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EDUCATION

Medical School and Graduate Training

<i>Dates Attended</i>	<i>Name and location of Institution</i>	<i>Degree Awarded</i>	<i>Major</i>
1992 - 1997	Stanley Medical College, Madras, India	Bachelor of Medicine, Bachelor of Surgery	Medicine (M.B.B.S)
1999 - 2001	University of Illinois at Chicago, Chicago, IL	Master of Science	Bioengineering (M.S)

Clinical Training

<i>Dates Attended</i>	<i>Name and location of Institution</i>	<i>Position</i>
1997 - 1998	Stanley Medical College Madras, India	Compulsory Rotatory Resident Internship: Medicine, Surgery, Public Health.
1998 - 1999	Christian Medical College Vellore, India	Registrar: Physical Medicine & Rehab Director: Dr Suranjan Bhattacharjee
2002 -2003	Brookdale University Medical Center, New York.	Clinical Internship: Medicine Program Director: Dr Mohan Sharma
2003- 2006	University of Pittsburgh Medical Center, Pittsburgh, PA.	Neurology Resident Program Director: Dr Mark L Scheuer
2006- 2007	University of Pittsburgh Medical Center, Pittsburgh, PA.	Fellow in Clinical Neurophysiology Director: Dr David Lacomis, Dr Richard Brenner

Research Training

<i>Dates Attended</i>	<i>Name and location of Institution</i>	<i>Position and Guide</i>
1998-1999	Christian Medical College Vellore, India	Research Assistant Suranjan Bhattacharjee M.D. Physical Medicine & Rehabilitation

1999-2001	University of Illinois at Chicago, Chicago, IL	Research Assistant Bioengineering Guide: Daniel Hier M.D
2000	Harvard University/ MGH, Boston, MA.	Visiting Fellowship in Functional MRI. Course Director: Robert L. Savoy PhD.
2001-2002	University of Illinois at Chicago, Chicago, IL	Research Fellow Neurology Daniel Hier M.D

APPOINTMENTS:

ACADEMIC:

Year	Institution	Rank
2007-2008	University of Virginia Department of Neurology Charlottesville, VA 22908	Staff
2007-2008	Department of Neurology Lahey Clinic, Boston MA 01805	Consultant
2008-2013	Department of Neurological Surgery University of Pittsburgh Medical Center Pittsburgh, PA 15213.	Clinical Assistant Professor
2010-2013	Department of Neurology University of Pittsburgh Medical Center Pittsburgh, PA 15213	Clinical Assistant Professor Secondary Appointment
2013-2014	Department of Neurological Surgery University of Pittsburgh Medical Center Pittsburgh, PA 15213.	Clinical Associate Professor
2013-2014	Department of Neurology University of Pittsburgh Medical Center Pittsburgh, PA 15213	Clinical Associate Professor Secondary Appointment
2014-2016	Department of Neurological Surgery University of Pittsburgh Medical Center Pittsburgh, PA 15213.	Visiting Associate Professor
2014-2016	Department of Neurology University of Pittsburgh Medical Center Pittsburgh, PA 15213	Visiting Associate Professor Secondary Appointment

2016-Present	Department of Neurological Surgery University of Pittsburgh Medical Center Pittsburgh, PA 15213.	Associate Professor
2016-Present	Department of Neurology University of Pittsburgh Medical Center Pittsburgh, PA 15213	Associate Professor Secondary Appointment
2016-Present	Clinical and Translational Science Institute University of Pittsburgh Pittsburgh, PA 15123	Associate Professor Secondary Appointment
2017-2018	Vice Chair, Clinical Affairs Department of Neurology	
2018-Present	Vice Chair, Safety and Quality Clinical Affairs Department of Neurology	
2020-Present	Department of Neurological Surgery University of Pittsburgh Medical Center Pittsburgh, PA 15213.	Professor
2020-Present	Department of Neurology University of Pittsburgh Medical Center Pittsburgh, PA 15213	Professor Secondary Appointment

CLINICAL:

Year	Institution	Rank
2007- 2008	American Neuromonitoring Associates, Columbia, MD	Clinical Neurophysiologist
2008	St Luke's Hospital, New Bedford, MA	Staff
2008-Present	UPMC Presbyterian Shadyside	Staff
2008-present	Children's Hospital of Pittsburgh	Staff
2008-present	Magee-Women's Hospital	Staff
2008-present	UPMC Mercy,	Consulting Staff
2009-present	UPMC Passavant	Consulting Staff
2009-present	UPMC St Margaret	Medical Associate
2009-present	UPMC McKeesport	Staff
2011-present	Jameson Memorial Hospital	Consulting Staff
2011-present	UPMC Horizon	Consulting Staff
2011-present	Mon-Vale Health resources	Medical Staff
2012-present	UPMC-Hamot	Staff
2013-present	UPMC Northwest	Staff
2015-present	UPMC Altoona	Staff
2015-present	Trinity Health System	Staff
2016-present	Armstrong County Memorial Hospital	Staff

2016-present	UPMC Bedford	Staff
2017-present	Excelsa Health System Latrobe	Staff
2017-present	Excelsa Health System Westmoreland	Staff
2018- Present	Penn Highlands- Huntingdon	Staff

NONCLINICAL APPOINTMENTS:

2007-2008	Impulse Monitoring Inc. Columbia, MD.
2009	Co-Director, Center for Clinical Neurophysiology, University of Pittsburgh Medical Center.
2014	Director, Center for Clinical Neurophysiology, University of Pittsburgh Medical Center.

CERTIFICATION and LICENSURE

SPECIALTY BOARD CERTIFICATIONS:

Year	Certifying Board
2006	American Society of Neuroimaging, Certificate,
2007, 2017	American Board of Psychiatry and Neurology. Recertified
2009, 2019	American Board of Psychiatry and Neurology. Special qualifications in Clinical Neurophysiology
2010	American Board of Neurophysiological Monitoring
2010	American Board of Clinical Neurophysiology: Certification in Intraoperative monitoring.

MEDICAL AND OTHER PROFESSIONAL LICENSURE:

Year	Licensing Board/State
2001-present	Educational Council for Foreign Medical Graduates.
2006	Pennsylvania Medical Board Physician License.
2007	Connecticut Board of Medicine
2007-08	California Board of Medicine
2007-08	District of Columbia
2008-10	Florida Board of medicine
2008-09	Georgia Board of medicine
2008-10	Massachusetts Board of medicine
2008-09	Michigan Board of Medicine
2007-09	State of New Jersey
2007-09	New Mexico Medical Board
2008-09	Oregon Board of Medical examiners
2007-10	Virginia Board of Medicine
2016	Ohio Board of Medicine
2018	West Virginia Board of Medicine
2018	New York Board of Medicine

MEMBERSHIPS in PROFESSIONAL and SCIENTIFIC SOCIETIES

Year Organization

2002 American Medical Association
2003 American Academy of Neurology
2004 American Epilepsy society
2006 American Society of Neuroimaging.
2007 American Clinical Neurophysiology society
2007 American Society of Neuromonitoring.
2009 American Association of Neuromuscular and Electro diagnostic Medicine
2010 America's Registry of Outstanding Professionals
2010 North American Spine Society.

Fellowships at Organization

2014 American Clinical Neurophysiology Society (FACNS)
2015 American Academy of Neurology (FAAN)

HONORS

Year Title of the Award

2005 National Epi-fellows grant from Pfizer, American Epilepsy society
2009 Research chosen to "Clinical Practice Scientific Topic Highlights"
 at the 61st AAN Annual Meeting on Thursday, April 30, 2009, Seattle, WA.
2013 Best Abstract Award, Pennsylvania Neurological Society
2014 Doctors Day Award, Meenakshi Mission Hospital, Madurai, India
2018 Top 10 Advances in Cranial Nerve Disorders, World Federation of
 Cranial Nerve Disorders, Shanghai, PRC

LEADERSHIP TRAINING and POSITION

2014 Emerging Leadership Forum, American Academy of Neurology
2013 President, Pennsylvania Neurological Society
2013 Donald M. Palutucci Advocacy Forum,
 American Academy of Neurology, Minneapolis, MN
2013 Specialty Leadership Cabinet, PNS representative,
 Pennsylvania Medical Society, Harrisburg, PA
2013 Marshall Webster Physician Leadership Program
 Joseph M Katz Graduate School of Business, Pittsburgh PA

PUBLICATIONS

ISI Web of Science: 537 citations, H-index: 12

Refereed articles:

1. Kimatian SJ, Saliba KJ, Soler X, Valentine EA, Coleman ML, Kunselman AR, Schuler HG, Barnes ML, **Thirumala PD**, Myers JL. The influence of neurophysiologic monitoring on the management of pediatric cardiopulmonary bypass ASAIO J. 2008; Sep-Oct; 54(5):467-9.
2. Balzer JR, Tomycz ND, Crammond DJ, Habeych M, **Thirumala PD**, Urgo L, Moossy JJ. Localization of Cervical and Cervicomedullary Stimulation Leads for Pain Treatment Using Median Nerve Somatosensory Evoked Potentials. J Neurosurg. 2011; 114(1):200-5.
3. **Thirumala PD**, Shah AC, Nikonow TN, Habeych ME, Balzer JR, Crammond DJ, Burkhart L, Chang YF, Gardner P, Kassam AB, Horowitz MB Microvascular Decompression for Hemifacial Spasm: Evaluating the Prognostic Value of Intra-Operative Lateral Spread Response Monitoring and Clinical Characteristics in 293 Patients. J Clin Neurophysiol. 2011; Feb; 28(1):56-66.
4. **Thirumala PD**, Kassasm AB, Habeych M, Wichman K, Chang YF, Gardner P, Prevedello D, Snyderman C, Carrau R, Crammond DJ, Balzer J. Somatosensory evoked potential monitoring during endoscopic endonasal approach to skull base surgery: analysis of observed changes. Neurosurgery. 2011; Sep;69 Operative Neurosurgery, 64:76
5. Habeych ME, Shah AC, Nikonow TN, Balzer JR, Crammond DJ, **Thirumala PD**, Kassam A, Horowitz M. Muscle and nerve. Effect of botulinum neurotoxin treatment in the lateral spread monitoring of microvascular decompression for hemifacial spasm. Muscle and Nerve. 2011; Oct; 44(4):518-24.
6. Shah A, Nikonow T, Thirumala P, Hirsch B, Chang Y, Gardner P, Balzer J, Habeych M, Crammond D, Burkhart L, Horowitz M. Hearing Outcomes Following Microvascular Decompression for Hemifacial Spasm. Clinical Neurology and Neurosurgery. 2012 Jul;114(6):673-7
7. **Thirumala PD**, Mohanraj S, Habeych M, Wichman K, Chang YF, Gardner P, Snyderman C, Crammond DJ, Balzer J. Value of free run electromyographic monitoring of lower cranial nerves in endoscopic endonasal approach to skull base surgeries. J Neurolog Surg B. 2012 Aug;73:236-44.
8. Pandey P, Kansara A, **Thirumala P**, Tamkus AA, Xavier AR. Neurophysiological monitoring with brainstem evoked potentials can be a valuable tool for patients undergoing vertebrobasilar stenting and angioplasty-initial experience. J Clin Neurophysiol. 2013 Feb; 30(1):55-8.
9. Ying T, **Thirumala P**, Shah A, Nikonow T, Wichman K, Holmes M, Hirsch B, Chang Y,

Gardner P, Habeych M, Crammond DJ, Burkhart L, Horowitz M, Balzer J. Incidence of high-frequency hearing loss after microvascular decompression for hemifacial spasm. *J Neurosurg*. 2013; Feb 8.

10. Wang X, **Thirumala P**, Shah A, Gardner P, Habeych M, Crammond DJ, Horowitz M, Balzer J. Effect of previous Botulinum Neurotoxin treatment on Microvascular Decompression for Hemifacial Spasm, *Neurosurg Focus*. 2013 Mar;34(3):E3.
11. **Thirumala PD**, Ilangovan, P, Crammond DJ, Habeych ME, Blazer JR, Analysis of Interpeak Latencies of Brainstem auditory evoked potential waveforms during microvascular decompression of cranial nerve VII for hemifacial Spasm. *Neurosurg Focus*. 2013 Mar;34(3):E6.
12. **Thirumala PD**, Kodavatiganti HS, Habeych M, Wichman K, Chang YF, Gardner P, Snyderman C, Crammond DJ, Balzer J. Value of multimodality monitoring using brainstem auditory evoked potentials and somatosensory evoked potentials and in endoscopic endonasal surgery. *Neurol Res*. 2013 Jul;35(6):622-30
13. Wang X, **Thirumala P**, Shah A, Habeych M, Crammond DJ, Burkhart L, Horowitz M, Balzer J. The Role of Vein in Microvascular Decompression for Hemifacial Spasm: A Clinical Analysis of Fifteen Cases, *Neurol Res*. 2013 May;35(4):389-94.
14. Wang X, **Thirumala PD**, Shah A, Gardner P, Habeych M, Crammond D, Balzer J, Burkhart L, Horowitz M. Microvascular decompression for hemifacial spasm: focus on late reoperation. *Neurosurg Rev*. 2013 Oct;36(4):637-43.
15. **Thirumala PD**, Mohanraj S, Habeych M, Wichman K, Chang YF, Gardner P, Snyderman C, Crammond DJ, Balzer J. Value of free run electromyographic monitoring of lower cranial nerves in endoscopic endonasal approach to skull base surgeries. *J Neurolog Surg Rep*. 2013;74(01):043-050.
16. **Thirumala PD**, Lai, D, Engh J; Habeych ME, Crammond DJ, Balzer JR. Predictive value of somatosensory evoked potential monitoring during resection of intraparenchymal and intraventricular tumors using an endoscopic port. *J Clin Neurol*. 2013 Oct;9(4):244-51
17. **Thirumala PD**, Potter M, Habeych ME, Chang Y, Gardner P, Snyderman C, Crammond DJ, Balzer JR Value of electromyographic monitoring of cranial nerve V during endoscopic endonasal surgery. *Neurosurgery Quarterly* 2013. 23(4):264-267.
18. Ying T, **Thirumala P**, Chang Y, Habeych M, Crammond D, Balzer J. Empirical factors associated with Brainstem auditory evoked potential monitoring during microvascular decompression for hemifacial spasm and its correlation to hearing loss. *Acta Neurochir (Wien)*. 2014 Mar;156(3):571-5.

19. **Thirumala PD**, Bodily L, Tint D, Ward TW, Deeney VF, Crammond D, Habeych ME, Balzer JR. Somatosensory evoked potential monitoring during instrumented scoliosis corrective procedures: validity revisited. *Spine J.* 2014 Aug 1;14(8):1572-80.
20. **Thirumala PD**, Krishnaiah B, Habeych M, Crammond DJ, Balzer J Analysis of Wave III of Brain stem Auditory Evoked Potential Waveforms During Microvascular Decompression of Cranial Nerve VII for Hemifacial Spasm., *J Clin Neurophysiol.* 2014 Apr;31(2):127-32.
21. Habeych M, **Thirumala PD**, Crammond DJ, Balzer J Intraoperative neurophysiological monitoring of microvascular decompression for Glossopharyngeal neuralgia. *Journal of Clinical Neurophysiology. J Clin Neurophysiol.* 2014 Aug;31(4):337-43
22. **Thirumala PD**, Carnovale G, Habeych ME, Crammond DJ, Balzer JR. Diagnostic accuracy of brainstem auditory evoked potentials during microvascular decompression. *Neurology.* 2014 Nov 4;83(19):1747-52.
23. Mohanraj S, **Thirumala PD**, Habeych M, Crammond DJ, Balzer J. Appropriate time to establish baseline responses for brainstem auditory evoked potentials during microvascular decompression for hemifacial spasm. *J Clin Neurophysiol.* 2014 Oct;31(5):500-4.
24. Nwachuku EL, Yabes YG, Crammond DJ, Habeych ME, Balzer JR, **Thirumala PD**, Diagnostic Value of Somatosensory Evoked Potential (SSEP) Changes During Carotid Endarterectomy *JAMA Neurol.* 2015 Jan;72(1):73-80
25. Hodnett, Benjamin; Schmitt, Nicole; Clayburgh, Daniel; Burkowsky, Alex; Balzer, Jeffrey; Thirumala, Parthasarathy; Duvvuri, Umamaheswar Superior Laryngeal Nerve Monitoring using Laryngeal Surface Electrodes and Intraoperative Neurophysiological Monitoring, *Clin Anat.* 2015 May;28(4):460-6.
26. **Thirumala PD**, Krishnaiah B, Habeych M, Crammond DJ, Balzer J, Hearing outcomes after loss of brainstem auditory evoked potentials during microvascular decompression. *Journal of Clinical Neuroscience.* 2015 Apr;22(4):659-63
27. **Thirumala PD**, Kumar H, Bertolet M, Habeych ME, Crammond DJ, Balzer JR Risk factors for cranial nerve deficits during carotid endarterectomy: a retrospective study. *Clin Neurol Neurosurg.* 2015 Mar;130:150-4.
28. **Thirumala P**, Meigh K, Dasyam N, Shankar P, Sarma KR, Sarma DR, Habeych M, Crammond D, Balzer J. The incidence of high-frequency hearing loss after microvascular decompression for trigeminal neuralgia, glossopharyngeal neuralgia, or geniculate neuralgia. *J Neurosurg.* 2015 Dec;123(6):1500-6.
29. **Thirumala PD**, Wang X, Shah A, Habeych M, Crammond D, Balzer JR, Sekula R. Clinical impact of residual lateral spread response after adequate microvascular decompression for hemifacial spasm: A retrospective analysis. *Br J Neurosurg.* 2015;29(6):818-22.

30. Luan B, Jia W, **Thirumala PD**, Balzer J, Gao D, Sun M A Feasibility Study on a Single-Unit Wireless EEG Sensor. *Int Conf Signal Process Proc.* 2014 Oct; 2014:2282-2285.
31. Hodnett BL, Schmitt NC, **Thirumala PD**, Duvvuri U. Intraoperative identification of the human communicating nerve during thyroidectomy. *J Surg Case Rep.* 2015 Dec 13;2015(12)
32. **Thirumala P**, Frederickson AM, Balzer J, Crammond D, Habeych ME, Chang YF, Sekula RF Jr. D Reduction in high frequency hearing loss following technical modifications to microvascular decompression for hemifacial spasm. *J Neurosurg.* 2015 Oct;123(4):1059-64
33. Ying T, **Thirumala P**, Gardner P, Habeych M, Crammond DJ, Balzer J. The incidence of early post-operative conductive hearing loss after microvascular decompression of hemifacial spasm. *J Neurol Surg B Skull Base.* 2015 Dec; 76(6):411-5.
34. **Thirumala PD**, Cheran S, Singh S, Habeych M, Wichman K, Tyler-Kabara E, Gardner P, Snyderman C, Crammond DJ, Balzer J. Intraoperative Neurophysiological monitoring during endoscopic endonasal surgery for pediatric skull base tumors. *J Neurosurg Pediatr.* 2015 Oct 30:1-9
35. Thiagarajan K, Cheng HL, Huang JE, Natarajan P, Crammond DJ, Balzer JR, **Thirumala PD** Is two really better than one? Examining the superiority of dual modality neurophysiological monitoring during carotid endarterectomy: A meta-analysis. *World Neurosurg.* 2015 Dec; 84(6):1941-9.
36. **Thirumala PD**, Muralidharan A, Loke YK, Crammond DJ, Habeych ME, Balzer JR, Value of Intraoperative neurophysiological monitoring to reduce neurological complications in patients undergoing anterior cervical spine procedures for cervical spondylotic myelopathy: A systematic review. *J Clin Neurosci.* 2016 Mar; 25:27-35.
37. Heffner D, **Thirumala PD**, Pokharna P, Chang YF, Weschler L Outcomes of Spoke-retained Telestroke Patients Vs. Hub-treated Patients After IV Thrombolysis. *Stroke.* 2015 Nov;46(11):3161-7
38. **Thirumala PD**, Thiagarajan K, Gedela S, Crammond DJ, Balzer JR. Diagnostic accuracy of EEG changes during carotid endarterectomy in predicting perioperative strokes. *J Clin Neurosci.* 2016 Mar; 25:1-9.
39. **Thirumala PD**, Zhou J, Krishnan R, Manem N, Umredkar S, Hamilton DK, Balzer JR, Oudega M Diagnostic accuracy of evoked potentials for functional impairment after contusive spinal cord injury in adult rats. *J Clin Neurosci.* 2016 Mar; 25:122-6.
40. Thiagarajan K, Cheng HL, Huang JE, Natarajan P, Crammond DJ, Balzer JR, **Thirumala PD**. Is Two Really Better Than One? Examining the Superiority of Dual Modality Neurophysiological Monitoring During Carotid Endarterectomy: A Meta-Analysis. *World Neurosurg.* 2015 Dec;84(6):1941-9.

41. **Thirumala PD**, Udesh R, Muralidharan A, Thiagarajan K, Crammond DJ, Chang YF, Balzer JR Diagnostic Value of Somatosensory-Evoked Potential Monitoring During scolio Clipping: A Systematic Review. *World Neurosurg.* 2016 May; 89:672-80.
42. **Thirumala PD**, Cheng HL, Loke YK, Kojo Hamilton D, Balzer J, Crammond DJ. Diagnostic accuracy of somatosensory evoked potential monitoring during scoliosis fusion. *J Clin Neurosci.* 2016 Aug;30:8-14.
43. **Thirumala PD**, Natarajan P, Thiagarajan K, Crammond DJ, Habeych ME, Chaer RA, Avgerinos ED, Friedlander R, Balzer JR. Diagnostic accuracy of somatosensory evoked potential and electroencephalography during carotid endarterectomy. *Neurol Res.* 2016 Aug;38(8):698-705.
44. **Thirumala PD**, Huang J, Thiagarajan K, Cheng H, Balzer J, Crammond DJ Diagnostic Accuracy of Combined Multimodality SSEP and TcMEP Intraoperative Monitoring in Patients with Idiopathic Scoliosis. *Spine (Phila Pa 1976).* 2016 Oct 1;41(19):E1177-84.
45. **Thirumala PD**, Cheng HL, Loke YK, Kojo Hamilton D, Balzer J, Crammond DJ. Diagnostic accuracy of somatosensory evoked potential monitoring during scoliosis fusion. *J Clin Neurosci.* 2016 Aug; 30:8-14.
46. **Thirumala PD**, Natarajan P, Thiagarajan K, Crammond DJ, Habeych ME, Chaer RA, Avgerinos ED, Friedlander R, Balzer JR. Diagnostic accuracy of somatosensory evoked potential and electroencephalography during carotid endarterectomy. *Neurol Res.* 2016 Aug;38(8):698-705.
47. Muralidharan A, Thiagarajan K, Van Ham R, Gleason TG, Mulukutla S, Schindler JT, Jeevanantham V, **Thirumala PD**. Meta-Analysis of Perioperative Stroke and Mortality in Transcatheter Aortic Valve Implantation. *Am J Cardiol.* 2016 Oct 1;118(7):1031-45.
48. Khattar NK, Friedlander RM, Chaer RA, Avgerinos ED, Kretz ES, Balzer JR, Crammond DJ, Habeych MH, **Thirumala PD**. Perioperative stroke after carotid endarterectomy: etiology and implications. *Acta Neurochir (Wien).* 2016 Dec;158(12):2377-2383
49. Acharya JN, Hani AJ, **Thirumala PD**, Tsuchida TN. American Clinical Neurophysiology Society Guideline 3: A Proposal for Standard Montages to Be Used in Clinical EEG. *J Clin Neurophysiol.* 2016 Aug; 33(4):312-6.
50. Acharya JN, Hani A, Cheek J, Thirumala P, Tsuchida TN. American Clinical Neurophysiology Society Guideline 2: Guidelines for Standard Electrode Position Nomenclature. *J Clin Neurophysiol.* 2016 Aug; 33(4):308-11.
51. Domenick SN, Chaer RA, Thirumala PD, Balzer J, Long B, Tzeng E, Makaroun MS, Avgerinos ED. Somatosensory Evoked Potentials and Electroencephalography during Carotid Endarterectomy Predict Late Stroke but not Death. *Ann Vasc Surg.* 2017 Jan; 38:105-112.

52. **Thirumala PD**, Melachuri SR, Kaur J, Ninaci D, Melachuri MK, Habeych ME, Crammond DJ, Balzer JR. Diagnostic Accuracy of Somatosensory Evoked Potentials in Evaluating New Neurological Deficits After Posterior Cervical Fusions. *Spine (Phila Pa 1976)*. 2017 Apr 1; 42(7):490-496.
53. **Thirumala PD**, Huang JE, Cheng HL, Loke YK, Crammond DJ, Habeych ME, Balzer JR. Diagnostic Accuracy of Motor Evoked Potentials to Detect Neurological Injury during Idiopathic Scoliosis Correction: Systematic Review, *Journal of Neurosurgery: Spine*. 2017 Mar;26(3):374-383
54. Udesh R, Natarajan P, Thiagarajan K, Wechsler LR, Crammond DJ, Balzer JR, **Thirumala PD**. Transcranial Doppler Monitoring in Carotid Endarterectomy: A Systematic Review and Meta-analysis. *J Ultrasound Med*. 2017 Mar; 36(3):621-630.
55. **Thirumala PD**, Carnovale G, Loke Y, Habeych ME, Crammond DJ, Balzer JR, Sekula R. Brain Stem Auditory Evoked Potentials' Diagnostic Accuracy for Hearing Loss: Systematic Review and Meta-Analysis. JNLSB-15-0138. *J Neurol Surg B Skull Base*. 2017 Feb; 78(1):43-51.
56. Udesh R, Mehta A, Gleason TG, Wechsler L, **Thirumala PD**. Perioperative Strokes and Early Outcomes in Mitral Valve Surgery: A Nationwide Analysis. *J Cardiothorac Vasc Anesth*. 2017 Apr;31(2):529-536
57. **Thirumala PD**, Muluk S, Udesh R, Mehta A, Schindler J, Mulukutla S, Jeevanantham V, Wechsler L, Gleason T. Carotid artery disease and periprocedural stroke risk after transcatheter aortic valve implantation. *Ann Card Anaesth*. 2017 Apr-Jun;20(2):145-15.
58. Udesh R, Mehta A, Gleason T, **Thirumala PD**. Carotid artery disease and perioperative stroke risk after surgical aortic valve replacement: A nationwide inpatient sample analysis. *J Clin Neurosci*. 2017 Apr 25
59. Cheng H, Udesh R, Mehta A, **Thirumala PD**. Perioperative strokes after coronary artery bypass grafting with staged carotid endarterectomy: A nationwide perspective. *J Clin Neurosci* 2017 Apr 25.
60. Kashkoush AI, Jankowitz BT, Gardner P, Friedlander RM, Chang YF, Crammond DJ, Balzer JR, **Thirumala PD**. Somatosensory Evoked Potentials During Temporary Arterial Occlusion for Intracranial Aneurysm Surgery: Predictive Value for Perioperative Stroke. *World Neurosurg*. 2017 Aug;104:442-451.
61. **Thirumala P**, Zhou J, Natarajan P, Balzer J, Dixon E, Okonkwo D, Hamilton DK. Perioperative neurologic complications during spinal fusion surgery: incidence and trends. *Spine J*. 2017 Nov;17(11):1611-1624.

62. Ares WJ, Grandhi RM, Panczykowski DM, Weiner GM, Thirumala P, Habeych ME, Crammond DJ, Horowitz MB, Jankowitz BT, Jadhav A, Jovin TG, Ducruet AF, Balzer J. Diagnostic Accuracy of Somatosensory Evoked Potential Monitoring in Evaluating Neurological Complications During Endovascular Aneurysm Treatment. *Oper Neurosurg* (Hagerstown). 2018 Feb 1;14(2):151-157.
63. Udesh R, Natarajan P, Jeevanantham V, Gleason TG, Badhwar V, **Thirumala PD**. Perioperative Strokes Following Surgical Correction of Mitral Valves: A Systematic Review and Meta-Analysis. *Eur Neurol*. 2017 Jun 24;78(1-2):63-70.
64. Soundhar A, Udesh R, Mehta A, Schindler J, Jeevanantham V, Gleason T, **Thirumala PD**. Delirium Following Transcatheter Aortic Valve Replacement: National Inpatient Sample Analysis. *J Cardiothorac Vasc Anesth*. 2017 Dec;31(6):1977-1984.
65. **Thirumala PD**, Huang J, Brahme IS, Thiagarajan K, Cheng H, Crammond DJ, Balzer J. Alarm criteria for motor evoked potentials. *Neurol India*. 2017 Jul-Aug;65(4):708-715
66. Domenick Sridharan N, **Thirumala P**, Chaer R, Balzer J, Long B, Crammond D, Makaroun M, Avgerinos E. Predictors of cross-clamp-induced intraoperative monitoring changes during carotid endarterectomy using both electroencephalography and somatosensory evoked potentials. *J Vasc Surg*. 2018 Jan;67(1):191-198.
67. Mehta A, Gleason T, Wechsler L, Winger D, Wang L, **Thirumala PD**. Perioperative stroke as a predictor of mortality and morbidity in patients undergoing CABG. *J Clin Neurosci*. 2017 Oct;44:175-179.
68. Kashkoush AI, Jankowitz BT, Nguyen C, Gardner PA, Wecht DA, Friedlander RM, Chang YF, Habeych M, Crammond D, Balzer J, **Thirumala PD**. Perioperative stroke after cerebral aneurysm clipping: Risk factors and postoperative impact. *J Clin Neurosci*. 2017 Oct;44:188-195.
69. **Thirumala PD**, Nguyen FD, Mehta A, Schindler J, Mulukutla S, Jeevanantham V, Wechsler L, Gleason T. Perioperative Stroke, In-Hospital Mortality, and Postoperative Morbidity Following Transcatheter Aortic Valve Implantation: A Nationwide Study. *J Clin Neurol*. 2017 Oct;13(4):351-358. doi: 10.3988/jcn.2017.13.4.351
70. Melachuri SR, Kaur J, Melachuri MK, Crammond DJ, Balzer JR, **Thirumala PD**. The diagnostic accuracy of somatosensory evoked potentials in evaluating neurological deficits during 1036 posterior spinal fusions. *Neurol Res*. 2017 Dec;39(12):1073-1079.
71. Udesh R, Solanki P, Mehta A, Gleason T, Wechsler L, **Thirumala PD**. Carotid artery stenosis as an independent risk factor for perioperative strokes following mitral valve surgical intervention. *J Neurol Sci*. 2017 Nov 15; 382:170-184.

72. Thiagarajan K, Jeevanantham V, Van Ham R, Gleason TG, Badhwar V, Chang Y, **Thirumala PD**. Perioperative Stroke and Mortality After Surgical Aortic Valve Replacement: A Meta-Analysis. *Neurologist*. 2017 Nov;22(6):227-233.
73. Mehta A, Choxi R, Gleason T, Wechsler L, Jovin T, **Thirumala PD**. Carotid Artery Disease as a Predictor of In-Hospital Postoperative Stroke After Coronary Artery Bypass Grafting From 1999 to 2011. *J Cardiothorac Vasc Anesth*. 2018 Aug;32(4):1587-1596.
74. Hariharan P, Balzer JR, Anetakis K, Crammond DJ, **Thirumala PD**. Electrophysiology of Extraocular Cranial Nerves: Oculomotor, Trochlear, and Abducens Nerve. *J Clin Neurophysiol*. 2018 Jan;35(1):11-15.
75. Hariharan P, Balzer JR, Anetakis K, Crammond DJ, **Thirumala PD**. Electrophysiology of Olfactory and Optic Nerve in Outpatient and Intraoperative Settings. *J Clin Neurophysiol*. 2018 Jan;35(1):3-10
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Abstract:

National:

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3. Shah A, Nikonow T, Thirumala P, Hirsch B, Chang Y, Gardner P, Balzer J, Habeych M, Crammond D, Holmes M, Wichman K, Horowitz M. Hearing Preservation after Microvascular Decompression for Hemifacial Spasm: Elucidating the Role of Intraoperative Brainstem Auditory Evoked Responses in 89 Patients. Congress of Neurological surgeons. 2010 Annual Meeting, SFO, October 18th 2010.

4. Wichman, K, **Thirumala PD S**; Potter M, Habeych ME, Chang Y, Gardner P, Snyderman C, Crammond DJ, Balzer JR. Value of electromyographic monitoring of cranial nerve V during endoscopic endonasal approach to skull base surgery. American Association of neuromuscular and Electrodiagnostic medicine, 58th Annual Meeting, September 2011.
5. **Thirumala PD**, Habeych ME, Crammond DJ, Balzer J, Ilangoan P. Analysis of Interpeak latencies of brainstem auditory evoked potential waveforms during microvascular decompression of cranial nerve VII for hemifacial spasm. AANEM 59th Annual Meeting to be held at the JW Marriott Grande Lakes, Orlando, Florida, on October 3-6, 2012.
6. **Thirumala PD**, Habeych ME, Crammond DJ, Balzer J, Mohanraj S. Establishing Baseline Values for Brainstem Auditory Evoked Potentials (BAEP) during Microvascular-Decompression for Hemifacial Spasm. American Neurological Association's (ANA) 2012 Annual Meeting October 7 – 9, 2012 at the Marriott Copley Place in Boston, MA.
7. **Thirumala PD**, Habeych ME, Crammond DJ, Balzer J, Krishniah B Analysis of Wave III of Brain Stem Auditory Evoked Potential during Microvascular Decompression of Cranial Nerve VII for Hemifacial Spasm. American Neurological Association's (ANA) 2012 Annual Meeting October 7 – 9, 2012 at the Marriott Copley Place in Boston, MA.
8. Krishniah B, **Thirumala PD**, Habeych ME, Crammond DJ, Balzer J, Loss of Brainstem auditory evoked potentials during microvascular decompression for hemifacial spasm. American Academy of Neurology, Annual Meeting, March 17-24, San Diego 2013.
9. **Thirumala PD**, Kumar H, Habeych ME, Crammond DJ, Balzer J, To evaluate the use of telemedicine to provide intraoperative neurophysiological monitoring and detect changes in neurophysiological responses during surgery: Observational study. American Academy of Neurology, Annual Meeting, March 17-24, San Diego 2013.
10. Sofjan I, Subramaniam K, **Thirumala PD**, Esper SA, Balzer JR, Sullivan EA, Badhwar V. Role of intraoperative Neurophysiologic Monitoring in high risk Patients Undergoing Cardiac Surgery has been accepted for ePoster presentation at the 36th Annual Meeting & Workshops at the Sheraton Hotel in New Orleans, LA 28th March 2014.
11. Hodnett B; Duvvuri U, Balzer JR, **Thirumala PD**. Superior Laryngeal Nerve Monitoring using Dragonfly Laryngeal Surface Electrodes and Intraoperative Neurophysiology Monitoring, Las Vegas, Nevada, May 14-18th 2014.
12. Thirumala PD, Zhou J, Balzer JR, Oudega M Diagnostic accuracy of evoked potentials for functional impairment after contusive spinal cord injury in adult rats. VIII, Annual Meeting, Pennsylvania Neurological Society, Pittsburgh PA, September 13-14th , 2014. **First prize abstract**
13. Nwachuku EL, Yabes YG, Crammond DJ, Habeych ME, Balzer JR, Thirumala PD, Diagnostic Value of Somatosensory Evoked Potential (SSEP) Changes During Carotid Endarterectomy

14. Heffner D, Thirumala PD, Pokharna P, Chang YF, Weschler L Outcomes of Spoke-retained Telestroke Patients Vs. Hub-treated Patients After IV Thrombolysis. VIII, Annual Meeting, Pennsylvania Neurological Society, Pittsburgh PA, September 13-14th, 2014. **Second prize abstract**
15. Schmitt NC, Hodnett BL, Balzer JR, Thirumala PD, Nance MA, and Duvvuri U, Intraoperative Stimulation of the Superior Laryngeal Nerve during Thyroidectomy: A Prospective Study of 60 Patients. Association of VA Surgeons.
16. Kashkoush AI; Nguyen C. Gardner P; Wecht D; Jankowitz B; Friedlander RF; Habeych ME; Crammond D; Balzer JR.; Thirumala PD Perioperative stroke after cerebral aneurysm clipping: Incidence, risk factors, and postoperative impact. IX Annual Meeting of the Pennsylvania Neurological Society, Hotel Hershey. October 24th, 2015, Hershey, PA. **Second prize paper**
17. Elangovan.C, Venkatesan, S, Thirumala P.D., Habeych M.E., Crammond D., Balzer J. Evaluation of perioperative stroke after carotid endarterectomy surgery using Quantitative EEG. Annual Meeting of the Pennsylvania Neurological Society, Hotel Hershey. October 24th, 2015, Hershey, PA.
18. Thirumala PD, Udesh R, Natarajan P, Thiagarajan K. Diagnostic Accuracy of Transcranial Doppler Monitoring during Carotid Endarterectomy a Systematic Review and Meta-analysis. Annual Meeting of the Pennsylvania Neurological Society, Hotel Hershey. October 24th, 2015, Hershey, PA
19. Thiagarajan K, Thirumala PD, Udesh R, Muralidharan A, Crammond D, Balzer JR. Diagnostic Value of Somatosensory Evoked Potential Monitoring during Cerebral Aneurysm Clipping a Systematic Review and Meta-analysis. Annual Meeting of the Pennsylvania Neurological Society, Hotel Hershey. October 24th, 2015, Hershey, PA
20. Thirumala PD, Huang J, Thiagarajan K, Cheng H, Natarajan P, Crammond D, Habeych M, Chaer, R, Avgerinos E, Friedlader R Balzer JR. Diagnostic accuracy of SSEP Monitoring during Carotid Endarterectomy in Patients with Asymptomatic Carotid Stenosis: Systematic review, Annual Meeting of the Pennsylvania Neurological Society, Hotel Hershey. October 24th, 2015, Hershey, PA.
21. Domenick NA, Chaer R, **Thirumala PD**, Balzer JR, Makaroun M, Tzeng E, Avgerinos E Somatosensory Evoked Potentials and Electroencephalography during Carotid Endarterectomy Predict Late Stroke but not Death. VESS 2016 Annual Meeting in Park City, UT (February 4-7, 2016).
22. Domenick NA, Chaer R, **Thirumala PD**, Balzer JR, Makaroun M, Avgerinos E Predictors of cross-clamp induced intraoperative monitoring changes requiring shunt placement during carotid endarterectomy using both EEG and SSEP monitoring. SVS 2016 Vascular Annual Meeting. Chicago, Illinois - Apr 14 - 16, 2016

23. Khattar NK, Friedlander RM, Chaer RA, Avgerinos ED, Balzer JR, Crammond DJ, Habeych ME, **Thirumala PD**, Perioperative stroke after carotid endarterectomy: etiology and implications. 84th AANS Annual Scientific Meeting at McCormick Place West in Chicago, Illinois April 30th – May 4th 2016. *First place, eposter, Cerebrovascular Neurosurgery Subsection.*
24. Gandhoke GS, MD; Kaur J, MBBS; **Thirumala PD**; Balzer JR,. Crammond DJ, Okonkwo DO, Kanter A. Does intraoperative Pedicle screw stimulation prevent the development of a new neurodeficit? Experience with the use of IOM in 2012 patients undergoing posterior lumbar fusion surgery.84th AANS Annual Scientific Meeting, April 30th- May 4th, 2016, Chicago, Illinois.
25. Gandhoke GS, MD; Kaur J, MBBS; **Thirumala PD**; Balzer JR,. Crammond DJ, Okonkwo DO, Kanter A. Incidence of Position related neuropraxia in 4489 consecutive patients undergoing spine surgery. What is the role of SSEP monitoring?. 84th AANS Annual Scientific Meeting, April 30th- May 4th, 2016, Chicago, Illinois.
26. Kashkoush AI; Nguyen C. Gardner P; Wecht D; Jankowitz B; Friedlander RF; Habeych ME; Crammond D; Balzer JR.; **Thirumala PD** Perioperative stroke after cerebral aneurysm clipping: Incidence, risk factors, and postoperative impact. 84th AANS Annual Scientific Meeting at McCormick Place West in Chicago, Illinois April 30th – May 4th 2016.
27. Domenick N, Long R, Chaer R, Al Khoury G, Thirumala PD, Leers S, Makaroun M, Avgerinos E, .Routine Shunting for Carotid Endarterectomy is Associated with a Lower Minor Perioperative Complication Rate but may be Related to Long Term Cognitive Decline. 2016 Annual Meeting of the Eastern Vascular Society to be held September 15-17, 2016 at the Westin Philadelphia in Philadelphia, PA.
28. Yassin A; Zusman B; Shutter L; Mehta A; Ghearing G; Antony A; **Thirumala PD**. Incidence, Risk Factors, and Morbidity and Mortality of Post-Intracerebral Hemorrhage Seizures. Annual Meeting, American Clinical Neurophysiology Society, February 8-12, 2017, at the Sheraton Grand Phoenix in Phoenix, Arizona.
29. Jani RH, Feroze RA, Balzer JR, **Thirumala PD**: Neurophysiological Characteristics of Cranial Nerve XII EMG in Endoscopic Endonasal Approach Skull Base Surgery: Technical Report. North American Skull Base Society, Annual Meeting, New Orleans, Louisiana, March 3, 2017.
30. Feroze RA, Jani RH, Balzer JR, **Thirumala PD**: Triggered EMG Responses of Cranial Nerve X During Endoscopic Endonasal Skull Base Surgery. North American Skull Base Society, Annual Meeting, New Orleans, Louisiana, March 3, 2017.
31. Mehta A, Gleason T, Wechsler L, **Thirumala PD** Perioperative Stroke as a Predictor of Mortality and Morbidity in Patients Undergoing CABG. Quality of Care and Outcomes

Research in Cardiovascular Disease and Stroke 2017 Scientific Sessions. Pentagon City in Arlington, VA on April 2-3, 2017.

32. Jorge A, **Thirumala PD**, Umredkar S, Fish E, Krishan R: The Effects of Hypothermia on Functional Outcomes Following Simulated Iatrogenic Spinal Cord Injury, in AANS/CNS Joint Section on Disorders of the Spine and Peripheral Nerves. Las Vegas: Neurosurgical Focus, 2017, p A54
33. Eyad E. Sacal MD; Ahmed I. Kashkoush BS; Donald J. Crammond PhD; Jeffrey R. Balzer PhD.; Parthasarathy D. Thirumala MD, MS. Optimal Baseline Selection Approach for Somatosensory Evoked Potential Monitoring During Cerebral Aneurysm Surgery. **First Prize at the Pennsylvania Neurological Society IXth Annual Meeting**, Pittsburgh, PA, Sept 16th 2017.
34. Eyad E. Saca MD; Ahmed I. Kashkoush BS; Donald J. Crammond PhD; Jeffrey R. Balzer PhD.; Parthasarathy D. Thirumala MD, MS. Improving Perioperative Stroke Detection During Intracranial Aneurysm Surgery Using Somatosensory Evoked Potential Waveform Analysis. American Heart Association, International Stroke Association Annual Meeting, Los Angeles, CA. **2018 Stroke Minority Travel Award. 2018**
35. Jorge A, Zhou J, Umredkar S, Krishnan R, **Thirumala PD**: Characterization of Neurologic Injury using the Area under the Curve of Somatosensory Evoked Potentials, in AANS/CNS Joint Section on Disorders of the Spine and Peripheral Nerves. Orlando, FL: Neurosurgical Focus, 2018
36. Agarwal, N., Dayananda, S., Mehta, A., Nwachuku, E.L. Hamilton, D.K., **Thirumala, P.D.** Impact of Perioperative Neurological Deficits on Clinical Outcomes Following Posterior Cervical Fusion. 34th Annual Meeting of the Section on Disorders of the Spine and Peripheral Nerves, Spine Summit, General Spine Breakout 3. Orlando, FL. March 14-17, 2018.
37. **Thirumala PD**, Chang R, Iyengar P, Reddy R, Altibi A, Saca E, Saleh A, Anetakis K, Crammond D, Balzer JR, Sekula R. Utility of Intraoperative Electromyography in Microvascular decompression for Hemifacial Spasm: Systematic Review and Meta-analysis. 31st International Congress of Clinical Neurophysiology 2018, Washington DC, May 1-6th 2018.
38. Jorge A, Zhou J, **Thirumala PD**: The effects of preemptive hypothermia on neurophysiological and functional outcomes following iatrogenic spinal cord impact injury. Congress of Neurological Surgeons, Spine Summit 2019 Meeting in Miami, Florida March 14-17
39. Agarwal, N., Kashkoush, A., Mehta, A., Nwachuku, E.L., Fields, D.P., Alan, N., Kanter, A.S., Okonkwo, D.O., Hamilton, D.K., **Thirumala, P.D.** Perioperative Neurological Complications Following Anterior Cervical Discectomy and Fusion: Clinical Impact on 317,789 Patients from the National Inpatient Sample. 35th Annual Meeting of the Section on Disorders of the Spine

and Peripheral Nerves, Spine Summit, General Spine Surgery 3 Breakout. Miami, FL. March 14-17, 2019.

40. Jorge A, Balzer JR, Crammond DJ, Anetakis K, **Thirumala PD**: Characterization and Validation of Somatosensory Evoked Potential Morphology during Carotid Endarterectomy to Detect Stroke, in American Academy of Neurology. Philadelphia, 2019
41. Jorge A, Dixon CE, Hamilton K, Balzer J, **Thirumala PD**: The effects of preemptive hypothermia on neurophysiological and functional outcomes following iatrogenic spinal cord impact injury, in CNS Spine. Miami, 2019.
42. Patel, B. M., Reinert, N. J., Al-Robaidi, K., & Thirumala, P. D. Impact of Carotid Stenosis on Perioperative Mortality from Stroke Following Cardiovascular Surgery. Poster session presented at: Pennsylvania American College of Physicians Western Region Abstract Competition; October 12, 2019; Pittsburgh, PA.
43. Nathan J. Reinert, Bansri M. Patel, Khaled Al-Robaidi, MD, Parthasarathy Thirumala, MD .The Impact of Atrial Fibrillation and Asymptomatic Carotid Stenosis on the Risk of Perioperative Stroke-Related Mortality in the Non-Cardiovascular, Non-Neurological Surgery Population" Pennsylvania American College of Physicians Western Region Abstract Competition; October 12, 2019; Pittsburgh, PA.
44. Khaled A, Alshaer Q, Alhuneafat L, Alrifai N, Alghazawi S, Thirumala PD, Total And Cause-specific Mortality In Patients Who Had A Perioperative Stroke Following Cardiovascular Procedures. AHA Scientific Sessions, November 2-6, 2019 Philadelphia, PA.
45. Alrifai N, Alhuneafat L, Al-robaidi K, Thirumala,PD Hospital Readmission In Perioperative Stroke Patients After Invasive Cardiac Procedures: California State Inpatient Database Study. AHA Scientific Sessions, November 2-6, 2019, Philadelphia, PA.
46. Hanmer J, Altieri Dunn S, Freel J, Bilderback A, Bellon J, Thirumala P. "PROMIS-Preference scores are associated with utilization in outpatient Neurology patients." Value Health. 2019 May;22(Suppl 2):S284. International Society for Pharmaceutical Outcomes Measurement Annual Meeting. April 2019. New Orleans, LA
47. Hanmer J, Altieri Dunn S, Freel J, Bilderback A, Bellon J, Thirumala P. "PROMIS-Preference scores are associated with utilization in outpatient Neurology patients." Health Measures User Conference. June 2019. Chicago, IL.
48. Sridharan N, Avgerinos,E, Thirumala PD, Carotid Endarterectomy is associated with post-operative neurocognitive improvement in both symptomatic and asymptomatic patients. SVS 2020 Vascular Annual Meeting.
49. Dolia J, Jadhav A, Anetakis K, Thirumala PD, Time Last Electrically Well : Neurophysiological Monitoring for Identification of Intra-operative Large Vessel Occlusion Formation. Society for Interventional Neurology, 2019

International:

50. **Thirumala PD**, Gardner P, Kassasm AB, Crammond DJ, Habeych ME, Wichman K, Prevedello D, Snyderman C, Carrau R, Balzer J.. Changes in Somatosensory Evoked Potentials to Fluctuations in Mean Arterial Pressure during Endoscopic Endonasal Approach to Skull Base Surgery. American Academy of Neurology 62nd annual meeting, Toronto, Ontario. April 2010.
51. Habeych ME, Anderson W, Balzer JR, Crammond DJ, Thirumala PD. Neurophysiological monitoring of the trans-procedure endovascular closure of atriaum septum defects (ASDs) in adults. 16th Congress of European Federation of Neurological Societies – EFNS 2012, Stockholm, Sweden, September 8-11, 2012.

Oral Abstract Presentations:

National:

1. **Thirumala PD**, Gardner P, Kassasm AB, Crammond DJ, Habeych ME, Wichman K, Prevedello D, Snyderman C, Carrau R, Balzer J. Predictive Value of spontaneous electromyography (S-EMG) monitoring of lower cranial nerves (CN V, VII-XII) during expanded endonasal approach (EEA) to skull base surgeries. AAN, Annual meeting, Seattle, April 2009.
2. **Thirumala PD**, Gardner P, Kassasm AB, Crammond DJ, Habeych ME, Wichman K, Prevedello D, Snyderman C, Carrau R, Balzer J. Predictive value of Brainstem Auditory evoked potentials (BAEPs) in decreasing post operative neurological deficit during expanded endonasal approach (EEA) to skull base surgeries. AAN, Annual meeting, Seattle, April 2009.
3. **Thirumala PD**; Engh J, Kassam A, Crammond DJ, Habeych ME, Balzer JR. Predictive value of somatosensory evoked potential monitoring during resection of intraparenchymal and intraventricular tumors using an endoscopic port", for presentation at the 4TH World Congress for endoscopic surgery of the brain, skull base and spine, April 28-30, 2010, Pittsburgh PA.
4. Gandhoke GS, MD; Kaur J, MBBS; Thirumala PD; Balzer JR,. Crammond DJ, Okonkwo DO, Kanter A. Predictive value of intraoperative neurophysiological monitoring during spine surgery: a prospective analysis of 4489 consecutive patients. 84th AANS Annual Scientific Meeting, April 30th- May 4th, 2016, Chicago, Illinois. *Sanford J. Larson Award for the best spine research paper*
5. Nwachuku E, Mehta A, Okonkwo D, Kanter A, Hamilton K, Thirumala PD, Risk Factors and Clinical Impact of Perioperative Neurological Deficits Following Thoracolumbar Arthrodesis: National Inpatient Sample Analysis. 2017 Congress of Neurological Surgeons Annual Meeting, October 7-11, in Boston, Massachusetts.

6. Kashkoush A, Crammond DJ, Balzer JR, Friedlander RF, Gardner P, Thirumala PD, Somatosensory Evoked Potentials During Temporary Arterial Occlusion for Intracranial Aneurysm Surgery: Predictive Value for Perioperative Stroke. 2017 Congress of Neurological Surgeons Annual Meeting, October 7-11, in Boston, Massachusetts.

International:

7. Shah A, Nikonow T, Thirumala P, Habeych M, , Chang Y, Gardner P, Balzer J, , Crammond D, Burkhart L, Kassam AB Horowitz M. Aalap Shah BS, Tara N Nikonow BS, Microvascular Decompression for Hemifacial Spasm: Evaluating the Prognostic Value of Intra-Operative Lateral Spread Response Monitoring and Clinical Characteristics in 293 Patients. American Academy of Neurology, April 10- 17, 2010,
8. Thirumala PD, Bodily L, Ward T, Habeych ME, Crammond DJ, Balzer JR Intraoperative monitoring using somatosensory evoked potentials in four hundred and seventy eight instrumented scoliosis procedures: Analysis revisited. National Association of Spine Surgeons, Bangalore India, September, 2011.
9. Thirumala PD, Bodily L, Ward T, Habeych ME, Crammond DJ, Balzer JR Intraoperative monitoring using somatosensory evoked potentials in four hundred and seventy eight instrumented scoliosis procedures: Analysis revisited. Association of Spinal Surgeons of India, Calcutta Jan 24-16th, 2014.
10. Thirumala PD, Cheran S, Singh S, Habeych M, Wichman K, Tyler-Kabara E, Gardner P, Snyderman C, Crammond DJ, Balzer J Intraoperative Neurophysiological monitoring during endoscopic endonasal approach to resect pediatric skull base tumors. Annual Conference of Neurosurgical society of India, Coimbatore 24th -14th India 2014.
11. Balzer JR, Elangovan C, Quallich R, Celin C, Crammond DJ, Habeych ME, Celin S, Pollice P, Thirumala P Electromyography during Thyroid Surgery: Techniques and Value of Recurrent Laryngeal Nerve Monitoring using a Dynamic Mapping Approach. Annual Meeting of Indian Academy of Neurology, 6th-9th Chandigarh, India 2014.
12. Thiagarajan K, Cheng HL, Huang JE, Natarajan P, Crammond DJ, Balzer JR, Thirumala PD. Is two really better than one? Examining the superiority of dual modality neurophysiological monitoring during carotid endarterectomy: A meta-analysis. 23rd Annual Conference of Indian Academy of Neurology, Agra, India, October 1st-4th.2015.
13. Thirumala PD, Melachuri SR, Kaur J, Ninaci D, Melachuri MK, Habeych ME, Crammond DJ, Balzer JR. Diagnostic Accuracy of Somatosensory Evoked Potentials in Evaluating New Neurological Deficits After Posterior Cervical Fusions. Cervical Spine Research Society,- Europe Annual Meeting 2017, Salzburg, 24th – 26th May 2017 Oral Presentation.

14. Thirumala PD, Reddy R, Brahme IS, Prognostic value of SSEP changes for perioperative stroke during CEA. World Congress of Neurology 2017, Kyoto, Japan 16-21st September 2017, Oral Presentation.

Review and Invited Published papers

1. **Thirumala PD.** Visual evoked potentials for visual function monitoring during endoscopic sphenoidal surgery: Advancement and challenges. *Neurol India.* 2018 Jul-Aug;66(4):958-959.
2. **Thirumala P,** Hier DB, Patel P. Motor recovery after stroke: lessons from brain imaging. *Neurol Res* 2002; 24(5), 453-458.
3. **Thirumala PD,** Habeych ME, Crammond DJ, Balzer JR Intraoperative monitoring of olfactory and visual evoked potentials: Review. *Journal of clinical neurophysiology. J Clin Neurophysiol.* 2011 Dec 5.

Book Chapters:

1. **Parthasarathy D. Thirumala;** John M. Murkin, Donald J Crammond, Miguel Habeych, Jeffery Balzer, *Cerebral Monitoring during aortic surgery*, Title: Anesthesia and Perioperative Care for Aortic Surgery edited by: Drs. Kathirvel Subramaniam, K.W. Tim Park, and Balachundhar Subramaniam, Springer, 171-194, NY 2011.
-

PROFESSIONAL ACTIVITIES

TEACHING ACTIVITIES:

Course Director:

- 2016-- Principles of Intraoperative Neurophysiological Monitoring
Annual course for professionals in Clinical Neurophysiology
University of Pittsburgh Medical Center.
- 2014 Challenges and Advances in Neurology,
Annual Meeting Course, Pennsylvania Neurological Society Meeting.
Sept 13-14, 2014, Hillman Cancer Center, Pittsburgh, PA 15232.

Courses Taught:

Medical Students:

- 2009-2012 Clinical Neuroscience Clerkship Lectures:**
Peripheral Neuropathy: An Introduction to Peripheral Neuropathy
Lecture during their Neurology Clerkship, MS1
School of Medicine, University of Pittsburgh.

Undergraduate Students:

- 2008-2016 Foundations in Clinical Neurophysiology**
Course faculty: Teach 3 lectures during the course
Functional Neuroanatomy, Electroencephalography, Electrocorticography.
Course: Neuroscience 1026, Undergraduate Honors Level course in Neuroscience
University of Pittsburgh
- 2015-2016 Medical Product Ideation**
Course Faculty: Clinical Mentor
Department of Bioengineering, University of Pittsburgh

Mentoring students:

Neurology Residents and Clinical Neurophysiology Fellows:

- 2012 Daniel K Lai, MD, Neurology Resident,
Fellowship: Intraoperative Monitoring, Stanford University
Current Position: Private Practice
- 2015 Yassin Ahmed MD, Clinical Neurophysiology Fellow,
Current Position: Neurologist, Jordan University of Science and Technology
(JUST) School of Medicine, Jordan
- 2016 Katherine Anetakis MD, Clinical Neurophysiology Fellow,

2019 Current Position: Faculty, University of Pittsburgh.
Mayur Chalia MD, Clinical Neurophysiology Fellow.

Medical Students: School of Medicine, University of Pittsburgh, Pittsburgh, PA
Clinical Scientist Training Program

2017 Priya Roy Pravin ('19), Faculty Mentor

Scholarly Project and Research Electives

2010 Aalap Shah BS, Scholarly Project Research elective (MSELCT 5720)
Journal Articles accepted: 7, Abstract accepted: 1.

2013 Lance Bodily, BS ('13), Scholarly Project Research elective (MSELCT 5720)
Journal Articles accepted: 1, Abstract accepted: 1
Certificate of Merit Award for Scholarly Project

2013 Enyinna Nwachuku BS ('15) Scholarly Project Research elective (NSURG 5880)
Journal Articles Accepted: 1, Abstract accepted: 2

2014 James Jun Zhou, BS ('17) Scholarly Project Research elective (MSELCT 5720)
Journal Articles Accepted: 1, Abstract accepted: 2

2014 Danielle Heffner BS ('17), Scholarly Project Research elective (MSELCT 5720)
Journal Articles Accepted: 1, Abstract accepted: 1

2014 Melina Radparvar BS ('17), Scholarly Project Research elective (MSELCT 5720)

2014 Tejas, Karnati BS ('17), Scholarly Project Research elective (MSELCT 5720)
Journal articles Accepted: 1

2015 Nathan, Suresh ('18), Scholarly Project Research elective (MSELCT 5720)
Journal articles Accepted: 1

2015 Dhillon, Harbir ('19), **Certificate of Merit Award for Scholarly Project**

2015- Jorge, Ahmed ('19), Scholarly Project Research elective (MSELCT 5720)
Journal Articles Accepted: 1, Abstract accepted: 1

2015 Roy, Priya ('19)

2015- Daniel Lewis ('19)

2017 Felix Nguyen ('19), Scholarly Project Research elective (MSELCT 5720) 7
Certificate of Merit Award for Scholarly Project

2017 Jennifer Ahn ('19), Scholarly Project Research elective (MSELCT 5720)

2017 Mehta, Amol ('19), Scholarly Project Research elective (MSELCT 5720)
Journal Articles Accepted: 13, Abstract accepted: 1
2019 Bert and Sally O'Malley Award

2019 Jymirah Morris ('21)

2019 Amir Mina ('22) MD, PhD, MSTP 5015 Summer Lab Rotation

2020 Keelin Moehl ('22)

2020 Nate Reinhardt ('22)

2020 Bansri Patel ('22)

Deans Summer Research Project

2014 James Jun Zhou, BS

- 2014 Danielle Heffner BS
 2015 Priya Pravin Roy BS ('18)
 2015 Harbir Singh Dhillon, BS ('18)
 2015 Suresh Nathan ('18)
 2015 Raymond James Van Ham ('18)
 2015 Ahmed Jorge ('18)
 2015 Lewis, Dan ('19) **Certificate of Merit Award**
 2016 Mehta, Amol ('19)
 2019 Nikita Raman (22) **Certificate of Merit Award**
 2019 Nate Reinhardt ('22) **Certificate of Merit Award**
 2019 Bansri Patel ('22) **Certificate of Merit Award**
 2nd place at the Pennsylvania American College of
 Physicians (PA-ACP) Western Region Poster Competition
 2020 Rajiv Reddy ('23)

Medical Students from other Schools.

- 2016 Pawan Solanki ('19) Neo Med, Ohio
 2019 Aditya Muralidharan ('20), University of Maryland
 2019 Wesley Shoap ('20), University of Maryland
 FRCT 520 Scholarly Project Student Performance - Research

Pitt-med Research Experience for Pre-matriculants (PREP)

- 2018 Samyuktha Melachuri ('22)

Medical students Research mentor

- 2015 Ahmed Kashkoush ('19)
 2016 Shanaz Hossain ('19)

Graduate Students

- 2017 Mark Tripson, Slippery Rock University, Practicum

Ph.D Thesis Examiner:

- 2016 Ramesh Kunjuni, All India Institute of Medical Sciences, Delhi India.
 Thesis for MR Ramesh Kunjuni Ph.D. student in the Department of Neurobiochemistry
 Title: "Role of Human CutC Protein in Copper Homeostatis"
 2018 Mutahar Andrabi All India Institute of Medical Sciences, Delhi India.
 Thesis for Mutahar Andrabi Ph.D. student in Department of Neurobiochemistry
 Title: "Study of Clock Genes in Rat Model of Mania-like Behavior".

Undergraduate students

Faculty Mentor Thesis

2018 Justin Meinert, Thesis advisor, BPhil, University of Pittsburgh
Medical School, Drexel School of Medicine

Undergraduate students

Department of Neuroscience, University of Pittsburgh

- 2008 Kelley Wichman
Independent study and Thesis Research: NROSCI 1901,
Spring 2010: Independent study and Thesis Research: NROSCI 1961,
Grade Option: 4 letter credits. Department of Neuroscience
Journal Articles accepted: 4, Abstract accepted: 4,
- 2010 Tara Nikonow BS, Department of Neurosurgery,
- 2011 Mark Potter, Faculty Mentor, Undergraduate Independent Study
Fall 2011: Independent study and Thesis Research: NROSCI 1901, 2 Credits
Spring 2012: Independent study and Thesis Research: NROSCI 1901, 2 Credits
Fall 2012: Independent study and Thesis Research: NROSCI 1901, 2 Credits
Spring 2013: Independent study and Thesis Research: NROSCI 1901, 2 Credits
Journal Articles accepted: 1, Abstract accepted: 1,
- 2011 Elizabeth Langan, First Experience in Research, Pass/Fail
- 2012 Erin Paolini, Faculty mentor, First experience in Research
Fall 2012: Independent study and Thesis Research: NROSCI 1901, 2 Credits
Spring 2013: Independent study and Thesis Research: NROSCI 1901, 1 Credit
- 2012 Hannah Cheng, Faculty mentor, First experience in Research, 1 Credit
Spring 2013: Independent study and Thesis Research: NROSCI 1901, 1 Credit
Fall 2013: Independent study and Thesis Research: NROSCI 1901, 1 Credit
Spring 2014: Independent study and Thesis Research: NROSCI 1901, Grade: 1 Credit
Medical Student, Drexel School of Medicine.
- 2012 Greg Carnovale, Faculty mentor, First experience in Research, 1 Credit
Spring 2013: Independent study and Thesis Research: NROSCI 1901, 1 Credit
Fall 2013: Independent study and Thesis Research: NROSCI 1901, 2 Credits.
Spring 2014: Independent study and Thesis Research: NROSCI 1901, 2 Credits.
Journal Articles: 1; Abstract: 1
- 2013 Lauren Baff,
Spring 2013: Independent study and Thesis Research: NROSCI 1901, 1 credit.
Fall 2012: Independent study and Thesis Research: NROSCI 1901, 2 Credits.
- 2013 Chris Nguyen, Faculty mentor, First experience in Research, 1 credit.
Fall 2013: Independent study and Thesis Research: NROSCI 1901, 2 Credits.
Spring 2014: Independent study and Thesis Research: NROSCI 1901, 2 Credits.
Fall 2014: Independent study and Thesis Research: NROSCI 1901, 1 Credits.
Spring 2015: Independent study and Thesis Research: NROSCI 1901, 2 Credits.
Fall 2015: Thesis writing Practicum Agreement: NROSCI 1962, 1 Credit.
Fall 2015: Independent study 1901 and Thesis Research: NROSCI 1962, 2 Credits.

Dental School, University of Pennsylvania

- 2013 Trevor Octavio
Spring 2013, Faculty mentor, First experience in Research, 1 Credit.
- 2013 Dennis Rodriguez,
Spring 2013, Faculty mentor, First experience in Research, 1 Credit.
- 2014 Nicholas Tost
Spring 2014, Faculty mentor, First experience in Research ARTSC 0120, 1 Credit.
- 2014 Simona Avramovska,
Spring 2014, Faculty mentor, First experience in Research ARTSC 0120, 1 credit
- 2014 Alexandria Jansen
Spring 2014, Faculty mentor, First experience in Research ARTSC 0120, 1 Credit.
- 2014 Katherine Barnett:
Spring 2014, Faculty mentor, First experience in Research ARTSC 0120, 1 Credit.
Fall 2014, Faculty mentor: Continuing experiences in Research ARTSC 0121
- 2014 Greg Adams
Spring 2014: Independent study and Thesis Research: NROSCI 1901, 4 Credit
- 2014 Rohan Krishnan
Fall 2014, Independent study and Thesis Research: NROSCI 1901, 2 Credit
Spring 2014, Independent study and Thesis Research: NROSCI 1901, 1 Credit
Fall 2015, Independent study and Thesis Research: NROSCI 1961, 1 Credit
- 2014 Simrath Randhawa
Fall 2014: Independent study and Thesis Research: NROSCI 1901, 2 Credit.
Spring 2014: Independent study and Thesis Research: NROSCI 1901, 2 Credit.
- 2015 Nihita Manem
Spring 2015, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
Fall 2015, Independent study and Thesis Research: NROSCI 1961, 1 Credit.
- 2015 Erika Fish
Spring 2015, Faculty mentor, First experience in Research ARTSC 0120, 1 Credit.
Fall 2017, Independent study and Thesis Research: NROSCI 1901, 3 Credit.
Spring 2018, Independent study and Thesis Research: NROSCI 1901, 1 Credit
- 2015 Justin Meinert,
Spring 2015, Faculty mentor, First experience in Research ARTSC 0120, 1 credit.
Fall 2015, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
Spring 2016, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
Fall 2016, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
Spring 2017, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
Spring 2018, Independent study and Thesis Research: NROSCI 1901, 2 Credit.
- Medical student, Drexel School of Medicine*
- 2015 Catherine Morba
Spring 2015, Faculty mentor, First experience in Research ARTSC 0120, 1 credit.
- 2015 Indraneel Brahme,
Spring 2015, Faculty mentor, First experience in Research ARTSC 0120, 1 Credit.
Fall 2015, Faculty Mentor, Undergraduate Research BIOSC 1903, 1 Credit.
Spring 2016, Faculty Mentor, Undergraduate Research BIOSC 1903, 1 Credit.
Fall 2016, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
Spring 2017, Independent study and Thesis Research: NROSCI 1901, 1 Credit.

- Fall 2017, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
Medical student, California Northstate University College of Medicine
- 2015 Philip Himmelstein
 Spring 2015, Faculty mentor, First experience in Research ARTSC 0120, 1 Credit.
- 2015 Samyuktha Ratnam Melachuri,
 Fall 2015, Independent study 1901 and Thesis Research: NROSCI 1962, Credit 2
 Spring 2017 Independent study and Thesis Research: NROSCI 1901, Credit 1.
Medical student, University of Pittsburgh
- 2016 Jiali Wen
 Spring 2016 Faculty mentor, First experience in Research ARTSC 0120, 1 Credit.
 Fall 2016 Faculty Mentor: Continued experience in Research ARTSC 0121, 1 Credit.
 Spring 2017 Independent study and Thesis Research: NROSCI 1901, 3 Credit.
 Fall 2017, Independent study and Thesis Research: NROSCI 1901, 2 Credits.
- 2016 Rajiv Reddy,
 Fall 2016, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
 Spring 2017, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
 Fall 2017, Independent study and Thesis Research: NROSCI 1901, 2 Credits.
Medical student, University of Pittsburgh
- 2017 Carolyn Stopera
 Spring 2017 Faculty mentor, First experience in Research ARTSC 0120, 1 Credit.
 Fall 2017, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
 Spring 2018, Independent study and Thesis Research: NROSCI 1901, 2 Credit.
 Spring 2019, Independent study and Thesis Research: NROSCI 1901, 2 Credit.
- 2017 Thia Paruchuru
 Spring 2017, Faculty mentor, First experience in Research ARTSC 0120, 1 Credit.
 Fall 2017, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
- 2017 Megan Rode
 Spring 2017, Faculty mentor, First experience in Research ARTSC 0120 . 1 credit
 Fall 2017, Independent study and Thesis Research: NROSCI 1901, 2 Credit.
 Spring 2018, Independent study and Thesis Research: NROSCI 1901, 3 Credits.
 Fall 2018, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
 Fall 2019, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
- 2017 Michael Moran
 Spring 2017, Independent study and Thesis Research: NROSCI 1901, 2 Credits.
- 2017 Matthew Karr
 Spring 2017, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
 Fall 2017, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
 Spring 2018, Independent study and Thesis Research: NROSCI 1901. 1 Credit.
- 2017 Pragnya Iyengar
 Spring 2017, Independent study and Thesis Research: NROSCI 1901, 2 Credits.
 Fall 2017, Independent study and Thesis Research: NROSCI 1901, 2 Credits.
- 2018 Brooke Vulcano
 Spring 2018, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
 Fall 2018, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
- 2017 SaiKrishna Kothapalli
 Fall 2017, Independent study and Thesis Research: NROSCI 1901, 2 Credits.

- Fall 2018, Independent study and Thesis Research: NROSCI 1901, 2 Credits.
- 2018 Stephanie Paras,
Spring 2018, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
Fall 2019, Independent study and Thesis Research: NROSCI 1901, 2 Credits
- 2018 Gabrielle Stout, Independent study and Thesis Research: NROSCI 1901, 2 Credits.
Spring 2019, Independent study and Thesis Research: NROSCI 1901, 2 Credits.
Fall 2019, Independent study and Thesis Research: NROSCI 1901, 2 Credits.
- 2019 Pallavi Muluk, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
Fall 2019 Independent study and Thesis Research: NROSCI 1901, 1 Credit.
Spring 2020 Independent study and Thesis Research: NROSCI 1901, 1 Credit.
- 2019 Hannah Easow, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
Fall 2019, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
Spring 2020, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
- 2019 Robert Chang, Independent study and Thesis Research: NROSCI 1901, 3 Credits
- 2020 Maya Cara Fleseriu, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
Fall 2020, Independent study and Thesis Research: NROSCI 1961, 1 Credit.
- 2020 Jacob Frenchman, Independent study and Thesis Research: NROSCI 1901, 1 Credit.
Fall 2020, Independent study and Thesis Research: NROSCI 1961, 1 Credit.
- 2020 Haishal Patel, Independent Study and Thesis Research: NROSCI1901 Credit.
- 2020 Morgan Salter, Independent Study and Thesis Research: NROSCI1901 Credit.
- 2020 Brandie Bottz, Independent Study and Thesis Research: NROSCI1901 Credit.

School of Arts and Sciences:

- 2013 Sam Friedlander
Spring 2013, Faculty mentor, First experience in Research, 1 Credit.
Fall 2013: Undergraduate research Chem 1710, Grade option: Pass/fail
Spring 2014: Undergraduate research Chem 1710, Grade option: Pass/fail.
Osteopathic School of Medicine, Ohio
- 2016 Rebecca Doyle
Spring 2016, Faculty mentor, First experience in Research ARTSC 0120, 1 credit.
- 2016 Hunter Skroczyk
Spring 2016, Faculty mentor, First experience in Research ARTSC 0120, 1 credit
- 2016 Joshua Frost
Spring 2016, Faculty mentor, First experience in Research ARTSC 0120, 1 credit.
- 2016 Patrick Healy
Spring 2016, Faculty mentor, First experience in Research ARTSC 0120, 1 Credit.
- 2017 Megan Dehavan
Spring 2017, Faculty mentor, First experience in Research ARTSC 0120, 1 credit
- 2019 Jaideep Reddy
Spring 2019, First experience in Research: ARTSC 0120, Grade option: Pass or Fail
- 2019 Rohan Patil
Spring 2019, Undergraduate Research BIOSC 1903, Grade Option Pass or Fail.
Fall 2019, Undergraduate Research BIOSC 1903, 2 Credit.
Spring 2020, Undergraduate Research BIOSC 1903, 1 Credit.

Mentoring Foreign Medical Graduate Research Students:

- 2013 Preethi Ilangovan M.B.B.S, *Internal Medicine Residency, University of Texas Austin.*
- 2013 Santhoshkumar Mohanraj MD, *Occupational Physician, Chennai India*
- 2013 Harsha Kumar M.B.B.S, *Radiology Residency, Dubai, UAE.*
- 2013 Balaji Krishnaiah M.B.B.S, *Neurology Residency, Penn State Hershey Medical Center*
Current Position: Assistant Program Director, Neurology, University of Tennessee,
- 2014 Karthy Thiagarajan M.B.,B.S, *Family Medicine Center, Bethelhem, PA*
- 2014 Prithviraj Natarajan M.B.,B.S, *Magnetoencephalography Research, NYU, NY.*
- 2014 Reshmi Udesh MBBS, *Surgery Residency, Howard University, DC*
- 2017 Cheran Elangovan, MBBS, *Neurology Residency, Penn State Hershey Medical Center*
- 2017 Praveen Hari MBBS, *Neurology Residency, University of Nebraska Medical Center*
- 2016 Amritha Soundar M.B.B.S, *Physician, National Health Service UK.*
- 2017 Alaa Saleh MD, *Internal Medical Residency, Florida*
- 2017 Ahmed Teebi MD, *Internal Medical Residency, Wayne State, Detroit.*
- 2017 Eyad Saca MD, *Neurology Residency, University of Alabama.*
- 2017 Khaled Al Robaidi MD, *Pediatric Neurology, University of Alabama.*
- 2017 Rami Haider MD, *Neurology Resident, Henry Ford Hospital, Detroit.*
- 2018 Samir Ghazawi MD, *Neurology Resident, Memorial Hospital, Florida*
- 2018 Qasem Shaer MD, *Neurology, Emory University Hospital, Atlanta, GA.*
- 2018 Laith Alhuneafat MD, *Medicine, Alleghany General Hospital, Pittsburgh, PA.*
- 2018 Nada Al-rifai MD, *Medicine, Alleghany General Hospital, Pittsburgh, PA.,*
- 2019 Yasodhara Priyadharsini MD, *Neurology, University of Kentucky, Louisville, KC*
- 2019 Akram Azzal MD, *Medicine, George Washington University, Washington DC.*
- 2020 Amar Batta MD,

High School Students: Mentor: Pittsburgh Sci-Tech

- 2012 Keenan Brown, Nia Miller
- 2013 Alan Hord, Kevin Demus

Visiting Scholars:

- 2009 Paula Araya MD, Neurologist, *Santiago, Chile*
- 2009 George Kariampuzha MD, Tyler, Tx 75702
- 2010 Bruce Katerna MD, Denver, CO
- 2010 Peter Stefanides MD, Garden City, NY 11530
- 2018 Carla Fierra MD, *Sao Paulo, Brazil.*
- 2018 Anas AlBarack MBBS, Riyadh, *Kingdom of Saudi Arabia.*
- 2019 Daniel Santos MD, *Rio de Janeiro, Brazil.*
- 2019 Gautama Reddy PhD, *Bangalore, India*

Research awards/Scholarships for Students and Residents

- 2013 Certificate of Merit Award for Scholarly Project (Lance Bodily PittSOM 13)

- 2014 1st Prize Abstract Award, Pennsylvania Neurological Society (James Zhou)
- 2014 2nd Prize Abstract Award, Pennsylvania Neurological Society (Danielle Heffner)
- 2014 2nd Prize Abstract Award, Pennsylvania Neurological Society (Ahmed Kashkoush)
- 2016 Sanford J. Larson Award for the best spine research paper (Gurpreet Gandhoke)
- 2016 1st place, eposter, Cerebrovascular Neurosurgery Subsection (Nicholas Khattar)
- 2016 PittHonors Travel Award (Indraneel Brahme, Rajiv Reddy)
- 2017 Best Abstract Award, Pennsylvania Neurological Society (Eyad Saca)
- 2018 Stroke Minority Travel Grant (Eyad Saca)
- 2018 PittHonors Travel Award (Samyuktha Melachuri)

Resident & Fellow Lectures: Department of Neurology, University of Pittsburgh.

1. Introduction to Intraoperative Neurophysiology: Sept 2008, Nov 2009, Feb 2013.
2. Laplacian Montages and Digital EEG: A look at understanding and implementation of Laplacian montages. May 2007.
3. Minimally Conscious state and Persistent Vegetative state: A review of guidelines to define MCS and PVS, and legal implications. June 2007.
4. Triphasic waves: A method to distinguish triphasic appearing waves from epileptiform discharges during electrographic seizures. Jan 2007.
5. EEG and Epilepsy: An introduction to the basics EEG Neurosurgery Board preparation Residents 2007.
6. SIRPIDS: Stimulus induced rhythmic or periodic Ictal appearing discharges. Sept 2006
7. Evaluation of Myopathy: An introduction to evaluation of myopathy to neurology residents.
8. Wernicke Korsakoff Psychosis: Identification and treatment lecture as a part of introductory neurology course for residents 2005, 2006.

Medical Student Lectures:

1. Peripheral Neuropathy: An Introduction to Peripheral Neuropathy. Medical students IV 2006. University of Pittsburgh School of Medicine.
2. Pharmacotherapeutics in Epilepsy: A review of complications from antiepileptic drugs during treatment with epilepsy. Medical students III course in neurology 2005, 2006, 2007. University of Pittsburgh School of Medicine.

Nursing Students Lectures:

1. Epilepsy Introduction: An introduction about epilepsy and disease treatment to nursing graduates. Feb 2007. University of Pittsburgh, School of Nursing.

RESEARCH

Current Grant Support:

Project Number Source Title	Dates of Project Total cost Role	Person Month % calendar months
IIP1734751 NSF I-Corps READE: Realtime Evaluation of Adverse Events The aim of the project is to help early stage technology and services to commercial translational process.	9/01/20- 03/31/21 3,000	0
Research Grant (PI: PT) UPMC Enterprises Real time Evaluation of Adverse Events (READE-IONM). A machine learning tool to detect perioperative stroke. Role: PI	6/2020- 5/2021 564,117	2.4
2D43TW009114-06 (PI: VM) NIH. Psychiatric research infrastructure for intervention and implementation in India (PRIIIA). Consultant for Neurology Teaching.	2019-2024.	0
1R43NS107143-01A1 (PI: Jia) NIH/NINDS/SBIR Leadless EEG Sensor for Emergency Medicine. Role: Co- Investigator The aim of this project is to develop a self-contained EEG sensor in the size of a U.S. penny that is miniature, leadless and single-unit, reducing the clinical EEG practice from a complex procedure to a simple twist on the scalp.	9/15/2019 – 5/29/2020 150,000	0.5
3R41DC017406-01S1 (PI: Bao), NIH/NIDCD/STTR, An unique patient population for clinical trials against noise-induced hearing loss. <u>Subaward to University of Pittsburgh, PI Parthasarathy Thirumala (PT)</u>	09/1/2019-03/31/2021 40,000	0.6
412691(PI: Bryan Tilman) DoD Grant A Rapid, Temporary Distal Perfusion Stent for Hemorrhagic Injuries of the Torso. Role: Co-Investigator	09/30/2016 to 09/29/2020 2,500,000	0.24
Research Grant (PI: Nitin Aggarwal) Spine Research Award: Biomarkers and Severity of Perioperative Spinal Cord Injury, Department of Neurological Surgery Spine Research Fund. Role: Co-Investigator, Faculty Mentor for Dr Aggarwal.	07/1/2019-06/31/2020 10,000	0.03

Pending

Past Funding:

Research Grant (PI: Nitin Aggarwal)	07/1/2018-06/31/2019	0.03
Spine Research Award:	10,000	
Biomarkers and Severity of Perioperative Spinal Cord Injury, Department of Neurological Surgery Spine Research Fund.		
Role: Co-Investigator, Faculty Mentor for Dr Aggarwal.		
Research Grant (PI: Nitin Aggarwal)	07/1/2017-06/31/2018	0.24
Spine Research Award:	5,000	
Perioperative spinal cord injury. Role: Co-Investigator, Faculty Mentor for Dr Aggarwal.		
Research Grant (PI: PDT)	9/17/15 -9/16/16	0.12
Copeland Fund of Pittsburgh	5,000	
Hypothermia to reduce iatrogenic neurological injury in laboratory animals.		
Research Grant (PI: Mingui Sun)	2014	0.00
Center for Medical Innovation,	12,000.	
Single-Unit Leadless EEG Sensor in the Size of a U.S. Penny		
Research Grant (PI: PDT)	07/1/2014-06/31/2015	0.12
Copeland Fund of Pittsburgh	6,000	
Sensitivity and specificity of neurophysiological changes to detect iatrogenic neurological injury in laboratory animals		

Patents:

2015 Single-Unit Leadless EEG Sensor (Klarquist Ref. No. 8123-95521-01), Mingui Sun, Wenyan Jia, Di Gao, Parthasarathy Thirumala, Jeffrey Balzer

Ad Hoc Reviewer

2008-present Neurology
2010-present American Journal of Electroneurodiagnostic Technology
2012-present Journal of Clinical computation and Research
2013-present Frontiers in Neuroscience
2011-present Neurological research
2014-present Journal of Biomedical and Health Informatics
2014-present Journal of Clinical Neurophysiology
2015-Present European Neurology
2015-Present Journal of Neurology, Neurosurgery and Psychiatry
2015-present Transactions on Neural Systems and Rehabilitation Engineering
2015-present PLOS one A peer-reviewed, open Access Journal
2016-present Journal of Neurological Surgery Part B
2016-present Brain and Behavior

2016-present Scientific Reports (IF 4.259)
2017-present Neurohospitalist

Grant Review:

Copeland Grant, Pittsburgh Foundation 2012-present
MEG center, Department of Neurological Surgery 2014-present

List of CURRENT RESEARCH INTERESTS:

Perioperative Neurology, Intraoperative Neurophysiological Monitoring.

INVITED SEMINARs and LECTURSHIP

Course Faculty:

1. Session Chair, Evoked potentials and IONM. 31st International Congress of Clinical Neurophysiology 2018, Washington DC, May 1-6th 2018.
2. Session Chair, Monitoring during microvascular decompression 1st International Summit of World Neurosurgery Federation of Cranial nerve disorders, Shanghai, Peoples Republic of China, January 14th, 2017.
3. Session Chair, Functional aspects of Skull base surgery, 18th Annual Meeting, Skull Base Society of India, September 8-11th 2016, Jaipur, India.
4. Intraoperative monitoring. Skull Base Society of India, 17th Annual meeting, October 2015, Bangalore, India
5. Neurophysiological Monitoring during skull base surgery, 16th Annual Conference of the Skull Base Surgery Society of India 11th and 12th October 2014, JIPMER, Pondicherry, India.
6. Cranial nerve monitoring during skull base surgery. Intraoperative Neurophysiological Monitoring, Asia Oceanic Skull Base Society Jan 4th-11th, Mumbai, India 2015.
7. Symposium chair: Intraoperative Monitoring during Skull Base Surgeries: Annual Meeting American Clinical Neurophysiology Society, Atlanta, GA Feb 7th 2014
 - a. Brainstem auditory evoked potentials during microvascular decompression.
 - b. Intraoperative Monitoring Endoscopic endonasal procedures.
8. Brazilian Congress of Clinical Neurophysiology and Latin American Congress of Clinical Neurophysiology, Sao Paulo, Brazil, August 14th to 17th 2019.
9. Microvascular Decompression: Peals, Pittfalls and Neurophysiological Monitoring, July 24, 2020 National Brain center Neurosurgery, Jakarta, Indonesia. (VIRTUAL)
10. Last Electrically Well: Neurophysiology of Perioperative Stroke. Canadian Association of Neuromonitoring, 2020 Annual Fall Symposium. September 19th 2020 (Virtual)

Live Workshops (Full Day):

11. Scoliosis Surgery with Live Monitoring. October 9th 2014, Park Clinic, Calcutta, India. Live demonstration with workshop about the value of Intraoperative monitoring.
12. Endoscopic Endonasal Surgery with Intraoperative Monitoring, October 10th 2014, JIPMER, Pondicherry, India. Live demonstration on the value of Intraoperative Neurophysiological Monitoring.
13. Intraoperative Neurophysiological Monitoring, Asia Oceanic Skull Base Society Jan 4th-11th, Mumbai, India 2015.
14. “D wave” Value in Spine Surgery, SRM Institute of Medical Sciences (SIMS), Chennai, India, October 7th, 2015
15. Intraoperative Neurophysiological Mapping during Brainstem tumor resection, Tata Memorial Hospital and Research Center, Mumbai October 9th, 2015
16. Intraoperative Neurophysiological Monitoring in Cranial and Spinal Procedures, National Center for Neurosurgery, Astana, Republic of Kazakhstan, November 2-5th 2015.
17. Evoked potential Monitoring during Microvascular decompression, Xinhua Hospital, Shanghai Jiao tong University, March 24th, 2015 Shanghai, China.
18. Evoked potentials monitoring, Narayana Hridayala Hospital, August 1st 2016, Bangalore, India.
19. Intraoperative Neurophysiological Monitoring, 18th Annual Skull Base society Sept 8-11th 2016, Jaipur, India.

Invited National Lectures:

20. Introduction to Neurophysiological monitoring, Pennsylvania Neurological society, Harrisburg, PA October 24, 2009.
21. Neurophysiological monitoring during Neurointerventional procedures, Society of Vascular and Interventional neurology, 2010 Annual meeting, at San Francisco, January 16, 2010.
22. Monitoring extraocular muscles and mapping of the cranial nerve nuclei, American Clinical Neurophysiology society, 2010 Annual meeting, at San Diego, February 2, 2010.
23. Concurrent Session #5: Neuro-Otology: Minimizing Risk: Making Choices for Vestibular Schwannoma (Consensus Panel). North American Skull Base Society, Las Vegas, February, 2012.
24. Scope of Intraoperative Monitoring. Pennsylvania Neurological Society, Harrisburg, PA September 9th, 2012.

25. **Parthasarathy Thirumala MD:** Brainstem auditory evoked potentials Alarm Criteria: Are We crying Wolf !. ASNM, Chicago Oct 27-29, 2012.
26. Neurophysiological Monitoring During Interventional Neurology Procedures. ASNM, ASNM's 2013 Winter Symposium, at the Hyatt Regency San Antonio Riverwalk, Texas. February 2-3 2013.
27. Neuromonitoring during cardiac surgery, First Annual Perioperative and Critical Care Monitoring conference and workshops, August 24 and 25, 2013. UPMC Haberman Conference Center, UPMC Shadyside Campus, Pittsburgh, PA
28. Neurophysiological Monitoring During Interventional Neurology Procedures: PittsburghExperience ICIN, PNS Annual Meeting, Philadelphia Convention Center, Oct 12th, 2013.
29. Intraoperative Monitoring during cardiac surgery, PENNSYLVANIA STATE PERFUSION SOCIETY CONFERENCE - SPRING 2014 April 4-6, 2014 - Wyndham Grand Hotel 600 Commonwealth Place, Pittsburgh, Pa.
30. Advocacy in Neurology, American Academy of Neurology, State society round table, September 12th, 2015, Minneapolis, MN
31. Intraoperative Monitoring during vascular surgery, Pennsylvania Neurological Society, Hotel Hershey. October 24th, 2015, Hershey, PA.
32. New Alarm Criteria for SEP/BAEP Monitoring, Joint Symposium Argentinean Society (ASECN)/ACNS: Innovations in NIOM Interpretation February 11, 2017, Phoenix, Arizona.
33. Somatosensory evoked potentials: American Clinical Neurophysiology, Annual Course in Intraoperative Neurophysiological Monitoring, Las Vegas, NV, Feb 6-10th 2019.

Invited International Lectures:

34. Intraoperative Neurophysiological monitoring: Kokilaben Dhirubhai Ambani hospital and medical research Institute, Mumbai, India. Dec 23rd, 2010.
35. Symposium: Intraoperative Neurophysiological Monitoring during Spinal Surgeries. We have lost signals. Step by Step evaluation. ASSICON, Calcutta, India. Jan 24th, 2014.
36. Continuous EEG monitoring in the ICU. Institute of Neurology, Madras Medical College, Chennai, India June 24th, 2014
37. Intraoperative Neurophysiological Monitoring: A case based presentation, CME Program, Meenakshi Mission Hospital and Research Center, Madurai, 2014.

38. Intraoperative Neurophysiological Monitoring during scoliosis surgery, October 9th 2014, Park Clinic, Calcutta, India.
39. Intraoperative Electromyographic Monitoring during Endoscopic Endonasal Procedure, Oct 10th, 2014.
40. Brainstem auditory evoked potentials 16th Annual Conference of Skull Base Surgery Society of India, October 10th 2014.
41. Extraocular Cranial Nerve Monitoring, 12th Asia Oceanic Skull Base Society Jan 4th-11th, Mumbai, India 2015.
42. Brainstem auditory evoked potential “Weather Report” 17th Annual Conference of Skull Base Surgery Society of India, October 10th 2015.
43. Cranial nerve monitoring during skull base surgery. 17th Annual Conference of Skull Base Surgery Society of India, October 10th 2015.
44. Intraoperative Monitoring: Overview: National Center for Neurosurgery, Astana, Republic of Kazakhstan, November 3rd 2015
45. Tethered cord surgery National Center for Neurosurgery, Astana, Republic of Kazakhstan, November 4th 2015
46. Brainstem mapping. National Center for Neurosurgery, Astana, Republic of Kazakhstan, November 5th 2015.
47. Brainstem auditory evoked potential during microvascular decompression, The First Pan Yantze River Delta Neurosurgery Forum, March 25th, 2016, Shanghai, PR China.
48. Intraoperative Neurophysiological Monitoring, Chennai Neuro Society Meeting, April 23rd 2016, SIMS Hospital, Chennai, India.
49. Motor mapping: Penfield to present. Narayana Hridayala Hospital, August 1st 2016, Bangalore, India.
50. Extraocular cranial Nerve monitoring, 18th Skull Base Society of India Annual Meeting, Sept 8-11th 2016, Jaipur, India.
51. Neurophysiological monitoring during Microvascular decompression. 18th Skull Base Society of India Annual Meeting, Sept 8-11th 2016, Jaipur, India.
52. Facial nerve monitoring during Microvascular decompression, 1st International Summit of the World Federation of Cranial Nerve Disorders, Shanghai, PRC, Jan 14th, 2017.

53. Lateral Spread response during Microvascular decompression. 1st International Summit of the World Federation of Cranial Nerve Disorders, Shanghai, PRC, Jan 14th, 2017.
54. Intraoperative Monitoring in a avoiding complication, International Conference on Complications in Neurosurgery (ICCN), Mumbai, March 3-5,2017.
55. Intraoperative Monitoring during Scoliosis Surgery, 2nd International summit of the World Federation of Cranial Nerve Disorders, Shanghai, PRC, Jan 13th, 2018.
56. Hemifacial Spasm and Lateral Spread Response, 2nd International summit of the World Federation of Cranial Nerve Disorders, Shanghai, PRC, Jan 14th, 2018.
57. Intraoperative neurophysiological monitoring, Kauvery Hospital, Chennai India, March 2nd, 2018.
58. Electrophysiology of nerve injuries in the operating room, Department of Physical Medicine and Rehabilitation, Christian Medical College, Vellore, India, March 3rd, 2018.
59. Basics of Auditory evoked potential, Brazilian Congress of Clinical Neurophysiology, Sao Paulo, Brazil, August 14th. 2019.
60. Intraoperative Neurophysiological Monitoring in infratentorial Surgeries Brazilian Congress of Clinical Neurophysiology, *Sao Paulo, Brazil*, August 14th. 2019.
61. Intraoperative Neurophysiological Monitoring during Carotid Endarterectomy, Brazilian Congress of Clinical Neurophysiology, *Sao Paulo, Brazil*, August 14th. 2019.
62. Perioperative Stroke: Is it time to call Code Stroke, 12th Annual Canadian Association of Neurophysiological Monitoring Symposium. *Winnipeg, CA* Sept 19th 2019.

Visiting Professorship

63. Intraoperative Neurophysiological Monitoring during Microvascular decompression, What we know and what we don't. Department of Neuroscience, Winthrop University Hospital, Mineola, NY, June 2013.
64. Advocacy in Neurology: Department of Neurology, Penn state Hershey Medical Center, Hershey, PA Dec 5th, 2014.
65. Intraoperative Monitoring. Department of Neurosurgery, Tata Memorial Hospital, Mumbai, India. March 2nd, 2017.
66. Monitoring during endoscopic endonasal surgery. Department of Neurosurgery. Christian Medical College Vellore, India March 3rd, 2018.

67. Neurophysiology of Perioperative Neurology, Department of Neurosurgery, National Institute of Mental Health and Neurosciences, Bangalore, India, June 15th, 2019.

Invited Grand Rounds:

68. Intraoperative monitoring during cardiac surgery, Division of Cardiothoracic Surgery, UPMC Passavant Hospital, PA, October 2010.

69. Intraoperative monitoring during cardiac surgery, Heart, Lung and Esophageal Surgery Institute, UPMC, PA September 2009.

70. Cough and Weakness: Lambert-Eaton myasthenic syndrome (LEMS) at the VA Health system, Pittsburgh, PA 2007.

71. An Unusual Case of Coma: A case of acute inflammatory demyelinating polyneuropathy and coma. Department of Neurology, UPMC. 2006

Webinar:

1. Intraoperative Neurophysiological Monitoring During Microvascular Decompression, June 18th, 2015, Specialty Care, Tennessee.

SERVICE:**University of Pittsburgh,**

2009-Present: Graduate Faculty, Physician Scientist Training Program University of Pittsburgh, School of Medicine, Pittsburgh, PA 15213.

2013- Present Medical student Contact, Department of Neurological Surgery
Mentor, Medical School Scholarly Project.

2013-Present Telemedicine Evaluation Committee, Center for Connected Medicine, UPMC

2013-2014 MyUPMC Anywhere Care, Operations and Clinical Care Committee, UPMC

2014-2015 Ambassador, Asia Region, Global Care, UPMC

Service in Pennsylvania:

2013-2015 Pennsylvania Neurological Society, Board Member

2013-2015: Pennsylvania Medical Society, Specialty Leadership Cabinet.

2013-2015: President, Pennsylvania Neurological Society.

2015-2019 Board Member, Pennsylvania Neurological Society

National Service:

2013 American Telemedicine Association, Liaison

2015- State work group, Government Relations Committee, American Academy of Neurology

2013-2016 Social and Website Committee, American Clinical Neurophysiology Society.

2016- Chair, Social and Website Committee, American Clinical Neurophysiology Society

2014-2017 Advocacy Committee, American Clinical Neurophysiology Society.

2017- Member, Advocacy Committee, American Academy of Neurology.

Advocacy:**Federal:**

- 2010- Neurology on the Hill Program, Annual visit to Washington DC to advocate on behalf of patients, physicians to improve the care of neurological disorders. Meet with Senators and Congressman to lobby for specific issues related to practice of Neurology.
- 2012 Physician Representative, Alliance for advocacy against pay cuts to Intraoperative Neurophysiological Monitoring.
- 2013 Grass Roots Alliance, American Academy of Neurology.
- 2013 HR 1838: Requested Congressman Rothfus’s support of this legislation: Invited him to visit University of Pittsburgh Medical Center. The bill was sponsored by Representatives’ Steve Stivers (R-OH) and Jim Moran (D-VA) and would add Neurology, Ob/Gyn and Psychiatric visits to the “Medicaid Bump” and extend Medicare rates for these Specialist visits to Medicaid recipients.
- 2017 Visited the office of Rep Mike Doyle (PA 14) to advocate on the BRAIN Initiative. BRAIN Initiative increases funding for NIH research.
- 2018 Neurology off the Hill program, managing a program at the Academy of Neurology to connect neurologists to local congressman to improve advocacy.
- 2018 Coordinated the visit by Rep Keith Rothfus (PA 17) to the Multiple Sclerosis center. Highlighted issues including drug pricing and funding.
- State:**
- 2012 SB 137: Scope of Practice Legislation, Physician supervision for audiologist in PA. Added an amendment to a bill to which prevented audiologist from providing intraoperative monitoring services and perioperative neurological evaluation.
- 2013 Medicaid Expansion in the state of PA: Launched a public campaign via Facebook, Twitter, and Blogpost “yes2healthierPA” to encourage the governor to expand Medicaid in PA. @yes2healthierPA.