novel non-invasive biomarkers for early detection of cancers. |
| 7/1/18-6/30/23 | Tumor Derived DNA in Cerebrospinal Fluid as a Biomarker for Central Nervous System Malignancies
NCI R37 CA230400-01
\$1,250,000 Total: \$2,025,000
Role: PI 11%; Major Goals: Use tumor derived DNA in the CSF as a biomarker to track disease status in individuals with primary brain tumors. |
| 9/1/12-8/31/21 | Translational molecular profiling of oligodendrogliomas.
Burroughs Wellcome Fund Career Award for Medical Scientists
\$700,000
Role: PI, 8% Major Goals: Study the global genetic and epigenetic profiles of oligodendrogliomas to understand the key pathways that are dysregulated and attempt to harness this information for diagnostic, prognostic and therapeutic benefit. |
| 7/15/13-12/31/21 | Biomarkers for Children With Brain Tumors
Ian's Friend's Foundation
\$50,000
Role: Co-PI, 0%; Major Goals: Develop CSF based biomarkers for children with brain tumors |

1/1/16-12/31/20 Development of personalized biomarkers for children with medulloblastoma.
Alex's Lemonade Stand
\$40,000
Role: PI, 0%; Major Goals: Develop biomarkers capable of detecting disease burden in individuals with medulloblastoma.

4/1/16-3/31/22 PTRON – Primary Tumor Research and Outcome Network
AOSpine
\$54,742
Role: PI, 1%; Major Goals: Multinational registry of primary spinal column tumors undergoing surgical treatment

Past

1/1/11-3/1/15 Genetic Alterations in Intramedullary Spinal Cord Tumors
Malia's Cord Foundation
Direct: \$300,000
PI: George Jallo
Role: Co-Investigator, 0%; Major Goals: Determine the global mutational profile of spinal ependymomas and astrocytomas and compare them to their intracranial counterparts.

1/1/12-12/31/12 The development of novel diagnostic methods for managing children with brain tumors
Pediatric Brain Tumor Foundation; Vogelstein/Bettegowda (co-PI)
\$100,000
Role: Co-PI, 15%; Major Goals: Develop non-invasive methods of monitoring disease burden in children with brain tumors.

3/1/12-3/1/13 Circulating Tumor DNA as a Biomarker for Malignant Peripheral Nerve Sheath Tumors
American Association of Neurological Surgeons/Congress of Neurological Surgeons Spine Section David Kline Peripheral Nerve Research Award
\$15,000
Role: PI; 0% Major Goals: Develop novel blood based biomarkers for patients with malignant peripheral nerve sheath tumors.

7/1/12-6/30/13 Translational molecular genetics of brain tumors
Johns Hopkins University Clinical Scholars Award
\$80,000
Role: PI, 15%

11/1/12-10/31/13 Therapeutic and Diagnostic Strategies in Oligodendroglioma.
Brain Science Institute Translational Research Grant.
\$40,000
Role: PI, 0%; Major Goals: Develop *in vitro* and animal models of oligodendroglioma to test various targeted therapeutics. In addition, develop novel biomarkers for patients with oligodendrogliomas.

1/1/13-12/31/13 The development of novel diagnostic methods for managing children with CNS tumors
Pediatric Brain Tumor Foundation; Vogelstein/Bettegowda (co-PI)
\$100,000
Role: Co-PI, 15%; Major Goals: Develop non-invasive methods of monitoring disease burden in children with brain tumors.

7/1/13-6/30/14 Translational molecular genetics of brain tumors
Johns Hopkins University Clinical Scholars Award
\$80,000
Role: PI, 15%

11/1/13-10/30/15	<p>Development of novel personalized biomarkers for individuals with chordoma. Chordoma Foundation Direct: \$125,000 Role: PI, 0%; Major Goals: Develop blood based tests to track disease burden in individuals with chordoma.</p>
1/1/14-12/31/14	<p>The development of novel diagnostic methods for managing children with CNS tumors Pediatric Brain Tumor Foundation; Vogelstein/Bettegowda (co-PI) \$100,000 Role: Co-PI, 15%; Major Goals: Develop non-invasive methods of monitoring disease burden in children with brain tumors.</p>
4/1/14-3/31/15	<p>Development of personalized biomarkers for individuals with primary spinal column neoplasms. AOSpine North America Young Investigator Research Grant. \$30,000 Role: PI, 0%; Major Goals: Develop a blood based test to measure disease burden in individuals with primary spinal column tumors.</p>
6/1/16-5/31/17	<p>Development of personalized biomarkers for individuals with primary spinal column neoplasms. AOSpine North America Young Investigator Research Grant. \$30,000 Role: PI, 0%; Major Goals: Develop a blood based test to measure disease burden in individuals with primary spinal column tumors.</p>
10/1/12-12/31/17	<p>A Prospective Multicenter Trial of Novo-TTF 100 for High Grade Glioma Novocure LTD \$123,074 Role: PI, 0%; Major Goals: Testing efficacy of alternating electrical fields for individuals with high grade glioma</p>
7/1/14-6/30/18	<p>Blood based biomarkers for hereditary cancer syndromes using neurofibromatosis 1 as a model. Doris Duke Clinical Scientist Development Award \$486,000 Role: PI, 15%; Major Goals: Develop a screening test for malignant peripheral nerve sheath tumors in individuals with Neurofibromatosis 1.</p>
9/1/16-8/31/19	<p>Provocative Question 6: Exploiting Frequent Alterations in the PRC2 Complex to Distinguish Benign Neurofibromas from Malignant Peripheral Nerve Sheath Tumors National Cancer Institute R21 \$275,000 Role: PI, 20%; Major Goals: Understand the molecular progression from benign neurofibroma to malignant peripheral nerve sheath tumor.</p>
7/1/18-3/31/20	<p>Optimized Multi-Analyte Blood Test for the Early Detection of Cancer Commonwealth Foundation \$470,000 Role: Co-PI 4%; Major Goals: Use combination of protein and DNA biomarkers for the detection of incipient tumors throughout the body.</p>
4/27/16-9/30/20	<p>A Phase 2/3 Randomized, Open-Label Study of Toca 511, a Retroviral Replicating Vector, Combined With Toca FC versus Standard of Care in Subjects Undergoing Planned Resection for Recurrent Glioblastoma or Anaplastic Astrocytoma</p>

\$1,183,461.63

Role: PI, 1.5%; Major Goals: Clinical trial testing efficacy of viral vector for treatment of recurrent high grade glioma.

- 4/1/15-3/31/19 PREMIER Study: PROspective Study on EMbolization of Intracranial AnEuRysms with Pipeline™ Embolization Device Clinical Study
Medtronic
\$93,099
Role: PI, 1.5%; Major Goals: Test the efficacy of flow diversion for the treatment of intracranial aneurysms
- 1/1/17-12/31/20 A Novel Mutation-Based Blood Test for the Earlier Detection of Cancers
Marcus Foundation
\$4,532,589
Role: Co-Investigator, 2% (PI: Vogelstein); Major Goals: 1. Detection of incipient cancers in asymptomatic individuals. 2. Detection of occult disease in patients already diagnosed with cancer.
- 3/1/16-8/31/20 Exploiting frequent alterations in PRC2 in MPNSTs for translational benefit
Department of Defense
\$575,000 Total: \$931,500
Role: PI, 15%; Major Goals: Exploit mutations in the PRC2 complex for diagnostic purposes in individuals with MPNST

CLINICAL ACTIVITIES

Clinical Focus

My clinical practice is focused on the multi-disciplinary management of individuals with brain and spinal cord tumors. I perform both open surgical procedures as well as stereotactic radiosurgery. In addition, I offer comprehensive care for patients with trigeminal neuralgia.

Certification

Licensure

2012-present Maryland, #D74560

2017-present Board Certified, Neurological Surgery

Clinical Service Responsibilities

2012-Present Attending neurosurgeon, Johns Hopkins Hospital

2012-Present Attending neurosurgeon, Johns Hopkins Hospital

2013-Present Neurosurgeon, Baltimore, VA Hospital

Clinical Productivity

Perform on average ~300 surgery and radiosurgery cases per year.

2019 RVU Productivity: 323% of budgeted amount

2018 RVU Productivity: 217% of budgeted amount

2017 RVU Productivity: 250% of budgeted amount

2016 RVU Productivity: 265% of budgeted amount

Clinical Draw from outside local/regional area

36% of operative cases are from out-of-state

Clinical Program Building / Leadership

2013-present 1st Johns Hopkins Neurosurgeon to Provide Neurosurgical Care at Maryland, VA Hospital.

2015-present Heading Johns Hopkins Brain Tumor Clinical Practice Improvement Initiative

2015-present Member Neurosurgery/Neurology Appointment and Promotions Committee

2018-present Johns Hopkins Medicine Leadership Development Program

Clinical Demonstration Activities

12/2014	Speaker, Treatment Options for Trigeminal Neuralgia, Trigeminal Neuralgia Association, Columbia, MD
10/2017	Speaker, Treatment Options for Malignant Brain Tumors, American Brain Tumor Association, Baltimore, MD
12/2017	Speaker, Treatment Options for Trigeminal Neuralgia, Trigeminal Neuralgia Association, Columbia, MD
6/2018	Speaker, Career in Medicine to High School Students, National Youth Forum, Baltimore MD
7/2018	Speaker, Career in Medicine to High School Students, National Youth Forum, Baltimore MD

EDUCATIONAL ACTIVITIES

Educational Focus

I teach students, residents and fellows in and out of the operating room on the evaluation and management of neurosurgical diseases including primary and metastatic brain and spinal tumors, trigeminal neuralgia, and intracranial trauma. I also mentor students, residents and fellows on neurosurgery related clinical outcomes research as well as laboratory based efforts studying cancer genetics. I have mentored the spectrum of trainees spanning undergraduate and medical students, as well as neurosurgical residents and fellows. I also sit on the Neurosurgery Residency review committee where we evaluate and modify our residency program to meet the evolving needs of our trainees and maintain compliance with ACGME requirements. I also initiated and oversee the CAST approved fellowship program at Johns Hopkins in neuro-oncology for neurosurgical residents.

I am also the director of the Physician Scientist Training Program. This is a School of Medicine wide initiative that is charged with providing mentorship, tools, and funding to facilitate the transition of residents and fellows to successful careers in academic medicine. Each year we select approximately 25 talented trainees to participate in the program across all clinical disciplines. Each cohort of participants is provided small group opportunities to interact with leading clinician-scientists on campus, grant writing seminars and seed funding to create pilot data for NIH grants. Since the programs inception over 100 participants have enrolled into the program.

Educational Leadership

2012 - Present	Member, Johns Hopkins Neurosurgery Residency Review Committee
2017- Present	Member, Johns Hopkins Physician Scientist Training Program Managing Board
2018 - Present	Johns Hopkins Neurosurgery Brain Tumor CAST Fellowship Co-Director
2020 - Present	Director, Physician Scientist Training Program, Johns Hopkins University School of Medicine

Teaching

Classroom Instruction

6/2013	Speaker, Medical Students, Johns Hopkins School of Medicine Neuro-Oncology Interest Group, Baltimore, MD, "My Path to Neurosurgery"
5/2017	Speaker, First Year Medical Students, Johns Hopkins School of Medicine, Baltimore, MD, "Overview of Brain Tumors in Adults"
12/2017	Speaker, Masters in Public Health, Bloomberg School of Public Health, Baltimore, MD, "Overview of Brain Tumors in Adults"
5/2018	Speaker, First Year Medical Students, Johns Hopkins School of Medicine, Baltimore, MD, "Overview of Brain Tumors in Adults"
12/2018	Speaker, Masters in Public Health, Bloomberg School of Public Health, Baltimore, MD, "Overview of Brain Tumors in Adults"
8/2019	Speaker, Fundamentals of Cancer Course, Johns Hopkins School of Medicine, Baltimore, MD, "Overview of Cancer Genetics as Illustrated by Colon Cancer"

Clinical Instruction

In the operating room, I teach all levels of students and residents the surgical management of brain and spinal cord tumors, trigeminal neuralgia, head trauma and hydrocephalus. I guide residents and students daily on the inpatient management of neurosurgical problems. Students and residents alike participate in my weekly clinic to learn the outpatient management of neurosurgical disorders. I also mentor residents to obtain knowledge on stereotactic radiosurgery and other radiation treatment regimens available for individuals with tumors of the brain and spine. In addition, I have overseen and participate in our monthly journal club seminars for the residents. I also give several

grand round lectures every year focused on educating residents on various aspects of clinical and research arenas within neuro-oncology.

CME Instruction

JHMI/Regional

- 3/05 Speaker, PhD Thesis Defense, Cellular and Molecular Medicine, Johns Hopkins University School of Medicine - "Bacteriolytic Therapy for Cancer"
- 1/07 Speaker, Neurosurgery Grand Rounds, Johns Hopkins Hospital, "Developments in the use of an Anaerobic Bacterium in the Treatment of Solid Tumors"
- 8/07 Speaker, Neurosurgery Grand Rounds, Johns Hopkins Hospital, "Brainstem Tumors"
- 4/08 Speaker, Neurosurgery Grand Rounds, Johns Hopkins Hospital, "Torticollis"
- 12/09 Speaker, Neurosurgery Grand Rounds, Johns Hopkins Hospital, "Intramedullary Spinal Cord Tumors"
- 4/10 Speaker, Neurosurgery Grand Rounds, Johns Hopkins Hospital, "Blood Based Biomarkers in Cancer"
- 4/10 Speaker, Neurosurgery Grand Rounds, Johns Hopkins Hospital, "Spinal Cord Tethering Following Myelomeningocele Repair"
- 7/10 Speaker, Neuro-Oncology Seminar, Johns Hopkins Hospital, "Blood Based Biomarkers in Cancer"
- 2/11 Speaker, Neurosurgery Grand Rounds, Johns Hopkins Hospital, "Advances in the Genetic Understanding of Medulloblastoma"
- 10/11 Speaker, Neuro-Oncology Seminar, Johns Hopkins Hospital, "Genomic Alterations in Oligodendroglioma"
- 4/12 Speaker, Helen B. Taussig Young Investigators Day Lecture, Johns Hopkins University School of Medicine, "A Proposed Genetic Basis for 1p/19q Co-Deletion In Oligodendrogliomas"
- 6/12 Speaker, Neurosurgery Grand Rounds, Johns Hopkins Hospital, "Neurosurgical Training at Johns Hopkins"
- 7/12 Speaker, Neurosurgery Grand Rounds, Johns Hopkins Hospital, "Cancer Genetics for the Neurosurgeon"
- 8/12 Speaker, Neurosurgery Grand Rounds, Johns Hopkins Hospital, "Brain Tumor Emergencies"
- 11/12 Speaker, Neurosurgery Grand Rounds, Johns Hopkins Hospital, "Biomarkers for Medulloblastoma"
- 2/13 Speaker, Medical Oncology Grand Rounds, Johns Hopkins Hospital, "Surgical Management of Spinal Metastases"
- 1/15 Speaker, Neurosurgery Grand Rounds, Johns Hopkins Hospital, "Updates in Cancer Genetics for the Neurosurgeon"
- 2/17 Speaker, Neurosurgery Grand Rounds, Johns Hopkins Hospital, "Updates in Cancer Genetics for the Neurosurgeon"
- 3/17 Speaker, Prince George's Hospital, Washington DC, "Surgical and Radiation Management of Brain and Spinal Cord Tumors"
- 4/17 Speaker, Neurosurgery Grand Rounds, Johns Hopkins Hospital, "Management of Spinal Cord Tumors"
- 10/17 Speaker, Neurosurgery Grand Rounds, Johns Hopkins Hospital, "Management of Trigeminal Neuralgia"
- 12/17 Speaker, Neurosurgery Grand Rounds, Johns Hopkins Hospital, "Updates in Neuro-Oncology"
- 4/19 Speaker, Neurosurgery Grand Rounds, Johns Hopkins Hospital, "Updates in the Biology and Management of Chordoma"

National

- 7/13 Speaker, Audience was physicians from USA, Vokkaligara Parishat of America, Chicago, IL, "Altered Mental Status – New Guidelines for Evaluation and Treatment"
- 5/15 Speaker, Audience was pathologists in New York, New York Pathological Society, New York, NY "Application of Next Generation Sequencing for the Detection of Circulating Tumor DNA"
- 5/15 Speaker, American Association of Neurological Surgeons, Washington DC, "Somatic Mutations of SUZ12 in Malignant Peripheral Nerve Sheath Tumors"
- 6/15 Speaker, 2015 Children's Tumor Foundation Neurofibromatosis Conference, Monterey, CA, "Liquid Diagnostics: Biomarkers for the Neurofibromatosis"
- 3/16 Speaker, American College of Radiation Oncology Annual Meeting, Lake Buena Vista, FL, "New Molecular Categories of Glioma: What You Need to Know to Properly Treat Your Patients Today"
- 8/16 Speaker, Methodist Hospital, Division of Thomas Jefferson Hospital, Philadelphia PA, "Surgical and Radiation Treatment Options for Brain Tumors"
- 3/18 Speaker, American Association of Neurological Surgeons Spine Section Meeting, Orlando FL, "Molecular Profiling, Detection and Targeting of Spine Tumors"

International

- 10/15 Moderator, Fourth Bologna-Budapest Spine Meeting on Tumors and Osteoporosis, Bologna, Italy
"Management of spine tumors"
- 4/16 Moderator, Global Spine Congress 2016, Dubai, UAE, "Novel technologies in spine surgery"
- 4/17 Speaker, International Precision Oncology and Experimental Therapeutics Congress, Calgary, Canada, "Can precision oncology and experimental therapeutics be carried out using liquid biopsies?"
- 8/17 Speaker, National Institute of Neuroscience and Mental Health, Bangalore, India, "Updates to the molecular classification of brain tumors"
- 8/17 Speaker, National Institute of Neuroscience and Mental Health, Bangalore, India, "Novel CSF based biomarkers for individuals with CNS tumors"
- 8/17 Speaker, Narayana Health System, Bangalore, India, "Novel CSF based biomarkers for individuals with CNS tumors"

Mentoring

Undergraduate Advisees:

- 2013-2015 Anvesh Annadanam, BS, currently: Medical Student, Johns Hopkins University
- 2013-2017 Gabriela Frid, BS, currently: Undergraduate Student, Johns Hopkins University
- 2013-2017 Ravi Gaddipati, BS, currently: Research Associate, Personal Genome Diagnostics

Pre-Doctoral Advisees:

- 2010-2011 Vivek Mehta, MD, currently: Resident, Department of Neurosurgery, University of Southern California, Los Angeles
- 2011-2012 Amit Jain, MD, currently: Assistant Professor, Department of Orthopedic Surgery, Johns Hopkins University School of Medicine
- 2011-2012 Anu Amin, MD, currently: Resident, Department of Neurosurgery, New York Medical College
- 2012-2015 Yuxuan Wang, BS, currently: Internal Medicine Resident, Johns Hopkins University School of Medicine
- 2014-2015 Joanna Wang, MD, currently: Fellow, University of Pennsylvania School of Medicine
- 2014-present Ann Liu, MD, currently: Neurosurgery Resident, Johns Hopkins University School of Medicine
- 2015-present Timour Al-Khindi, currently: MD/PhD Student, Johns Hopkins University School of Medicine
- 2015-present Eric Xe, currently: MD Student, Johns Hopkins University School of Medicine
- 2016-present Josh Cohen, BS, currently: PhD Student, Johns Hopkins University School of Medicine
- 2017-present Ashley Cook, BS, currently: PhD Student, Johns Hopkins University School of Medicine
- 2017-present Jeffrey Ehresman, currently: MD Student, Johns Hopkins University School of Medicine
- 2017-present Austin Mattox, currently: MD/PhD Student, Johns Hopkins University School of Medicine
- 2017-present Emily Hsiue, currently: PhD Student, Johns Hopkins University School of Medicine
- 2018-present Alex Pearlman, currently: MD/PhD Student, Johns Hopkins University School of Medicine
- 2019-present Maureen Rakovec, currently: MD Student, Johns Hopkins University School of Medicine
- 2019-present Joshua Materi, currently: MD Student, Johns Hopkins University School of Medicine
- 2019-present David Botros, currently: MD Student, Johns Hopkins University School of Medicine

Post-Doctoral Advisees:

- 2012-present Ming Zhang, Post-doctoral Fellow, Department of Oncology, Johns Hopkins University School of Medicine
- 2012-2015 Yuchen Jiao, MD/PhD, Department of Oncology, Johns Hopkins University, currently: Professor, National Cancer Center, Chinese Academy of Medical Sciences and Peking Union Medical College
- 2013-15 Larry Lo, MD, Neurosurgery Resident, Johns Hopkins Hospital, currently: Assistant Professor, Johns Hopkins University
- 2014-16 Rory Goodwin, MD/PhD, Neurosurgery Resident, Johns Hopkins Hospital, currently: Assistant Professor, Duke University
- 2014-2019 Karisa Schreck, MD/PhD, Neuro-oncology Fellow, Johns Hopkins Hospital/NIH, currently: Assistant Professor, Johns Hopkins University
- 2015-2018 Tomas Garzon, Neurosurgery Resident, Johns Hopkins Hospital, currently: Assistant Professor, UT Southwestern

2017-2019	Rajiv Iyer, MD, Neurosurgery Resident, Johns Hopkins Hospital, current: Fellow, Utah School of Medicine
2018-present	Christopher Douville, PhD, Post-doctoral Fellow, Johns Hopkins University School of Medicine
2018-present	Jonathan Dudley, MD, Post-doctoral Fellow, Johns Hopkins University School of Medicine
2018-present	Christina Jackson, MD, Resident, Johns Hopkins University School of Medicine
2019-present	Jordina Rancon, MD, Resident, Johns Hopkins University School of Medicine, R25 recipient
2019-present	Dimitrios Mathios, MD, Resident, Johns Hopkins University School of Medicine
2019-present	Rishing Xu, currently: Neurosurgery Resident, Johns Hopkins University School of Medicine, R25 recipient
2019-present	Suman Paul, MD, Post-doctoral Fellow, Department of Oncology, Johns Hopkins University School of Medicine

RESEARCH ACTIVITIES

My clinical research focus is based on understanding how neurosurgical interventions alter patient outcomes. My laboratory based research is focused on understanding the genetic basis of central nervous system tumors and applying that knowledge for clinical benefit. We have discovered several of the pivotal genes involved in a myriad of CNS cancers, including *CIC/FUBP1* in oligodendroglioma, *hTERT* for GBM, *SUZ12* in malignant peripheral nerve sheath tumors and *DMD* in olfactory neuroblastoma. We are also actively interested in translating these genetic discoveries for diagnostic benefit by developing sensitive PCR based assays capable of detecting released tumor DNA in the circulation and a variety of biofluids such as cerebrospinal fluid, saliva and pap smears.

Research Program Building/Leadership

Scientific Lead for AOSpine Tumor Knowledge Forum – non-profit organization aimed at disseminating knowledge on the diagnosis and management of spinal tumors worldwide. We have been able to develop an international network of collaborators to study rare spinal neoplasms, which has resulted in discovering a link between germline and somatic variants and outcomes for individuals with chordoma.

I am also the co-chair of the biomarker committee for the Response Evaluation in Neurofibromatosis and Schwannomatosis International Collaboration (REiNS) consortium. REiNS is an international network of physicians, researchers and patient advocates dedicated to generating guidelines for the management of individuals with neurofibromatosis (NF). As a part of this multi-national group, we are developing consensus statements on how to best treat and monitor individuals with NF.

Inventions, Patents, Copyrights

5/05	United States Patent WO2005039491A2, “Improved Combination Bacteriolytic Therapy for the Treatment of Tumors”
3/08	United States Patent US7344710, “Combination Bacteriolytic Therapy for the Treatment of Tumors”
5/12	United States Patent US 11/629,607, “Imaging Infection with Compounds that Bind to Thymidine Kinase”
07/12	United States Provisional Patent US14/233,296, “Oligodendroglioma driver genes”
9/12	United States Provisional Patent US14/347,463, “Methods and composition for detecting infections”
4/15	United States Provisional Patent US14/439,041, “Papanicolaou Test for Ovarian and Endometrial Cancers”
7/15	United States Provisional Patent US62/192,424, “Detection of Tumor-Derived DNA in Cerebrospinal Fluid”
8/15	United States Provisional Patent US14/765,692, “TERT Promoter Mutations in Gliomas and a Subset of Tumors”
1/19	United States Patent US15/071,800, “Use of the ZMIZ1 Marker in Directing Treatment and Predicting Survival in Cancer”

SYSTEM INNOVATION AND QUALITY IMPROVEMENT ACTIVITIES

System Innovation Focus

I am focused on improving health delivery for our patients with brain tumors. In particular I am interested in improving safety and satisfaction in those individuals undergoing a craniotomy for resection of a brain tumor. With our new pathway to identify patients at risk for entering rehabilitation, we have been able to reduce length of stay by

an average of 1 day for brain tumor patients. In my role as the departmental physician advisor I actively participate and lead both departmental and institution wide initiatives to improve patient safety and increase value of care delivered. For example, based on our efforts we have had significant reductions in the number of falls on the inpatient service, reduced catheter associated infection, diminished the number of patients that are emergently transferred to the intensive care unit from an inpatient floor and reduced medication associated expenses associated with transfer of care of patients. These initiatives were all executed through multi-disciplinary efforts over months that included nursing, pharmacy, physicians from numerous specialties and administrators.

System Innovation and Quality Improvement Efforts within JHMI:

2013-present Working with neuropathology and neurosurgery to develop streamline tumor banking protocol.
2015-present Physician lead for Johns Hopkins Brain Tumor Clinical Community
2018-present Department of Neurosurgery Physician Advisor

ORGANIZATIONAL ACTIVITIES

Institutional Administrative Appointments

2016-present Director of Johns Hopkins Meningioma Center
2018-present Physician Advisor, Department of Neurosurgery
2020-present Director, Physician Scientist Training Program

Editorial Activities

Editorial Board Appointments:

2015-2018 *Annals of Surgical Oncology*, Editorial Board Member
2015-present *Operative Neurosurgery*, Editorial Board Member

Journal Peer Review Activities

2009-present *Molecular Imaging*, Ad Hoc Reviewer
2010-present *Neurosurgery*, Ad Hoc Reviewer
2011-present *International Journal of Medical Microbiology*, Ad Hoc Reviewer
2012-present *Annals of Surgical Oncology*, Ad Hoc Reviewer
2012-present *Journal of Neurosurgery*, Ad Hoc Reviewer
2012-present *Neurosurgery*, Ad Hoc Reviewer
2013-present *Child's Nervous System*, Ad Hoc Reviewer
2013-present *Science*, Ad Hoc Reviewer
2013-present *Cancer Research*, Ad Hoc Reviewer
2014-present *Nature Communications*, Ad Hoc Reviewer
2014-present *Oncotarget*, Ad Hoc Reviewer
2015-present *Clinical Cancer Research*, Ad Hoc Reviewer
2015-present *Neuro-oncology*, Ad Hoc Reviewer
2015-present *Journal of Neuro-Oncology*, Ad Hoc Reviewer
2016-present *New England Journal of Medicine*, Ad Hoc Reviewer

Professional Societies

2006-Present American Association of Neurological Surgeons (AANS)
2011-Present American Association of Cancer Researchers
2014-Present Congress of Neurological Surgeons (CNS)
2019-Present American Society of Clinical Investigators

Advisory Committees, Review Groups/Study Sections

2008-2010 Elected to Young Neurosurgeons Committee (YNC) of AANS
2011 YNC liaison to the Tumor Section of AANS
2012-2013 Associate Scientific Advisor, Science Translational Medicine
2012-present AO Spine Tumor Knowledge Forum Steering Committee
2017-present ECOG-ACRIN Biomarker Steering Committee
2017-present Response Evaluation in Neurofibromatosis and Schwannomatosis International Collaboration (REiNS), co-Chair Biomarkers Subgroup
2018-present Scientific Board Member, B*Cured Foundation

- 2019 Reviewer, R21 Program, NIH Center for Scientific Review, Washington DC, Feb 6, 2018.
- 2019 Reviewer, R21 Program, NIH Center for Scientific Review, Washington DC, Feb 5, 2019.
- 2019 Reviewer, B*Cured Foundation Funding Program, Baltimore MD, May 6, 2019
- 2019 Reviewer, Doris Duke Charitable Foundation, Clinician Scientist Development Award, May 17, 2019
- 2019 Reviewer, U01 Program, NIH Center for Scientific Review, Washington DC, July 2, 2019
- 2020 Reviewer, Imaging Grants, NIH Center for Scientific Review, Washington DC, July 15, 2020

Conference Organizer

National

- 9/16 Tumor Satellite Meeting, Congress of Neurological Surgeons, San Diego CA

Session Chair

National

- 11/13 Circulating Nucleic Acids in Plasma and Serum Meeting, Baltimore MD, “Legal, Regulatory and Clinical Considerations of CNAPS”.
- 8/14 Next Generation Diagnostics Summit, Washington DC, “Applications of Cell Free Tumor DNA in the Clinic”
- 11/18 Society of Neuro-Oncology, Sunrise Session Chair, “Liquid Biopsies for Brain Tumors”

International

- 5/15 Session on Spinal Oncology, Global Spine Congress 2015, Buenos Aires, Argentina
- 5/18 Course Director, Essentials of Spinal Oncology, Global Spine Congress 2018, Singapore
- 9/19 Session on Thymic Cancers, Advances in Thoracic Surgery, Oncology and Pulmonology (ATSOP) Workshop and Congress, Singapore

RECOGNITION

Awards, Honors

- 1994 Benjamin N. Duke Scholarship: Full scholarship given to 5-10 top students from North and South Carolina
- 1994 Watson IBM Scholarship for Scholastic Excellence: Annual award given for academic achievement to students who are children of IBM employees
- 2005 Alpha Omega Honor Society, Johns Hopkins University School of Medicine
- 2005 Oncology Fellows Research Award: First place for translational research in oncology, Johns Hopkins University School of Medicine
- 2005 Hunterian Neurosurgery Research Award, Johns Hopkins University School of Medicine
- 2008 Sherman Award for Neurosurgery Resident Achievement, Johns Hopkins University School of Medicine
- 2009 American Brain Tumor Associate Research Fellowship
- 2011 Harvey Cushing Award for Neurosurgery Research Excellence, Johns Hopkins University School of Medicine
- 2012 David Kline Research Award, AANS/ CNS Spine Section
- 2012 Helen B. Taussig Award, Given for Most Outstanding Research by Post-Doctoral Fellow, Johns Hopkins University School of Medicine
- 2012 Richard S. Ross Clinician Scientist Award Recipient, given annually to the applicant with the best application, Johns Hopkins University School of Medicine
- 2012 Irving Sherman Travel Award, Johns Hopkins University School of Medicine
- 2012 Genome Technology’s Seventh Annual “Tomorrow’s PI’s”; Given to Most Promising Young Investigators in the Country
- 2015 Sanford Larson Award for Best Peripheral Nerve/Spine Paper, AANS
- 2016 Reinhoff Scholar Award
- 2017 American Association of Cancer Researchers, Team Science Award for “Liquid biopsies”
- 2019 American Society for Clinical Investigators
- 2019 Visiting Scholar, NCI Neuro-oncology Branch
- 2020 Best Doctors, Baltimore Magazine

Invited Talks, Panels

JHMI/Regional

- 9/12 Moderator, Audience was neuro-oncology clinicians and researchers from around world, Basic Science Session, 11th Annual International Neuro-Oncology Update, Baltimore MD
- 9/12 Speaker, Audience was neuro-oncology clinicians and researchers from around world, 11th Annual International Neuro-Oncology Updates, Baltimore, MD
- 3/13 Speaker, Neuro-Oncology Research Conference, Johns Hopkins Hospital, “Molecular Classification of Brain Tumors”
- 10/13 Speaker, Translational Research Conference, Johns Hopkins Oncology Center, Baltimore, MD, “Blood based biomarkers for the detection and monitoring of human malignancies”
- 1/14 Speaker, Clinical Neurosciences Seminar, Baltimore MD. “Circulating Tumor DNA as a Biomarker for Human Malignancies”.
- 2/15 Speaker, NCCU Lecture Series, Johns Hopkins Hospital; “Circulating Tumor DNA as a Biomarker for Solid Malignancies”.
- 2/15 Speaker, Inaugural Indo-US Translational Neuroscience Symposium, Baltimore MD; “Cell Free Tumor DNA for the Management of Central Nervous System Tumors”
- 6/16 Speaker, Assistant Professors Series; “Translating our Genetic Understanding of Cancer into Personalized Biomarkers”
- 8/16 Speaker, Radiation Oncology Resident Research Seminar, “Management of Malignant Gliomas”
- 3/17 Speaker, Neuroscience in Intensive Care International Symposium, Washington DC, “Towards a Molecular Taxonomy for Cancer”
- 11/17 Speaker, A Woman’s Journey, Baltimore, MD, “Liquid biopsy for cancer”
- 2/19 Speaker, National Cancer Institute, Bethesda, MD, “CSF Based Liquid Biopsies for CNS Tumors”
- 2/19 Speaker, NCI Pancreatic Cancer Consortium Meeting, Bethesda MD, “Early Detection Strategies in Pancreatic Cancer”
- 5/19 Speaker, Annual Health Care Journalism Meeting, Baltimore MD, “Treatment and Advances in Brain Tumors”
- 5/19 Speaker, Plastic Surgery Research Council Annual Meeting, Baltimore MD, “Circulating Tumor DNA as a Biomarker in Human Malignancies”
- 8/19 Speaker, Washington, DC, Next Generation Diagnostic Summit, “CSF Tumor DNA for the Detection and Monitoring of Central Nervous System Cancers

National

- 3/04 Speaker, American Association of Cancer Researchers National Meeting, “Bacteriolytic Therapy for treatment of Solid Malignancies”
- 12/08 Speaker, Pediatric Section of American Association of Neurosurgeons, “Choroid Plexus Tumors: A 20 Year Institutional Experience”
- 3/11 Speaker, Neurosurgery Grand Rounds, Emory University, “Circulating Tumor DNA as a Personalized Biomarker for Patients with Solid Tumor”
- 12/11 Speaker, Department of Neuro-Oncology, Moffitt Cancer Center, “Translating Genomics into Personalized Biomarkers”; “Circulating Tumor DNA as Blood Based Biomarkers in Patients with Solid Tumors”
- 10/12 Speaker, 11th Annual Frye Halloran Brain Tumor Symposium, Massachusetts General Hospital, Boston MA, “CIC Mutations in Oligodendrogliomas”
- 1/13 Speaker, Low Grade Glioma Meeting, San Francisco, CA, “Molecular Classification of Low Grade Gliomas”
- 3/13 Speaker, Chordoma Foundation Biannual Workshop, Boston, MA, “AOSpine Tumor Biobanking”
- 3/13 Speaker, Chordoma Foundation Biannual Workshop, Boston, MA, “*C. novyi-NT* Cancer Therapeutic”
- 5/13 Speaker, Pediatric Brain Tumor Foundation Annual Meeting, Ft. Lauderdale, FL, “Novel Diagnostics Methods for Children with Brain Tumors”
- 5/13 Speaker, Pediatric Brain Tumor Foundation Annual Meeting, Ft. Lauderdale, FL, “Hot Topics in Pediatric Neuro-Oncology”
- 9/13 Speaker, Accelerate Brain Cancer Cure and National Cancer Institute Meeting on Glioblastoma. Washington DC, “Breakout Session Summary on Genomic Medicine to Advance Glioblastoma”
- 2/14 Speaker, Association for Collaborative Spine Research. San Diego, CA. “Prognostic Significance of T Gene snp2305089 in Individuals with Spinal Column Chordoma”.

- 2/14 Speaker, Association for Collaborative Spine Research. San Diego, CA. “Aneurysmal Bone Cysts of the Spine: Treatment Options and Considerations”.
- 3/14 Speaker, American Association of Neurological Surgeons/Congress of Neurological Surgeons Spine Section Meeting. Orlando, FL. “Circulating Tumor DNA as a Biomarker for Malignant Peripheral Nerve Sheath Tumors”.
- 5/14 Speaker, Pediatric Brain Tumor Foundation Annual Meeting, San Antonio, TX, “Development of Novel Personalized Biomarkers for Individuals with Brain Tumors”.
- 7/14 Speaker, 20th International Meeting on Brain Tumor Research and Therapy, Lake Tahoe NV, “Detection of circulating tumor DNA in early and late stage human malignancies”.
- 8/14 Speaker, 2014 Next Generation Diagnostic Summit, Washington, DC, “Detection of circulating tumor DNA in early and late stage human malignancies”.
- 12/14 Speaker, Biomed Valley Discoveries Investigator Meeting, Kansas City, KS, “Future Clinical Trials for *Clostridium noyi*-NT”.
- 2/15 Speaker, Invited Guest Lecture at Illumina, San Diego, CA, “Detection of Cell Free Tumor Derived DNA in Human Malignancies”.
- 2/15 Speaker, Pathology Grand Rounds, City of Hope Cancer Center, Los Angeles, CA, “Detection of Cell Free Tumor Derived DNA in Human Malignancies”.
- 2/15 Keynote Speaker, 2015 Molecular Medicine Tri-Conference, Circulating Cell-Free DNA Meeting, San Francisco, CA, “Detection of Circulating Tumor DNA in Early and Late Stage Human Malignancies”.
- 4/15 Speaker, Annual Doris Duke Clinician Scientist Awardee Meeting, Chicago, IL, “Somatic Mutations of SUZ12 in Malignant Peripheral Nerve Sheath Tumors”
- 4/15 Speaker, Neurosurgical Society of America, Newport Beach, CA. “Prognostic Significance of the T gene SNP rs2305089 in Individuals with Spinal Column Chordoma”
- 5/15 Speaker, Association for Collaborative Spine Research Meeting, Miami, FL, “Molecular Projects in Spinal Oncology”
- 6/15 Speaker, 2015 Children’s Tumor Foundation Neurofibromatosis Conference, Monterey, CA, “Liquid Diagnostics: Biomarkers for the Neurofibromatoses”
- 8/15 Speaker, 2015 Next Generation Diagnostic Summit, Washington DC, “Plasma Based Detection of Tumor Derived DNA in Human Malignancies”
- 4/16 Speaker, A Woman’s Journey, Sarasota, FL, “Liquid biopsy for cancer”
- 4/16 Speaker, A Woman’s Journey, St. Petersburg, FL, “Liquid biopsy for cancer”
- 4/16 Speaker, A Woman’s Journey, Tampa, FL, “Liquid biopsy for cancer”
- 7/16 Speaker, Chordoma Foundation Meeting, Boston MA, “Use of Circulating Tumor DNA as a Biomarker for Individuals with Chordoma”
- 7/16 Speaker, 2nd qPCR and Digital PCR Congress, Philadelphia PA, “Tumor Derived Cell Free DNA as a Diagnostic Tool for Human Malignancies”
- 9/16 Speaker, AANS/CNS Tumor Satellite Symposium, San Diego CA, Tumor Derived DNA in the CSF as a Biomarker for CNS Neoplasms
- 10/16 Panelist, Cowen and Company 5th Annual MedTools Unlocked Conference, New York, NY, “Liquid Biopsy & Beyond – Emerging Tools for Cancer Screening and Management”
- 2/17 Visiting Professor, Weill-Cornell University School of Medicine, New York, NY, “Tumor Derived DNA as a Biomarker for Individuals with Cancer”.
- 2/17 Speaker, Molecular Medicine Tri-Conference, San Francisco CA, “Tumor Derived DNA as a Diagnostic Tool for Human Malignancies”
- 2/17 Speaker, A Woman’s Journey, Naples, FL, “Liquid biopsy for cancer”
- 7/17 Speaker, 3rd qPCR and Digital PCR Congress, Philadelphia PA, “Tumor Derived Cell Free DNA as a Diagnostic Tool for Human Malignancies”
- 9/17 Speaker, Ian’s Friends Foundation Meeting, Atlanta, GA, “Development of novel diagnostic strategies for children”
- 10/17 Speaker, ECOG-ACRIN 2017 Annual Meeting, Orlando FL, “Circulating Tumor DNA: Current Technology and Applications to Colon Cancer
- 10/17 Speaker, ECOG-ACRIN 2017 Annual Meeting, Orlando FL, “Liquid Biopsy Applications for Brain Tumors”
- 12/17 Speaker, Neuro-Oncology Grand Rounds, Moffitt Cancer Center, Tampa, FL, “Liquid Biopsy Approaches in the Management of Human Cancers”

- 2/18 Speaker, Molecular Medicine Tri-Conference, San Francisco CA, “Tumor Derived DNA as a Diagnostic Tool for Human Malignancies”
- 3/18 Speaker, Spine Summit, Orlando FL, “Molecular Profiling, Detection and Targeting of Spine Tumors”
- 6/18 Speaker, Neurosurgical Society of America, Jackson Hole, WY, “TERT Promoter Mutations in Primary Spinal Column Sarcomas”
- 11/18 Speaker, MD Anderson Distinguished Seminar Series, Houston, TX “Multi-analyte Tests for the Detection and Monitoring of Cancers”.
- 11/18 Speaker, Society for Neuro-oncology, New Orleans, LA, “CSF Based Liquid Biopsies for Brain Tumors”.
- 3/19 Speaker, Molecular Medicine Tri-Conference, San Francisco CA, “Multi-analyte Assays for the Detection and Monitoring of Cancers”
- 4/19 Speaker, EDP Summit, Boston, MA, “Cancer-Seek, A Multi-Analyte Blood Test for the Earlier Detection of Cancers”
- 6/19 Speaker, Wyss Family Think Tank, Columbus, OH, “Released Tumor DNA to Detect and Monitor Cancers”
- 11/19 Speaker, Fifth Neuroplastic Surgery Symposium, Boston MA, “Ultrasound Modulation of Blood Brain Barrier”
- 11/19 Speaker, Society for Neuro-oncology, Phoenix AZ, “Released Tumor DNA for the Management of CNS Tumors”
- 2/20 Speaker, Neuro-Oncology and RNA Biology Symposium, St. Petersburg FL, “Tumor Derived DNA as a Biomarker for Cancer”
- 4/20 Speaker, American Neurological Association Webinar, “Pivoting to Covid-19 Research”
- 9/20 Speaker, NCI Cancer Diagnosis Program, “Translating Our Genetic Understanding of Brain Tumors For Diagnostic Benefit”
- 11/20 Speaker, Society for Neuro-Oncology, Virtual, Panelist for Liquid Biopsy Approaches for CNS Malignancies

International

- 7/10 Speaker, 9th International Meeting, Updates in Neuro-Oncology Brain Tumor Symposium, Tuscany Italy; “Blood Based Biomarkers, Applications to Neuro-Oncology.”
- 6/11 Speaker, Labatt Brain Tumour Research Centre Guest Lecture, University of Toronto, “Translating Genomics into Personalized Biomarkers”
- 3/12 Speaker, AO Spine Knowledge Forum Steering Committee, “Spinal Tumor Biobanking”, Banff Canada
- 9/12 Speaker, 2nd Annual Bologna-Budapest Spine Meeting, Budapest, Hungary, “Genetics of Primary Spinal Column Tumors”
- 6/14 Speaker, Neurosurgical Society of America, St. Andrews, New Brunswick Canada, Speaker, “Translational molecular profiling of oligodendrogliomas”.
- 6/14 Speaker, Neurosurgical Society of America, St. Andrews, New Brunswick Canada, “The promise of personalized cancer care”.
- 4/15 Speaker, AOSpine North America Fellows Forum, Banff, Canada, “Circulating Tumor DNA for the Detection of Spinal Malignancies”
- 5/15 Speaker, Global Spine Congress 2015, Buenos Aires Argentina, “Prognostic significance of T gene SNP rs2305089 in individuals with spinal column chordoma”.
- 5/15 Speaker, Global Spine Congress 2015, Buenos Aires Argentina, “Outcomes following surgical intervention for impending and gross instability caused by multiple myeloma in the spinal column”.
- 10/15 Speaker, 4th Bologna-Budapest Spine Meeting on Tumors and Osteoporosis, Bologna, Italy, “Molecular studies associated with primary and metastatic lesions”
- 10/15 Speaker, 4th Bologna-Budapest Spine Meeting on Tumors and Osteoporosis, Bologna, Italy, “Multidisciplinary management of spine metastases, to reduce morbidity and improve outcomes
- 4/16 Speaker, Global Spine Congress 2016, Dubai, UAE, “Clinical Decision Making: Integrating Advances in the Molecular Understanding of Primary Spine and Metastatic Tumors”
- 11/17 Speaker, Liquid Biopsies for next-generation diagnostics, Uppsala, Sweden, “Circulating Tumor DNA as a Biomarker for Human Cancers”
- 5/18 Speaker, Global Spine Congress 2018, Singapore, “Treatment of Intradural Spinal Tumors”
- 6/18 Speaker, American Society of Neuro-Radiology, Vancouver Canada, “Why I need fMRI: Neurosurgeon’s perspective”.

- 11/18 Speaker, Seventh Annual BMB Spine Meeting, Milan, Italy, “The Molecular Features of Spine Tumors and their Therapeutic Relevance”.
- 12/18 Speaker, EMBL-EBI Liquid Biopsy Conference, Cambridge, UK. “Multi-Analyte Tests for the Detection and Monitoring of Cancers”
- 6/19 Speaker, Neurosurgical Society of America, Banff, Canada. “Genomic Analysis Identifies Frequent Deletions of dystrophin in olfactory neuroblastoma”
- 9/19 Speaker, Advances in Thoracic Surgery, Oncology and Pulmonology (ATSOP) Workshop and Congress, Singapore, “Circulating Tumor DNA Applications for Lung Cancer”
- 9/19 Speaker, Advances in Thoracic Surgery, Oncology and Pulmonology (ATSOP) Workshop and Congress, Singapore, “Towards Molecular Surgery for Lung Cancer”
- 11/19 Speaker, FolkHalsan Research Center Symposium, Helsinki, Norway “Multi-Analyte Tests for the Diagnosis and Management of Cancers”,
- 11/19 Speaker, BMB Spine Meeting, Basel, Switzerland, “Targeted Therapies and Their Relevance to Spine Surgeons”
- 11/20 Speaker, 7th International Focused Ultrasound Symposium, “Focused Ultrasound and Liquid Biopsy in Brain Tumors: A Critical Role for the Blood Brain Barrier?”

OTHER PROFESSIONAL ACCOMPLISHMENTS

Posters

- 1997 Levin ED, **Bettegowda C**. Nicotinic NMDA interactions with working and reference memory. Soc Neurosci. 1997; 23: 216
- 1998 Levin ED, **Bettegowda C et al.** AR-R 17779, an $\alpha 7$ nicotinic agonist improves learning and memory in rats. Soc Neurosci. 1998;24: 183
- 2000 Haroun R, **Bettegowda C**, Li K and Brem H. Effects of Col-3, an anti-angiogenesis agent on rat brain endothelial cell proliferation. Am Assoc Neurolog Surgeons. San Francisco, CA
- 2000 Haroun R, Li K, **Bettegowda C**, Crumpler E, Landa J and Brem H. *In vivo* toxicity study of topoisomerase II inhibitor 9-chloro-2-methyl-ellipticinium acetate via local intracranial delivery. Am Assoc Neurolog Surgeons. San Francisco, CA
- 12/09 Mehta V, **Bettegowda C**, Jallo G. Intramedullary tumoral calcinosis. Am Assoc Neurolog Surgeons, Section on Pediatric Neurosurgery.
- 12/09 Mehta V, **Bettegowda C**, Jallo G. Intramedullary tumoral calcinosis. AANS/CNS Section on Pediatric Neurosurgery
- 10/10 Mehta V, **Bettegowda C**, Jallo G, Ahn E. Impact of tethered cord release on symptoms of Chiari II malformation in children born with a myelomeningocele. Congress of Neurological Surgeons Annual Meeting, San Francisco, CA
- 10/11 Ononiwu C, Mehta V, **Bettegowda C**, Jallo G. Pediatric Spinal Glioblastoma Multiforme. Congress of Neurological Surgeons Annual Meeting. Washington, DC
- 4/13 Fisher C, Boriani S, Varga PP, Rhines LD, Bilsky MH, Dekutoski MB, Fehlings MG, Reynolds JJ, Williams RP, Chou D, Berven S, Quraishi NA, **Bettegowda C**, Gokaslan ZL. A novel model for rare and often neglected neoplastic conditions. *Global Spine Congress 2013*, Hong Kong
- 3/14 Lo L, Puvanesarajah V, Germscheid N, Chou D, Fisher C, Rhines LD, Williams RP, Boriani S, Gokaslan ZL, **Bettegowda C**. Aneurysmal Bone Cysts Of The Spine: Treatment Options And Considerations. AANS/CNS Section on Disorders of the Spine and Peripheral Nerves Annual Meeting. Orlando, FL
- 4/14 **Bettegowda C**, Sausen M, Leary R, Kinde I, Agrawal N, Bartlett B, Wang H, Lubner B, Kinzler K, Vogelstein B, Papadopoulos N, Diaz L. Detection of circulating tumor DNA in early and late stage human malignancies. American Association of Cancer Researchers
- 4/14 Varga, P, Fisher C, Rhines L, Gokaslan Z, Boriani S, Lazaray A, Wang WL, Germscheid N, Yip S, **Bettegowda C**. Prognostic significance of T gene SNP rs2305089 in Individuals with Spinal Column Chordoma. American Association of Cancer Researchers
- 4/14 Fisher CG, Versteeg A, Boriani S, Varga PP, Dekutoski MB, Gokaslan ZL, Williams RP, Reynolds JJ, Fehlings MG, **Bettegowda C**, Kawahara N, Rhines LD. Chondrosarcomas of the spine: prognostic variables for local recurrence and mortality in a multicenter study. 82nd American Association of Neurological Surgeons Annual Scientific Meeting, San Francisco, CA
- 4/14 Rhines LD, Dirks MS, Boriani S, Luzzati A, Fehlings MG, Fisher CG, Dekutoski MB, Williams R, Quraishi NA, Gokaslan ZL, **Bettegowda C**, Kawahara N, Varga PP. Ewing’s sarcoma of the spine: prognostic

- variables for recurrence and survival in surgically treated patients. 82nd American Association of Neurological Surgeons Annual Scientific Meeting, San Francisco, CA
- 4/14 Quraishi NA, Boriani S, Varga P, Luzzati A, Gokaslan ZL, Fehlings MG, Fisher C, Dekutoski M, Rhines L, Reynolds J, **Bettegowda C**, Kawahara N, Williams R. A multi-center retrospective cohort study of spinal osteoid osteomas: surgical treatment and local recurrence results. 82nd American Association of Neurological Surgeons Annual Scientific Meeting, San Francisco, CA
- 4/14 Varga PP, Macki M, Bydon M, Boriani S, Fisher CG, Rhines LD, Chou D, Luzzati A, Reynolds JJ, Kawahara N, **Bettegowda C**, Sciubba D, Wolinsky JP, Gokaslan ZL. Long-term outcomes in primary spinal osteochondroma: a multicenter center study of 27 patients. 82nd American Association of Neurological Surgeons Annual Scientific Meeting, San Francisco, CA, USA
- 4/14 Zamorano JJ, Fehlings M, Nater A, Tetreault L, Varga P, Gokaslan Z, Boriani S, Fisher C, Rhines L, **Bettegowda C**, Kawahara N, Chou D. Local recurrence risk factors after surgical resection of spine schwannomas: analysis of 169 patients from a multicenter international database. 82nd American Association of Neurological Surgeons Annual. San Francisco, CA
- 4/14 Quraishi NA, Boriani S, Varga P, Luzzati A, Gokaslan ZL, Fehlings MG, Fisher C, Dekutoski M, Rhines L, Reynolds J, **Bettegowda C**, Kawahara N, Williams R. A multi-center retrospective cohort study of spinal osteoid osteomas: surgical treatment and local re-currence results. BritSpine, Warwick, U.K.
- 5/15 Clarke M, Molina C, Fournay D, Fisher C, Gokaslan Z, Schmidt M, Rhines L, Fehlings M, Laufer I, Patel S, Rampersaud R, Reynolds J, Chou D, **Bettegowda C**, Mendel E, Weber M, Sciubba D. Systematic Review of Surgical Treatment Outcomes of Prostate Metastases to the Spine. *Global Spine Congress 2015*, Buenos Aires, Argentina

Podium Presentations

- 10/07 Than KD, Woodworth GF, **Bettegowda C**, Mccirt MJ, Jallo GI, Rigamonti D. Adolescent Age Is An Independent Predictor Of Improved Outcome Following Endoscopic Third Ventriculostomy For The Treatment Of Hydrocephalus Congress of Neurological Surgeons Annual Meeting. San Diego CA
- 10/09 Liauw J, Hoang S, **Bettegowda C**, Frazier JL, Mccirt MJ, Lim M. Glomus Jugulare Tumors: Radiosurgical Treatment And Outcomes. Congress Of Neurological Surgeons Annual Meeting. New Orleans, LA
- 2/13 **Fisher C**, Boriani S, Varga P, Fehlings M, Bilsky M, Dekutoski M, Luzzati A, Williams R, Berven S, Chou D, Quraishi N, Rhines L, **Bettegowda C**, Gokaslan Z. A novel scientific model for rare and often neglected neoplastic conditions. 13th Annual Scientific Conference of the Canadian Spine Society, Mont-Tremblant, QC, Canada
- 3/13 Fisher C, Goldschlager T, Boriani S, Varga P, Fehlings MG, Bilsky M, Dekutoski M, Luzzati A, Williams R, Berven S, Chou D, Quraishi N, Rhines L, **Bettegowda C**, Gokaslan Z. A novel scientific model for rare and often neglected neoplastic conditions. 11th Annual AOSpine North America Fellows Forum, Banff, AB, Canada
- 5/13 Fisher C, Boriani S, Varga PP, Fehlings M, Bilsky M, Dekutoski M, Luzzati A, Williams R, Berven S, Chou D, Reynolds J, Quraishi N, Rhines L, **Bettegowda C**, Gokaslan Z. A novel evidence based model for rare and often neglected neoplastic conditions. Third Charite Spine Tumor Days, Berlin Germany
- 7/13 Fisher C, Fehlings M, Bilsky M, Dekutoski M, Luzzati A, Williams R, Berven S, Quraishi N, Rhines L, **Bettegowda C**, Gokaslan Z. A novel scientific model for rare and often neglected neoplastic conditions: AOSpine knowledge forum tumor international dataset for primary tumors of the spine. 20th International Meeting on Advanced Spine Techniques, Vancouver, BC, Canada
- 10/13 Reynolds J, Fisher C, Boriani S, Varga PP, Fehlings MG, Bilsky MH, Dekutoski MB, Rhines L, **Bettegowda C**, Gokaslan Z. A novel scientific model for rare and often neglected neoplastic conditions. EuroSpine 2013, Liverpool, UK
- 10/13 Fisher C, Boriani S, Varga PP, Fehlings MG, Bilsky MH, Dekutoski MB, Williams RP, Berven SH, Chou D, Reynolds JJ, Quraishi NA, Rhines LD, **Bettegowda C**, Gokaslan ZL. A novel scientific model for rare and often neglected neoplastic conditions: AOSpine International Knowledge Forum Tumor database for primary tumors of the spine. North American Spine Society (NASS) 28th Annual Meeting, New Orleans, LA
- 1/14 Varga P, Macki M, Bydon M, Sciubba D, Wolinsky JP, Boriani S, **Bettegowda C**, Chou D, Fisher CG, Luzzati A, Reynolds JJ, Germscheid NM, Zadnik P, Rhines LD, Gokaslan ZL, AOSpine Knowledge Forum Tumor. Long-term outcomes in primary, spinal osteochondroma: a multicenter study of 27 patients. Association for Collaborative Spine Research Meeting, San Diego, CA

- 1/14 Fisher CG, Boriani S, Varga PP, Rhines LD, Bilsky MH, Dekutoski MB, Fehlings MG, Reynolds J, Williams R, Chou D, Quraishi NA, **Bettegowda C**, Gokaslan ZL, AOSpine Knowledge Forum Tumor. The new frontier for research and management of primary tumors of the spine. Association for Collaborative Spine Research Meeting, San Diego, CA
- 2/14 Goldstein C, Varga P, Gokaslan Z, Boriani S, Luzzati A, Williams R, Rhines L, Fisher C, Chou D, Dekutoski M, Quraishi N, **Bettegowda C**, Kawahara N, Fehlings M. Hemangiomas of the spine: results of surgical management and prognostic variables for local recurrence and mortality in a multicenter study. Combined meeting with the Canadian Spine Society and the New Zealand Spine Society 2014, Lake Louise, AB, Canada
- 2/14 Fehlings M, Zamorano JJ, Nater A, Tetreault L, Varga P, Gokaslan Z, Boriani S, Fisher C, Rhines L, **Bettegowda C**, Kawahara N, Chou D. Local recurrence risk factors after surgical resection of spine schwannomas: analysis of 169 patients from a multicenter international database. Combined meeting with the Canadian Spine Society and the New Zealand Spine Society 2014, Lake Louise, AB, Canada
- 2/14 Goldstein C, Varga P, Gokaslan Z, Boriani S, Luzzati A, Williams R, Rhines L, Fisher C, Chou D, Dekutoski M, Quraishi N, **Bettegowda C**, Kawahara N, Fehlings M. Hemangiomas of the spine: results of surgical management and prognostic variables for local recurrence and mortality in a multicenter study. Combined meeting with the Canadian Spine Society and the New Zealand Spine Society 2014, Lake Louise, AB, Canada
- 2/14 Fisher CG, Versteeg A, Boriani S, Varga PP, Dekutoski MB, Gokaslan ZL, Williams RP, Reynolds JJ, Fehlings MG, **Bettegowda C**, Kawahara N, Rhines LD. Chondrosarcomas of the spine: prognostic variables for local recurrence and mortality in a multicenter study. Combined meeting with the Canadian Spine Society and the New Zealand Spine Society 2014, Lake Louise, AB, Canada
- 3/14 Goldstein CL, Varga P, Gokaslan ZL, Boriani S, Luzzati A, Williams RP, Rhines LD, Fisher C, Chou D, Dekutoski MD, Quraishi NA, **Bettegowda C**, Kawahara N, Fehlings MG. Hemangiomas Of The Spine: Results Of Surgical Management And Prognostic Variables For Local Recurrence And Mortality In A Multicenter Study. AANS/CNS Section On Disorders Of The Spine And Peripheral Nerves Annual Meeting. Orlando, FL
- 3/14 Sciubba DM, Mcloughlin GS, McGirt MJ, **Bettegowda C**, Jagannathan J, Fourney DR, Gokaslan ZL, Wolinsky JP, Witham TF. Postoperative Infection Of The Instrumented Spine: A Review Of 1,332 Procedures Over 5 Years. AANS/CNS Section On Disorders Of The Spine And Peripheral Nerves Annual Meeting. Phoenix, AZ
- 3/14 Puvanesarajah V, Lo L, Liauw J, **Bettegowda C**, Sciubba DM, Wolinsky JP, Gokaslan ZL, Rigamonti D, Redmond K, Kleinberg L, Lim M. Johns Hopkins Hospital Initial Experience With Stereotactic Radiosurgery Of Spinal Tumors. AANS/CNS Section On Disorders Of The Spine And Peripheral Nerves Annual Meeting. Orlando, FL
- 4/14 Zadnik P, Varga P, **Bettegowda C**, Fisher C, Fehlings M, Quraishi N, Luzzati A, Rhines L, Wolinsky JP, Sciubba D, Dekutoski M, Kawahara N, Boriani S, Gokaslan Z. Survival and recurrence following resection of chordoma in the mobile spine: results of 171 patients from the AOSpine Primary Tumor Knowledge Forum. 82nd American Association of Neurological Surgeons Annual Scientific Meeting, San Francisco, CA
- 4/14 Williams R, Williams R, Sowman B, Boriani S, Varga PP, Luzzati A, Gokaslan Z, Fehlings M, Fisher C, Dekutoski M, Rhines L, Reynolds J, **Bettegowda C**, Kawahara N, Quraishi NA. Spinal osteoid osteoma: a multicentre retrospective cohort study comparison of results with appendicular osteoid osteoma. Spine Society of Australia Annual Scientific Meeting, Brisbane, Australia
- 5/14 Varga PP, Fisher CG, Rhines LD, Gokaslan ZL, Boriani S, Lazary A, Wang W, Bozsodi A, Yip S, **Bettegowda C**. Prognostic significance of T gene SNP rs2305089 in individuals with spinal column chordoma. *27th Annual Meeting of the European Musculo-Skeletal Oncology Society*, Vienna, Austria
- 5/14 Boriani S, Lo SL, Puvanesarajah V, Fisher CG, Rhines LD, Germscheid NM, Chou D, Williams RP, **Bettegowda C**, Gokaslan ZL. Aneurysmal bone cysts of the spine: treatment options and considerations. *27th Annual Meeting of the European Musculo-Skeletal Oncology Society*, Vienna, Austria
- 5/14 Varga P, Gokaslan ZL, Sciubba DM, Wolinsky J, **Bettegowda C**, Luzzati A, Rhines L, Fisher C, Dekutoski M, Boriani S. Mobile spine chordoma. Results of 168 patients from the AOSpine Primary Tumor Knowledge Forum. *27th Annual Meeting of the European Musculo-Skeletal Oncology Society*, Vienna, Austria
- 10/14 Varga PP, Fisher CG, Rhines LD, Boriani S, Lazary A, Wang W-L, Germscheid N, Yip S, **Bettegowda C**. Prognostic significance of T gene SNP rs2305089 in individuals with spinal column chordoma. EuroSpine 2014, Lyon, France

- 10/14 Boriani S, Lo SL, Puvanesarajah V, Chou D, Fisher CG, Rhines LD, Williams R, Varga PP, Szoverfi Z, **Bettegowda C**. Aneurysmal bone cysts of the spine: treatment options and considerations. EuroSpine 2014, Lyon, France
- 3/15 Williams R, Sowman B, Boriani S, Varga PP, Luzzati A, Gokaslan ZL, Fehlings MG, Fisher CG, Dekutoski MB, Rhines LD, Reynolds J, **Bettegowda C**, Kawahara N, Quraishi NA. Spinal osteoid osteoma: a multicenter retrospective cohort study comparison of results with appendicular osteoid osteoma. British Association of Spine Surgeons (BASS) 2015, Bath, UK
- 5/15 Zamorano JJ, Fehlings MG, Nater A, Tetreault L, Varga P, 10.Gokaslan ZL, Boriani S, Fisher CG, Rhines LD, **Bettegowda C**, Kawahara N, Chou D. Risk factors for local recurrence after surgical resection of spine schwannomas: retrospective analysis of 169 patients from a multicenter international database. Global Spine Congress 2015, Buenos Aires, Argentina
- 5/15 **Goldstein CL**, Varga PP, Gokaslan ZL, Boriani S, Luzzati 9.A, Rhines L, Fisher CG, Chou D, Williams RP, Dekutoski MB, Quraishi NA, Bettegowda C, Kawahara N, Fehlings MG. Hemangiomas of the spine: results of surgical management and prognostic variables for local recurrence and mortality in a multicenter study. Global Spine Congress 2015, Buenos Aires, Argentina
- 5/15 Sciubba D, Yurter A, Derek J, Gokaslan Z, Fisher C, 7.Rhines L, Fehlings M, Fourney D, Mendel E, Laufer I, **Bettegowda C**, Goodwin CR, Patel S, Rampersaud R, Reynolds J, Chou D, Weber M, Clarke M. A systematic review of clinical outcomes and prognostic factors for patients undergoing surgery for spinal metastases secondary to breast cancer. Global Spine Congress 2015, Buenos Aires, Argentina
- 5/15 Versteeg AL, Fisher CG, Boriani S, Varga PP, Dekutoski 4.MB, Luzzati A, Gokaslan ZL, Williams RP, Reynolds JJ, Fehlings MG, **Bettegowda C**, Rhines LD. Chondrosarcomas of the spine: prognostic variables for local recurrence and mortality in a multicenter study. Global Spine Congress 2015, Buenos Aires, Argentina
- 7/15 Fisher CG, Versteeg AL, Dea N, Boriani S, Varga PP, 2.Dekutoski MB, Luzzati A, Gokaslan ZL, Williams RP, Reynolds JJ, Fehlings MG, **Bettegowda C**, Rhines LD. Chondrosarcomas of the spine: prognostic variables for local recurrence and mortality in a multicenter study. 22nd International Meeting on Advanced Spine Techniques (IMAST), Kuala Lumpur, Malaysia
- 7/15 Rhines LD, Dirks MS, Boriani S, Luzzati A, Fehlings MG, 1.Fisher CG, Dekutoski MB, Williams R, Quraishi NA, Gokaslan ZL, **Bettegowda C**, Germscheid N, Varga PP. Ewing's sarcoma of the spine: survival and local control in surgically treated patients. 22nd International Meeting on Advanced Spine Techniques (IMAST), Kuala Lumpur, Malaysia
- 10/18 **Bettegowda C**, Yip S, Jiang B, Wang WL, Clarke MJ, Lazary A, Gambarotti M, Zhang M, Sciubba DM, Wolinsky JP, Goodwin CR, McCarthy E, Germscheid NM, Sahgal A, Gokaslan ZL, Boriani S, Varga PP, Fisher CG, Rhines LD. Malignant primary spinal column tumors: prognostic significance of hTERT (human telomerase reverse transcriptase) promotor region mutations C228T and C250T for overall survival. CNS Annual Meeting - Spine and Peripheral Nerve Section, Houston, TX.
- 3/19 **Bettegowda C**, Yip S, Jiang B, Wang WL, Clarke MJ, Lazary A, Gambarotti M, Zhang M, Sciubba DM, Wolinsky JP, Goodwin CR, McCarthy E, Germscheid NM, Sahgal A, Gokaslan ZL, Boriani S, Varga PP, Fisher CG, Rhines LD. Malignant primary spinal column tumors: prognostic significance of hTERT (human telomerase reverse transcriptase) promotor region mutations C228T and C250T for overall survival. Spine Summit - 35th Annual Meeting of the Section on Disorders of the Spine and Peripheral Nerves, Miami, FL. *Awarded best abstract*
- 5/19 **Bettegowda C**, Yip S, Jiang B, Wang WL, Clarke MJ, Lazary A, Gambarotti M, Zhang M, Sciubba DM, Wolinsky JP, Goodwin CR, McCarthy E, Germscheid NM, Sahgal A, Gokaslan ZL, Boriani S, Varga PP, Fisher CG, Rhines LD. Malignant primary spinal column tumors: prognostic significance of hTERT (human telomerase reverse transcriptase) promotor region mutations C228T and C250T for overall survival. Spine Summit - 35th Annual Meeting of the Section on Disorders of the Spine and Peripheral Nerves, Miami, FL. *Awarded best abstract*.
- 10/9 Zhang M, Iyer RR, Azad TD, Wang Q, Garzon-Muvdi T, Wang J, Liu A, Burger P, Eberhart C, Rodriguez FJ, Sciubba DM, Wolinsky JP, Gokaslan Z, Groves ML, Jallo GI, **Bettegowda C**. Genomic Landscape of Intramedullary Spinal Cord Gliomas. Congress of Neurological Surgeons 2019 Annual Meeting, San Francisco, CA. *Awarded best basic science spine abstract*