

**Predicting Intracerebral Hemorrhage Expansion with non-contrast CT:
The BAT Score**

Andrea Morotti, MD; Dar Dowlatshahi, MD, PhD; Gregoire Boulouis, MD, MSc;
Fahad Al-Ajlan, MD; Andrew M. Demchuk, MD; Richard I. Aviv, MBChB;
Liyang Yu, MS; Kristin Schwab, BA; Javier M. Romero, MD; M. Edip Gurol, MD, MSc;
Anand Viswanathan, MD, PhD; Christopher D. Anderson, MD, MMSc;
Yuchiao Chang, PhD; Steven M. Greenberg, MD, PhD; Adnan I. Qureshi, MD;
Jonathan Rosand, MD, MSc; Joshua N. Goldstein, MD, PhD.

On Behalf of ATACH-II, NETT and PREDICT Investigators

SUPPLEMENTAL MATERIAL

METHODS

Development cohort

Study design and data collection

Consecutive patients with spontaneous intracerebral hemorrhage (ICH) included in a prospective single center cohort study at Massachusetts General Hospital, Boston, US from 1994 to 2015 (1–3). Clinical data were collected by physicians or clinical research coordinators through patients and family members interviews or with retrospective review of medical records. Mortality rate at 90 days was assessed via telephone interviews and querying of the Social Security Death Index national database.

Main inclusion criteria

- Diagnosis of primary spontaneous ICH
- Available baseline non-contrast CT (NCCT) scan

Main exclusion criteria

- Traumatic intracranial hemorrhage
- Brain tumor or vascular malformation presumed to be the underlying cause of the hemorrhage
- Ischemic stroke with secondary hemorrhagic transformation
- Primary intraventricular hemorrhage

Validation cohort # 1

Study design and data collection

Antihypertensive Treatment of Acute Cerebral Hemorrhage II (ATACH-2) trial (4,5).

Multicentre, international, open-label randomized clinical trial. A total of 1000 patients were randomized to intensive (systolic blood pressure target <140 mmHg) versus conventional (systolic blood pressure target <180 mmHg) blood pressure treatment with IV nicardipine within 4.5 hours from stroke onset. The trial was stopped prematurely for futility and showed no clinical benefit of intensive blood pressure reduction. Clinical variables and blood pressure measurements were collected upon admission by investigators at each study site to assess eligibility.

Main inclusion criteria

- Primary spontaneous supratentorial ICH with hematoma volume < 60 mL

- Age \geq 18 years or older
- Treatment initiated within 4.5 hours of symptom onset.
- Admission Total Glasgow Coma Scale (GCS) score \geq 5
- International normalized ratio $<$ 1.5

Main exclusion criteria

- ICH presumably due to head trauma, tumor or vascular malformation
- Brainstem or cerebellar hemorrhage
- Severe intraventricular hemorrhage
- Surgical evacuation of the hematoma
- Recent use of dabigatran
- Platelet count $<$ 50,000/mm³
- Known sensitivity to nicardipine
- Pre-morbid disability requiring assistance in ambulation or activities of daily living

Validation cohort # 2

Study design and data collection

Predicting haematoma growth and outcome in intracerebral haemorrhage using contrast bolus CT (PREDICT)(6). Multicentre, prospective observational study aimed at validation of the CT angiography spot sign as imaging predictor of ICH expansion. Demographic data and clinical variables were acquired on admission at each local site and submitted to the coordinating centre

Main inclusion criteria

- Age \geq 18 years

- Acute ICH with baseline hematoma volume < 100 mL presenting within 6 h of onset

Main exclusion criteria

- Renal impairment that precluded CTA
- Pre-stroke modified Rankin scale score > 3
- Intracranial bleeding attributable to neoplastic or vascular lesions
- Deep coma
- Major comorbid or terminal illness
- Surgery before follow-up NCCT

TABLES

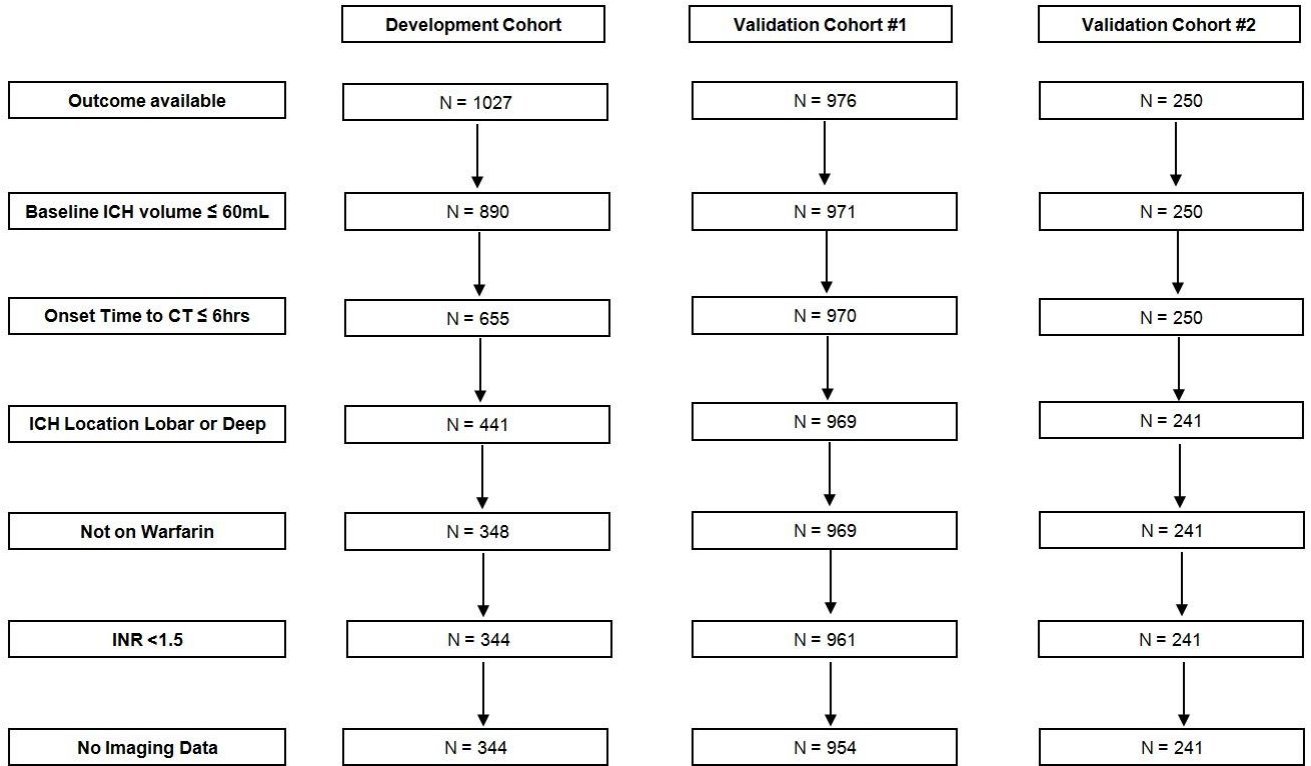
Table I. Cohorts raters and inter-rater reliability analysis

	Development Cohort	Validation Cohort #1	Validation Cohort #2
Raters	AM (Stroke Neurologist)	AM (Stroke Neurologist)	DD (Stroke Neurologist)
	GB (Neuroradiologist)	GB (Neuroradiologist)	FA (Stroke Fellow)
Cohen's Kappa (95% CI)			
Hypodensities	0.87 (0.77 - 0.97)	0.83 (0.76 - 0.90)	0.86 (0.84 - 0.88)
Blend Sign	0.67 (0.44 - 0.89)	0.71 (0.57 - 0.85)	0.91 (0.89 - 0.93)

CI indicates confidence interval.

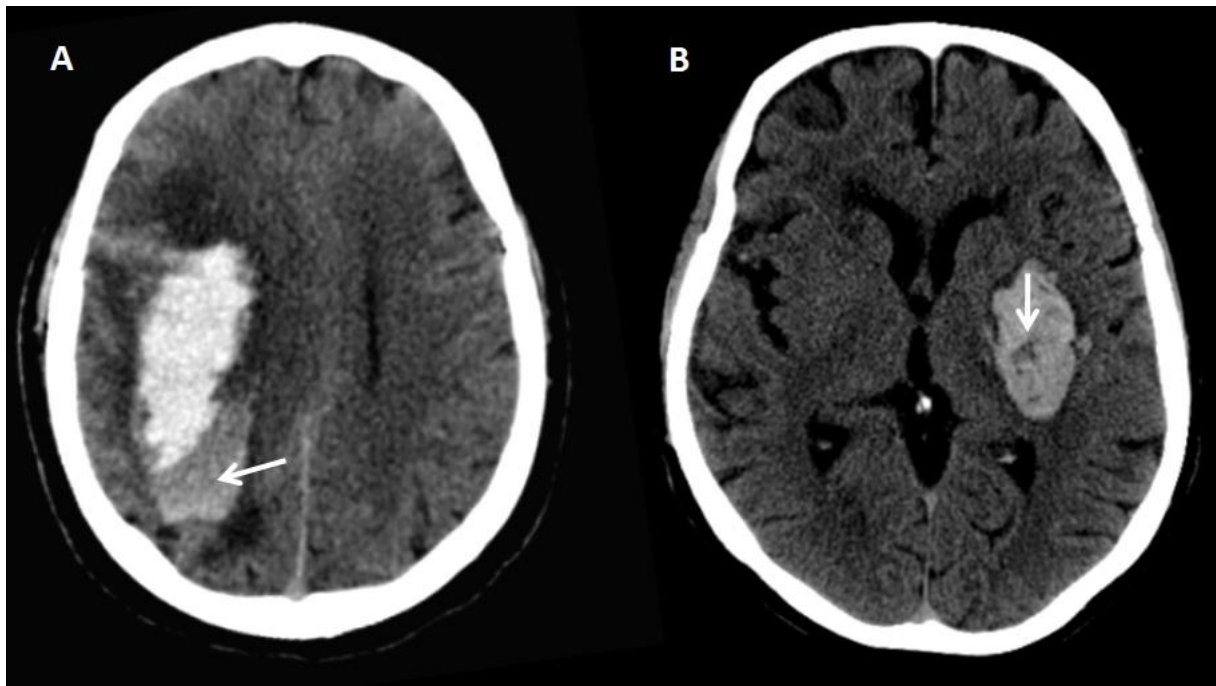
FIGURES

Figure I. Cohorts Selection Flowchart



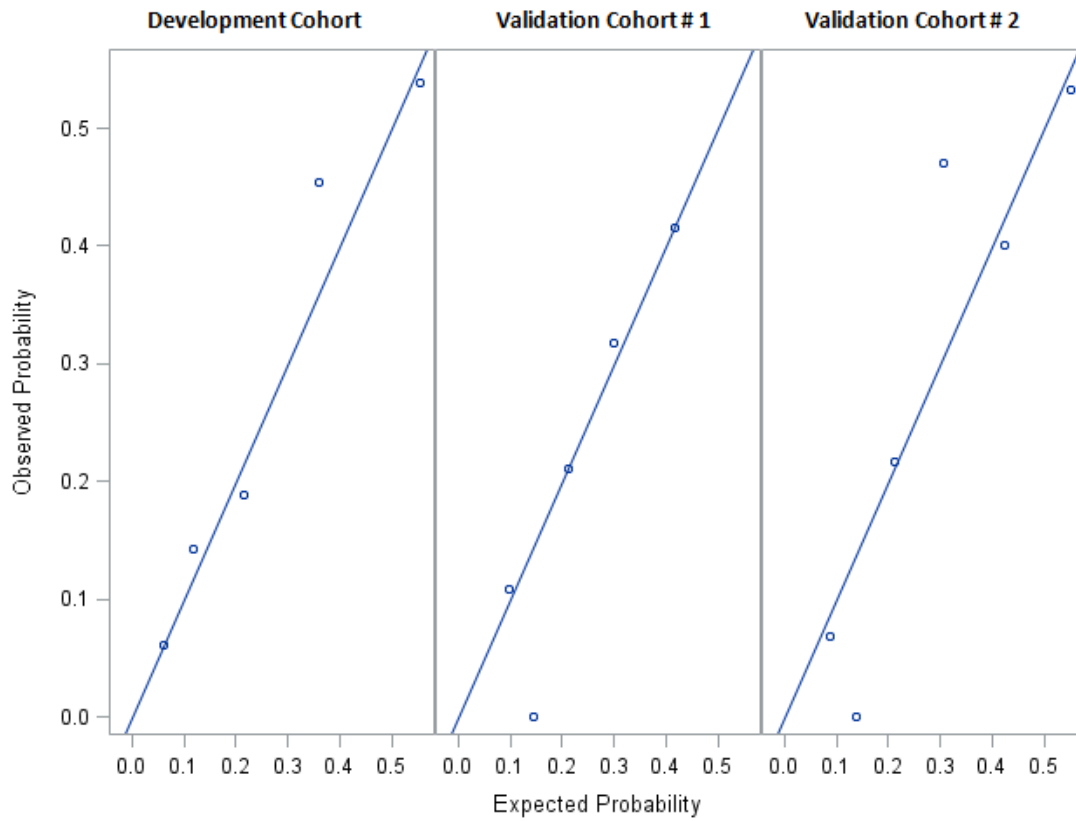
ICH indicates intracerebral hemorrhage; INR indicates International normalized ratio.

Figure II. Blend Sign and Intra-hematoma Hypodensity



Illustrative example of blend sign (A, arrow) and intra-hematoma hypodensity (B, arrow) on admission non-contrast computed tomography.

Figure III. BAT score calibration



The Hosmer-Lemeshow goodness-of-fit statistic was used for calibration. A graphical illustration of the calibration results is presented by plotting observed outcome by groups of predictions.

REFERENCES

1. Morotti A, Phuah C-L, Anderson CD, Jessel MJ, Schwab K, Ayres AM, et al. Leukocyte Count and Intracerebral Hemorrhage Expansion. *Stroke*.2016;47:1473–8.
2. Boulouis G, Morotti A, Brouwers HB, Charidimou A, Jessel MJ, Auriel E, et al. Association Between Hypodensities Detected by Computed Tomography and Hematoma Expansion in Patients With Intracerebral Hemorrhage. *JAMA Neurol*.2016;73:961.
3. Morotti A, Charidimou A, Phuah C-L, Jessel MJ, Schwab K, Ayres AM, et al. Association between serum calcium level and extent of bleeding in patients with intracerebral hemorrhage. *JAMA Neurol*.2016;73:1285.
4. Qureshi AI, Palesch YY, Barsan WG, Hanley DF, Hsu CY, Martin RL, et al. Intensive Blood-Pressure Lowering in Patients with Acute Cerebral Hemorrhage. *N Engl J Med*.2016;375:1033-43.
5. Qureshi AI, Palesch YY. Antihypertensive Treatment of Acute Cerebral Hemorrhage (ATACH) II: design, methods, and rationale. *Neurocrit Care*.2011;15:559–76.
6. Demchuk AM, Dowlatshahi D, Rodriguez-Luna D, Molina C a., Blas YS, Dzialowski I, et al. Prediction of haematoma growth and outcome in patients with intracerebral haemorrhage using the CT-angiography spot sign (PREDICT): A prospective observational study *Lancet Neurol*.2012;11:307–14.

Antihypertensive Treatment of Acute Cerebral Hemorrhage (ATACH)-2

Co-Investigators appendix

Adnan I. Qureshi, MD (Trial Coordination Center , Zeenat Qureshi Stroke Research Center, University of Minnesota, Principal Investigator) Haitham Hussein, MD (Trial Coordination Center, Zeenat Qureshi Stroke Research Center, University of Minnesota ,Consent and CRF Development); Jill M. Novitzke, MPA, BSN, CCM, CLNC (Trial Coordination Center, Zeenat Qureshi Stroke Research Center, University of MinnesotaMonitoring Oversight); Cathie Witzel, BA (Administrative Assistance, Editing, Trial Coordination Center, Zeenat Qureshi Stroke Research Center, University of Minnesota); Bo Connelly, JD (Trial Coordination Center, Zeenat Qureshi Stroke Research Center, University of Minnesota, Project Manager); Saqib A. Chaudhry, MD (Trial Coordination Center, Zeenat Qureshi Stroke Research Center, University of Minnesota, Education Development); Emily I. Abbott, JD, CPA (Trial Coordination Center, Zeenat Qureshi Stroke Research Center, University of innesota,Grants and Contracts, International Liaison); Erik T. Maland, BAN, RN, PHN (Trial Coordination Center, Zeenat Qureshi Stroke Research Center, University of Minnesota, Clinical Research Associate and Monitor); Kathryn A. France, BA, RN, PHN, CCRC, CCRA (Trial Coordination Center, Zeenat Qureshi Stroke Research Center, University of Minnesota, Clinical Research Associate, Clinical Trial Nurse-Coordinator, Domestic Affairs and Protocol Liaison, Monitor); Basit Rahim, MD (Trial Coordination Center, Zeenat Qureshi Stroke Research Center, University of Minnesota,Clinical Tools Design); Zachariah Miller, MA (Trial Coordination Center, Zeenat Qureshi Stroke Research Center, University of Minnesota, Communications Coordinator); Alfredo J. Caceres, MD (Trial Coordination Center, Zeenat Qureshi Stroke Research Center, University of Minnesota, Central Imaging Reader); Logan J. Brau, BS (Trial Coordination Center, Zeenat Qureshi Stroke Research Center, University of Minnesota Imaging Technician); Mushtaq H. Qureshi, MD (Trial Coordination Center, Zeenat Qureshi Stroke Research Center, University of Minnesota, Central Imaging Analyst); Jessy K. Thomas, MS, CCRP (Trial Coordination Center, Zeenat Qureshi Stroke Research Center, University of Minnesota, Project Manager); Mohammad R. Afzal, MD (Trial Coordination Center, Zeenat Qureshi Stroke Research Center, University of Minnesota, Assistant to Central Imaging Analyst); Norrita Rech, BS, MA, CCRP (Trial Coordination Center, Zeenat Qureshi Stroke Research Center, University of Minnesota,Grants and Contracts).

Yuko Y. Palesch, PhD, (Data Coordination Unit, Department of Public Health Sciences, Medical University of South Carolina, Principal Investigator), Renee Martin, PhD (Data Coordination Unit, Department of Public Health Sciences, Medical University of South Carolina, Co-Investigator), Wenle Zhao, PhD (Data Coordination Unit, Department of Public Health Sciences, Medical University of South Carolina, Co-Investigator), Lydia Foster, MS(Data Coordination Unit, Department of Public Health Sciences, Medical University of South Carolina, Biostatistical Programmer), Jaime Speiser, MS (Data Coordination Unit, Department of Public Health Sciences, Medical University of South Carolina, Biostatistical Programmer), Catherine Dillon, BS (Data Coordination Unit, Department of Public Health Sciences, Medical University of South Carolina, Trials Operations Manager), Jaemyung Kim, MBA (Data Coordination Unit, Department of Public Health Sciences, Medical University of South Carolina,Senior IS Developer), Cassidy Conner, MS (Data Coordination Unit, Department of Public Health Sciences, Medical University of South Carolina, Adam Henry, MPH (Data Coordination Unit, Department of Public Health Sciences, Medical University of South Carolina, Biostatistical Programmer, Data Manager), Kristina Hill, MPH, MIS (Data Coordination Unit, Department of Public Health Sciences, Medical University of South Carolina, Biostatistical Programmer, Data Manager) Kristen Clasen, MEd (Data Coordination Unit, Department of Public Health Sciences, Medical University of South Carolina,Regulatory Documents Manager); Christy Cassarly (Data Coordination Unit, Department of Public Health Sciences, Medical University of South Carolina,Graduate Research Assistant).

Daniel F. Hanley, MD (Independent Oversight Committee Johns Hopkins University – Division of Brain Injury Outcomes, Baltimore, Chair); Carlos S. Kase, MD Independent Oversight Committee Johns Hopkins University –

Division of Brain Injury Outcomes, Baltimore Committee Member), J. Ricardo Carhuapoma, MD (Independent Oversight Committee Johns Hopkins University – Division of Brain Injury Outcomes, Baltimore, Committee Member); Nichol McBee, MPH, CCRP (Independent Oversight Committee Johns Hopkins University – Division of Brain Injury Outcomes, Baltimore IOC Coordinator).

Claudia Moy, PhD (National Institute of Neurological Disorders and Stroke of the National Institutes of Health, Project Scientist); and Scott Janis, PhD (National Institute of Neurological Disorders and Stroke of the National Institutes of Health, Program Official).

J. Claude Hemphill III, MD, MAS (NINDS-Appointed Data and Safety Monitoring Board, Chair); Brian L. Hoh, MD, FACS, FAHA; Mario Zucharello, MD; and Michael K. Parides, PhD (NINDS-Appointed Data and Safety Monitoring Board, Board Members).

William Barsan, MD (The Neurological Emergency Treatment Trials (NETT) Network, University of Michigan, NETT Network Principal Investigator); Robert Silbergleit, MD (The Neurological Emergency Treatment Trials (NETT) Network, University of Michigan, NETT Network Co-Investigator); Joshua N. Goldstein, MD, PhD (The Neurological Emergency Treatment Trials (NETT) Network, University of Michigan, Investigator); Valerie Stevenson, BAS, LRT, CCRP (The Neurological Emergency Treatment Trials (NETT) Network, University of Michigan, Administrative Director); Erin Bengelink, MS (The Neurological Emergency Treatment Trials (NETT) Network, University of Michigan, Site Manager); Joy Black, BSN, MS (The Neurological Emergency Treatment Trials (NETT) Network, University of Michigan, Education Coordinator); Mickie Speers, BSN, Donna Harsh, MS, Carol Van Huysen, BS, Angela Caveney, PhD, and Andrace Deyampert, MSHS (The Neurological Emergency Treatment Trials (NETT) Network, University of Michigan, Monitors). Beth Grundman and Allison DuRoss (The Neurological Emergency Treatment Trials (NETT) Network, University of Michigan, Research Assistants).

Additional NETT hub participants: Jan Claassen, MD (Columbia); Michelle Biros, MD (University of Minnesota); David Wright, MD (Emory University); James Quinn, MD; and Rosen Mann (Stanford University); Jill Baren, MD (University of Pennsylvania); Robert Welch, MD (Wayne State University); Tom Aufderheide, MD; Melissa Mena; and Erica Chopskie (Medical College of Wisconsin); Roger Humphries, MD (University of Kentucky); Monica Mendoza-Moore (University of Texas); Katherine Lamond (University of Pennsylvania); Ryan Callahan and Melissa Howell, (Massachusetts General Hospital); Patricia M. McNelis and Hannah Reimer (Temple University); Ginny Stasinski and Bruce Barnhart (University of Arizona); Ryan McCormick (UCSF); Ana Maria Gomez Ramirez (Ohio State University).

Jose I. Suarez (Neurocritical Care Research Network (NCRN), Principal investigator).

Kazunori Toyoda, MD, PhD (National Cerebral and Cardiovascular Center and Japan Cardiovascular Research Foundation, Japan, Lead National Principal Investigator); Haruko Yamamoto, MD PhD (National Cerebral and Cardiovascular Center and Japan Cardiovascular Research Foundation, Japan, Lead Project Manager); Masatoshi Koga, MD PhD, Shoichiro Sato, MD PhD, and Sohei Yoshimura, MD PhD (National Cerebral and Cardiovascular Center and Japan Cardiovascular Research Foundation, Japan, coordination for Japanese sites); Mayumi Fukuda-Doi, MD MPH (National Cerebral and Cardiovascular Center and Japan Cardiovascular Research Foundation, Japan, Regulatory Manager); Kanae Hirase RN, CCRC (National Cerebral and Cardiovascular Center and Japan Cardiovascular Research Foundation, Japan, Lead Monitor); Shuhei Okazaki, MD PhD (National Cerebral and Cardiovascular Center and Japan Cardiovascular Research Foundation, Japan, Monitor); Hiromi Ohara, RN, CCRC (National Cerebral and Cardiovascular Center and Japan Cardiovascular Research Foundation, Japan, Coordinator).

Yongjun Wang, MD, PhD (Beijing Tiantan Hospital Clinical Coordinating Center, China, Lead National Principal Investigator); Zeyu Ding, MD, PhD (Beijing Tiantan Hospital Clinical Coordinating Center, China, Lead Coordinator); Dandan Wang, MD (Beijing Tiantan Hospital Clinical Coordinating Center, China, Regulatory Specialist); Nannan Xu (Beijing Tiantan Hospital Clinical Coordinating Center, China, Clinical Research Associate).

Prof. Chung Y. Hsu, MD, PhD (China Medical University Hospital Clinical Trial Center of Excellence, Taiwan,

Lead National Principal Investigator); Dana Lin (China Medical University Hospital Clinical Trial Center of Excellence, Taiwan, Lead Coordinator); Mamiko Suzuki (China Medical University Hospital Clinical Trial Center of Excellence, Taiwan, Lead Monitor); Chin-Ting Hsu, Jou-Ping Hsu, and Emma Ho, MS, BSN (China Medical University Hospital Clinical Trial Center of Excellence, Taiwan, Monitors).

Prof. Dr. Thorsten Steiner, MD (Coordinating Center for Clinical Trials (KKS), University Hospital Heidelberg, Germany, Lead National Principal Investigator); Andrea Seidel-Glätzer, MA, RN (Coordinating Center for Clinical Trials (KKS), University Hospital Heidelberg, Germany, Project Manager); Claudia Simonis, PhD (Coordinating Center for Clinical Trials (KKS), University Hospital Heidelberg, Germany, Clinical Research Associate), Ulrike Berlet, Pharmacist (Coordinating Center for Clinical Trials (KKS), University Hospital Heidelberg, Germany, Clinical Research Associate) .

Byung-Woo Yoon, MD, PhD (Seoul National University Hospital Clinical Coordinating Center, South Korea, Lead National Principal Investigator); Dongjin Yoo, MD (Seoul National University Hospital Clinical Coordinating Center, South Korea, Lead Project Manager); Youngrang Lee, MS (Seoul National University Hospital Clinical Coordinating Center, South Korea, Project Manager); Jae Young Jo, RN (Seoul National University Hospital Clinical Coordinating Center, South Korea, Coordinator); Juri Park, RN (Seoul National University Hospital Clinical Coordinating Center, South Korea, Coordinator); EunHye Hu (Seoul National University Hospital Clinical Coordinating Center, South Korea, Monitor).

Kazunori Toyoda, MD, PhD (National Cerebral and Cardiovascular Center, Osaka, Japan, Principal Investigator); Kazuyuki Nagatsuka, MD, PhD (National Cerebral and Cardiovascular Center, Osaka, Japan, Investigator); Kanae Hirase, RN, CCRC (National Cerebral and Cardiovascular Center, Osaka, Japan, Primary Coordinator).

Yongjun Wang, MD, PhD (Beijing Tiantan Hospital, Beijing, China , Principal Investigator); Zeyu Ding, MD, PhD (Beijing Tiantan Hospital, Beijing, China , Primary Coordinator).

Nobuyuki Sakai, MD, DMSc (Kobe City Medical Center General Hospital, Kobe City, Hyogo, Japan , Principal Investigator); Kenichi Todo, MD, PhD (Kobe City Medical Center General Hospital, Kobe City, Hyogo, Japan , Investigator); Sakina Yoshihira (Kobe City Medical Center General Hospital, Kobe City, Hyogo, Japan , Primary Coordinator),

Takayuki Hara, MD (Toranomom Hospital, Tokyo, Japan, Principal Investigator); Mihoko Matsukami (Toranomom Hospital, Tokyo, Japan, Primary Coordinator).

Zhimin Wang, MD (Taizhou First People's Hospital, Taizhou City, Zhejiang Province, China, Principal Investigator); Jie Chen, MD (Taizhou First People's Hospital, Taizhou City, Zhejiang Province, China, Primary Coordinator).

Jiann-Shing Jeng, MD, PhD (National Taiwan University Hospital, Taipei, Taiwan, Principal Investigator); Sung-Chun Tang, MD, PhD; Li-Kai Tsai, MD, PhD; and Shin-Joe Yeh, MD (National Taiwan University Hospital, Taipei, Taiwan, Co-Principal Investigators); Yu-Ting Wang (National Taiwan University Hospital, Taipei, Taiwan, Primary Coordinator).

Sachin Agarwal, MD, MPH (Columbia University Medical Center, New York, NY, USA, Principal Investigator); Stephan A. Mayer, MD (Columbia University Medical Center, New York, NY, USA, Principal Investigator, former, currently Director, Institute for Critical Care Medicine - Icahn School of Medicine at Mount Sinai); M. Cristina Faló, PhD; and Angela Velazquez, MD (Columbia University Medical Center, New York, NY, USA, Primary Coordinators).

M Fareed K Suri, MD (St. Cloud Hospital, St. Cloud, MN, USA, Principal Investigator); Melissa A. Freese, BSN, RN, CNRN (St. Cloud Hospital, St. Cloud, MN, USA, Primary Coordinator).

Qaisar A. Shah, MD (Abington Memorial Hospital, Abington, PA, USA, Principal Investigator); Karin Jonczak, CRNP; and Patricia Businger, CRNP (Abington Memorial Hospital, Abington, PA, USA, Primary Coordinators) Jose I. Suarez, MD; and Paulina B. Sergot, MD (Baylor College of Medicine, Houston, TX, USA, Principal

Investigators); Eusebia Calvillo, RN; and Kelly Rogers Keene, BSN, RN (Baylor College of Medicine, Houston, TX, USA, Primary Coordinators).

Jawad F. Kirmani, MD (Stroke & Neurovascular Center, JFK Medical Center, Edison, NJ, USA, Principal Investigator); Spozhmy Panezai, MD (Stroke & Neurovascular Center, JFK Medical Center, Edison, NJ, USA, Co-Principal Investigator); Charles Porbeni, MD; Nnamdi Uhegwu, MD; and Briana DeCarvalho, MSN, RN (Stroke & Neurovascular Center, JFK Medical Center, Edison, NJ, USA, Primary Coordinators).

Ching-Huang Lin, MD; and Yuk-Keung Lo, MD (Kaohsiung Veterans General Hospital, Kaohsiung, Taiwan, Principal Investigators); Yi-Ting Hsu (Kaohsiung Veterans General Hospital, Kaohsiung, Taiwan, Primary Coordinator).

Pramod Sethi, MD (Guilford Neurologic Associates, Greensboro, NC, USA, Principal Investigator); Rizwan Sabir and Wesley Harbison, RN, MHA (Guilford Neurologic Associates, Greensboro, NC, USA, Primary Coordinators).

Yoshiaki Shiokawa, MD, PhD (Kyorin University, Tokyo, Japan, Principal Investigator); Masataka Torii MD, PhD (Kyorin University, Tokyo, Japan, Primary Coordinator).

Yasuhiro Hasegawa, MD, PhD (St. Marianna University Hospital, Kawasaki, Kanagawa, Japan, Principal Investigator); Yuki Ohta, PhD; and Sachiko Takenoshita, PhD (St. Marianna University Hospital, Kawasaki, Kanagawa, Japan, Primary Coordinators).

Chun-Lin Liu, MD (China Medical University Hospital, Taichung, Taiwan, Principal Investigator); Li-Te Tseng (China Medical University Hospital, Taichung, Taiwan, Primary Coordinator).

Thomas A. Bergman, MD (Hennepin County Medical Center, Minneapolis, MN, USA, Principal Investigator); Gustavo J. Rodriguez, MD (Hennepin County Medical Center, Minneapolis, MN, USA, Principal Investigator, former, Currently at Texas Tech University Health Sciences Center of El Paso, TX); Kathryn France, BA, RN, PHN, CCRC, CCRA (Hennepin County Medical Center, Minneapolis, MN, USA, Primary Coordinator); and Kathleen Miller, BSN CCRC (Hennepin County Medical Center, Minneapolis, MN, USA, Primary Coordinator, former). Toru Iwama, MD, PhD (Gifu University Hospital, Gifu, Japan, Principal Investigator); Shin-ichi Yoshimura, MD, PhD (Gifu University Hospital, Gifu, Japan, Principal Investigator); Yusuke Egashira, MD, PhD; and Toshinori Takagi, MD, PhD (Gifu University Hospital, Gifu, Japan, Primary Coordinators).

Julian Bösel, MD (University Hospital Heidelberg, Heidelberg, Germany, Principal Investigator); Perdita Beck (University Hospital Heidelberg, Heidelberg, Germany, Primary Coordinator).

Kenji Kamiyama, MD (Department of Neurosurgery, Nakamura Memorial Hospital, Sapporo, Hokkaido, Japan, Principal Investigator); Ryo Fujii and Megumi Chiba (Department of Neurosurgery, Nakamura Memorial Hospital, Sapporo, Hokkaido, Japan, Primary Coordinators).

Gustavo Pradilla, MD (Grady Memorial Hospital, Atlanta, GA, USA, Principal Investigator); Alex J. Hall, MS, RN (Grady Memorial Hospital, Atlanta, GA, USA, Primary Coordinator); and Michael P. Lunney, MPH, NRP (Grady Memorial Hospital, Atlanta, GA, USA, Primary Coordinator, former).

Katherine Palmieri, MD (Kansas University Medical Center, Kansas City, KS, USA, Principal Investigator); Abhijit Lele, MD (Kansas University Medical Center, Kansas City, KS, USA, Principal Investigator, former); Rachel Henning, RN, BSN, CCRP (Kansas University Medical Center, Kansas City, KS, USA, Primary Coordinator); Stephanie Thomas-Dodson and Angie Ballew (Kansas University Medical Center, Kansas City, KS, USA, Primary Coordinators, former).

Chitra Venkatasubramanian, MBBS, MD, MSc (Stanford University, Stanford, CA, US, Principal Investigator); Christine Wijman, MD (Stanford University, Stanford, CA, US, Principal Investigator, initial, in memory of); Rosita Thiessen, BA, CCRP (Stanford University, Stanford, CA, US, Primary Coordinator); Madelleine Garcia and Ami Okada, PhD (Stanford University, Stanford, CA, US, Primary Coordinators, former).

Haruhiko Hoshino, MD (Tokyo Saiseikai Central Hospital, Tokyo, Japan, Principal Investigator); Chiaki Arakawa

(Tokyo Saiseikai Central Hospital, Tokyo, Japan, Primary Coordinator).

Yuhua Chen, MD (Wuhan Brain Hospital, Wuhan, China, Principal Investigator); Jin Li, MD (Wuhan Brain Hospital, Wuhan, China, Primary Coordinator).

Tiffany R. Chang, MD (Memorial Hermann - Texas Medical Center, Houston, TX, USA, Principal Investigator); Misty Ottman (Memorial Hermann - Texas Medical Center, Houston, TX, USA, Primary Coordinator).

Ameer E. Hassan, DO (Valley Baptist Medical Center, Harlingen, TX, USA, Principal Investigator); Olive Sanchez, MSN, RN, BC (Valley Baptist Medical Center, Harlingen, TX, USA, Primary Coordinator).

Eisuke Furui, MD (Kohnan Hospital, Sendai, Miyagi, Japan, Principal Investigator); Aki Osanai (Kohnan Hospital, Sendai, Miyagi, Japan, Primary Coordinator).

Li-Ming Lien, MD, PhD (Shin-Kong Wu Ho-Su Memorial Hospital, Taipei, Taiwan, Principal Investigator); Hsu-Ling Yeh, MD (Shin-Kong Wu Ho-Su Memorial Hospital, Taipei, Taiwan, Investigator); I-Yu Lee (Shin-Kong Wu Ho-Su Memorial Hospital, Taipei, Taiwan, Primary Coordinator).

Byung-Woo Yoon, MD, PhD (Seoul National University Hospital, Seoul, South Korea, Principal Investigator); Yeo-Jung Chae, and Jae-Young Jo, RN (Seoul National University Hospital, Seoul, South Korea, Primary Coordinators).

Angela N. Hays, MD (UAB Comprehensive Stroke Center, Birmingham, AL, USA, Principal Investigator); Andrei V. Alexandrov, MD (UAB Comprehensive Stroke Center, Birmingham, AL, USA, Principal Investigator, former, now Semmes Murphy Professor and Chair, Department of Neurology, University of Tennessee Health Science Center); April Sisson, BSN, RN (UAB Comprehensive Stroke Center, Birmingham, AL, USA, Primary Coordinator); and Lynn Merritt, RN (UAB Comprehensive Stroke Center, Birmingham, AL, USA, Primary Coordinator, former).

Joshua N. Goldstein, MD, PhD (Massachusetts General Hospital, Boston, MA, USA, Principal Investigator); Gregory Tirrell, MS (Massachusetts General Hospital, Boston, MA, USA, Primary Coordinator); Abigail Cohen, Kristen McNamara, and Lauren Barton (Massachusetts General Hospital, Boston, MA, USA, Primary Coordinators, former).

Toshihiro Ueda, MD (St. Marianna University Tokoyo Hospital, Kawasaki, Kanagawa, Japan, Principal Investigator); Yoko Kaji (St. Marianna University Tokoyo Hospital, Kawasaki, Kanagawa, Japan, Primary Coordinator).

Yasushi Okada, MD, PhD (National Hospital Organization Kyushu Medical Center, Fukuoka, Japan, Principal Investigator); Asako Nakamura, MD, PhD; and Kouichirou Maeda (National Hospital Organization Kyushu Medical Center, Fukuoka, Japan, Primary Coordinators).

Xudong Ren, MD (Datong Third People's Hospital, Datong, Shanxi Province, China, Principal Investigator); Kang Ye (Datong Third People's Hospital, Datong, Shanxi Province, China, Primary Coordinator).

Hartmut Vatter, MD (University of Bonn, Bonn, Germany, Principal Investigator); Erdem Güresir, MD (University of Bonn, Bonn, Germany, Investigator); Azize Boström, MD (University of Bonn, Bonn, Germany, Investigator, Primary Coordinator).

Ifeanyi Iwuchukwu, MD (Ochsner Clinic Foundation, New Orleans, LA, USA, Principal Investigator); Arash Afshinnik, MD; and Kenneth Gaines, MD (Ochsner Clinic Foundation, New Orleans, LA, USA, Principal Investigators, former); William Itoua Nganongo (Ochsner Clinic Foundation, New Orleans, LA, USA, Primary Coordinator).

Nina T. Gentile, MD (Temple University Hospital, Philadelphia, PA, USA, Principal Investigator); Vernon S. Kalugdan, BSN, RN; and Brent Freeman (Temple University Hospital, Philadelphia, PA, USA, Primary Coordinators).

Benjamin Anyanwu, MD (Novant Health Research Institute – Novant Health Forsyth Medical Center, Winston-Salem, NC, USA, Principal Investigator); and Chere Chase-Gregory, MD, MHS (Novant Health Research Institute – Novant Health Forsyth Medical Center, Winston-Salem, NC, USA, Principal Investigator, former); Kevin Colston, LPN, CRC (Novant Health Research Institute – Novant Health Forsyth Medical Center, Winston-Salem, NC, USA, Primary Coordinator).

Christopher Lewandowski, MD (Henry Ford Hospital, Detroit, MI, USA, Principal Investigator); Joseph B. Miller, MD, MS (Henry Ford Hospital, Detroit, MI, USA, Investigator); Shannen Berry-Hymon, RN (Henry Ford Hospital, Detroit, MI, USA, Primary Coordinator); Kathleen Mays-Wilson, MS, BSN, RN, CCRP; and Anne Marie Lundell, BSN, RN (Henry Ford Hospital, Detroit, MI, USA, Primary Coordinators, former).

Steven Messe, MD (University of Pennsylvania, Philadelphia, PA, USA, Principal Investigator); Nichole Gallatti, MSED (University of Pennsylvania, Philadelphia, PA, USA, Primary Coordinator).

Satoshi Okuda, MD (National Hospital Organization Nagoya Medical Center, Nagoya City, Aichi, Japan, Principal Investigator); Kazumi Nakamura (National Hospital Organization Nagoya Medical Center, Nagoya City, Aichi, Japan, Primary Coordinator).

Nicholas Bambakidis, MD (University Hospitals Case Medical Center, Cleveland, OH, USA, Principal Investigator); Valerie Cwiklinski (University Hospitals Case Medical Center, Cleveland, OH, USA, Primary Coordinator).

Hermann Christian Schumacher, MD (Lehigh Valley Hospital, Allentown, PA, USA, Principal Investigator, currently Neurohospitalist at Capital Health, NJ); Kathy Knapp, Susan Nabhan, and Leighanne Hartman (Lehigh Valley Hospital, Allentown, PA, USA, Primary Coordinators).

Yoshiaki Itoh, MD, PhD; Takato Abe, MD, PhD; and Shinichi Takahashi, MD, PhD (Keio University Hospital, Tokyo, Japan, Principal Investigators); Mao Okamoto (Keio University Hospital, Tokyo, Japan, Primary Coordinator).

Chih-Hung Chen, MD (National Cheng Kung University Hospital, Tainan, Taiwan, Principal Investigator); Ya-Fang Hsueh (National Cheng Kung University Hospital, Tainan, Taiwan, Primary Coordinator).

Erik Kulstad, MD (Advocate Christ Medical Center, Oak Lawn, IL, USA, Principal Investigator); Michael T. Stanek, MD (Advocate Christ Medical Center, Oak Lawn, IL, USA, Co-Principal Investigator); Kathleen Hesse, RN, CCRC (Advocate Christ Medical Center, Oak Lawn, IL, USA, Primary Coordinator).

Susan W. Law, DO (King's County Medical Center, New York, NY, USA, Principal Investigator); Helen Valsamis, MD (King's County Medical Center, New York, NY, USA, Principal Investigator, former); Steven R. Levine, MD (King's County Medical Center, New York, NY, USA, Investigator); Bryce Petty, CCRC (King's County Medical Center, New York, NY, USA, Primary Coordinator); Sarah Z. Weingast, Saroj D. Kunnakkat, Bruhati Shah, and Vanessa Arnedo (King's County Medical Center, New York, NY, USA, Primary Coordinators, former).

Yuechun Li, MD (Baotou Central Hospital, Baotou, China, Principal Investigator); Qiang Chen (Baotou Central Hospital, Baotou, China, Primary Coordinator).

Hee-Joon Bae, MD, PhD (Seoul National University Bundang Hospital, Seongnam, Gyeonggi-do, South Korea, Principal Investigator); Jounsim Kim (Seoul National University Bundang Hospital, Seongnam, Gyeonggi-do, South Korea, Primary Coordinator); Juri Park, RN (Seoul National University Bundang Hospital, Seongnam, Gyeonggi-do, South Korea, Coordinator).

Michael D. Zwank, MD (Regions Hospital, St. Paul, MN, USA, Principal Investigator); Tenbit Emiru, MD, PhD (Regions Hospital, St. Paul, MN, USA, Principal Investigator, former, currently at Hennepin County Medical Center, Minneapolis, MN); Emily Mischel, MA (Regions Hospital, St. Paul, MN, USA, Primary Coordinator); and Sandi Wewerka, MPH (Regions Hospital, St. Paul, MN, USA, Primary Coordinator, former).

Dawn Meyer, FNP-C, PhD (University of California San Diego, San Diego, CA, USA, Principal Investigator); Karen Rapp, BSN, RN, CCRC (University of California San Diego, San Diego, CA, USA, Primary Coordinator); Nancy Kelly, Ronelyn Chavez, and Teresa Rzesiewicz (University of California San Diego, San Diego, CA, USA, Primary Coordinators, former).

Souvik Sen, MD (Palmetto Health Richland and University of South Carolina, Columbia, SC, USA, Principal Investigator); Evelyn Kennedy, MSN, RN, CCRP (Palmetto Health Richland and University of South Carolina, Columbia, SC, USA, Primary Coordinator); Krista Vaughan, RNC; and Selena Lollar, RN (Palmetto Health Richland and University of South Carolina, Columbia, SC, USA, Primary Coordinators, former).

Dorothea Altschul, MD (St. Joseph's Regional Medical Center, Paterson, NJ, USA, Principal Investigator); Avery Katz, MD (St. Joseph's Regional Medical Center, Paterson, NJ, USA, Principal Investigator, former); Bogdana

Dikovytka, CCRC (St. Joseph's Regional Medical Center, Paterson, NJ, USA, Primary Coordinator); and Milicent Titus, CCRP (St. Joseph's Regional Medical Center, Paterson, NJ, USA, Primary Coordinator, former).

Katja E. Wartenberg, MD, PhD (Martin-Luther University Hospital Halle-Wittenberg, Halle (Saale), Germany Principal Investigator); Doreen Herale (Primary Coordinator); and Sandra Seidl (Martin-Luther University Hospital Halle-Wittenberg, Halle (Saale), Germany Primary Coordinator, former).

Sven Poli, MD (University of Tübingen, Tübingen, Germany, Principal Investigator); Ulf Ziemann, Florian Härtig, Martin Ribitsch, Hardy Richter, Matthias Ebner, Alexandra Gaenslen (University of Tübingen, Tübingen, Germany, Investigators); Julia Zeller (University of Tübingen, Tübingen, Germany, Primary Coordinator).

Ramy El Houry, MD (Tulane Medical Center, New Orleans, LA, USA, Principal Investigator), Elizabeth Jones, (Tulane Medical Center, New Orleans, LA, USA, Principal Investigator, NETT hub, and site former); Sheryl Martin-Schild, MD, PhD (Tulane Medical Center, New Orleans, LA, USA, Investigator); Annie Stell and Cheryl Carmody (Tulane Medical Center, New Orleans, LA, USA, Primary Coordinators, former).

Gregory M. Norris, MD (Sinai-Grace Hospital, Detroit, MI, USA, Principal Investigator); Valerie Mika (Sinai-Grace Hospital, Detroit, MI, USA, Primary Coordinator).

David M. Greer, MD, MA (Yale - New Haven Hospital, New Haven, CT, USA, Principal Investigator); Kimberly Kunze, MSN, RN (Yale - New Haven Hospital, New Haven, CT, USA, Primary Coordinator); Janet R. Halliday, BS, RN (Yale - New Haven Hospital, New Haven, CT, USA, Primary Coordinator, former).

W. David Freeman, MD (Mayo Clinic Florida, Jacksonville, FL, USA, Principal Investigator); Emily Edwards, MS, CCRP (Mayo Clinic Florida, Jacksonville, FL, USA, Primary Coordinator); Dale Gamble, MHSc, CCRP; and Sothear Luke, MPH, CCRP (Mayo Clinic Florida, Jacksonville, FL, USA, Primary Coordinators, former).

David Z. Rose, MD (Tampa General Hospital/University of South Florida School of Medicine, Tampa, FL, USA, Principal Investigator); Tara McTigue, RN, CCRC (Tampa General Hospital/University of South Florida School of Medicine, Tampa, FL, USA, Primary Coordinator).

Jignesh J. Shah, MD (University of Louisville, Department of Neurology, Louisville, KY, USA, Principal Investigator); Kerri S. Rimmel, MD, PhD (University of Louisville, Department of Neurology, Louisville, KY, USA, Principal Investigator, former, now Professor and Chair, Department of Neurology at University of Louisville); Ann Jerde (University of Louisville, Department of Neurology, Louisville, KY, USA, Primary Coordinator).

Ann Helms, MD (Medical College of Wisconsin, Milwaukee, WI, USA, Principal Investigator); Ling Zhong, PhD (Medical College of Wisconsin, Milwaukee, WI, USA, Primary Coordinator); Emon Das, (Medical College of Wisconsin, Milwaukee, WI, USA, Primary Coordinator, former).

Ira Chang, MD (Colorado Neurological Institute, Englewood, CO, USA, Principal Investigator); Alicia Novak, PhD; and Laura Greeley (Colorado Neurological Institute, Englewood, CO, USA, Primary Coordinators); Paula Fisk, BS, CCRP; Ashley Bittner, BS, CCRP; and Lenden Neeper, BS, CCRP (Colorado Neurological Institute, Englewood, CO, USA, Primary Coordinators, former).

Alexander Y. Zubkov, MD, PhD (Fairview Southdale Hospital, US, Principal Investigator); Abbey Staugaitis, MSN (Fairview Southdale Hospital, US, Primary coordinator); Kathryn France, BA, RN, PHN, CCRC, CCRA ; and Kathleen Miller, BSN, CCRC (Fairview Southdale Hospital, US, Primary Coordinators, former).

J. Christopher Zacko, MD (Penn State Milton S. Hershey Medical Center, Hershey, PA, USA, Principal Investigator); Deborah Hoffman, BSN (Penn State Milton S. Hershey Medical Center, Hershey, PA, USA, Primary Coordinator).

Kenneth E. Krell, MD (Eastern Idaho Regional Medical Center, Idaho Falls, ID, USA, Principal Investigator); Erich Garland, MD and Douglas N. Whatmore, MD (Eastern Idaho Regional Medical Center, Idaho Falls, ID, USA, Investigators); Amy Thornley, ACNP-BC (Eastern Idaho Regional Medical Center, Idaho Falls, ID, USA, Primary Coordinator).

Iftexhar Ahmed, MD (Research Medical Center, Kansas City, MO, USA, Principal Investigator); Sarah Dunalewicz (Research Medical Center, Kansas City, MO, USA, Coordinator); Jennifer W. Feedback, Amy Akins, Pamela McCann (Research Medical Center, Kansas City, MO, USA, Primary Coordinators, former).

Hsin-I Ma, MD, PhD (Tri-Service General Hospital and the National Defense Medical Center, Taipei, Taiwan,Principal Investigator); Pei-Min Hsiao (Tri- Service General Hospital and the National Defense Medical Center, Taipei, Taiwan,Primary Coordinator).

Jefferson T. Miley, MD (University Medical Center Brackenridge, Austin, TX, USA,Principal Investigator); Laura Lachance, MA, CCRP (University Medical Center Brackenridge, Austin, TX, USA,Primary Coordinator).

Lisa H. Merck, MD, MPH (Rhode Island Hospital, Providence, RI, USA,Principal Investigator); Bradford B. Thompson, MD (Rhode Island Hospital, Providence, RI, USA,Co- Principal Investigator); Jena Lerch (Rhode Island Hospital, Providence, RI, USA,Primary Coordinator).

Bradley J. Molyneaux, MD, PhD; Clifton W. Callaway, MD, PhD; and Jon C. Rittenberger, MD (UPMC Presbyterian Hospital, Pittsburgh, PA, USA,Principal Investigators); Sara DiFiore, Pamela Fazio, RN, CNC; and Kara Armbuster, BSN, RN (UPMC Presbyterian Hospital, Pittsburgh, PA, USA,Primary Coordinators).

Greg M. Norris, MD (Detroit Receiving Hospital, Detroit, MI, USA,Principal Investigator); Wazim Mohamed, MD; and Mohammad S Ibrahim, MD (Detroit Receiving Hospital, Detroit, MI, USA,Investigators); Valerie H. Mika, MS; and Amy Spencer (Detroit Receiving Hospital, Detroit, MI, USA,Primary Coordinators); Cathey Boyer (Detroit Receiving Hospital, Detroit, MI, USA,Primary Coordinator, former).

Steven R. Levine, MD (SUNY Downstate Medical Center/University Hospital of Brooklyn, Brooklyn, NY, USA,Principal Investigator); Bryce Petty (SUNY Downstate Medical Center/University Hospital of Brooklyn, Brooklyn, NY, USA,Primary Coordinator); Sarah Z. Weingast, Saroj D. Kunnakkat, Bruhati Shah, Marijayne Bushey, and Vanessa Arnedo (SUNY Downstate Medical Center/University Hospital of Brooklyn, Brooklyn, NY, USA,Primary Coordinators, former).

David B. Seder, MD (Maine Medical Center, Portland, ME, USA,Principal Investigator); Richard R. Riker, MD (Maine Medical Center, Portland, ME, USA,Investigator); Barbara F. McCrum, RN, BSN (Maine Medical Center, Portland, ME, USA,Primary Coordinator).

Asim Mahmood, MD (Sutter Roseville Medical Center, Roseville, CA, USA,Principal Investigator); Michele Guillen (Sutter Roseville Medical Center, Roseville, CA, USA,Primary Coordinator); Teresa Carter (Sutter Roseville Medical Center, Roseville, CA, USA,Primary Coordinator, former).

Huy Tran, MD (University of New Mexico, Albuquerque, NM, USA,Principal Investigator); Marc Malkoff, MD (University of New Mexico, Albuquerque, NM, USA,Principal Investigator, former); Theresa Wussow, BSSN, RN; and Alice Brown, CNP(University of New Mexico, Albuquerque, NM, USA,Primary Coordinators).

Ted Lowenkopf, MD (Providence Brain and Spine Institute, Portland, OR, USA,Principal Investigator); Monica Rodriguez (Providence Brain and Spine Institute, Portland, OR, USA,Primary Coordinator).

Marc Fatar, MD (University Hospital Mannheim, Mannheim, Germany,Principal Investigator); Kathrin Knoll (University Hospital Mannheim, Mannheim, Germany,Primary Coordinator).

Gustavo J. Rodriguez, MD (Texas Tech University Health Sciences Center of El Paso, El Paso, TX, USA, Principal Investigator); Alberto Maud, MD (Texas Tech University Health Sciences Center of El Paso, El Paso, TX, USA,Co- Principal Investigator); Elizabeth Ledger (Texas Tech University Health Sciences Center of El Paso, El Paso, TX, USA,Primary Coordinator).

Wade Smith, MD, PhD (UCSF Medical Center, San Francisco, CA, USA,Principal Investigator); Michelle Meeker, BSN, RN (UCSF Medical Center, San Francisco, CA, USA,Primary Coordinator).

Luther Creed Pettigrew, MD (University of Kentucky, Lexington, KY, USA,Principal Investigator); Linda Dechtenberg and Joann Short, RN BSN (University of Kentucky, Lexington, KY, USA,Primary Coordinators).

Kurt Denninghoff, MD (Banner University Medical Center - Tucson Campus, Tuscon, AZ, USA,Principal Investigator); Chelsea S. Kidwell, MD (Banner University Medical Center - Tucson Campus, Tuscon, AZ, USA,Principal Investigator); Andrew Laine (Banner University Medical Center - Tucson Campus, Tuscon, AZ, USA,Primary Coordinator).

Rakesh Khatri, MD (Parkview Hospital, Fort Wayne, IN, USA, Principal Investigator); Jeanne Carroll, RN BA CCRC (Parkview Hospital, Fort Wayne, IN, USA,Primary Coordinator).

Hartmut Uschmann, MD (University of Mississippi Medical Center, Jackson, MS, USA, Principal Investigator); As'ad Ehtisham, MD, (University of Mississippi Medical Center, Jackson, MS, USA, Principal Investigator, former, currently at Ehtisham Neurovascular Institute, ENVI, PLLC); Marcia Bankston (University of Mississippi Medical Center, Jackson, MS, USA, Primary Coordinator, former).

Michel Torbey, MD, MPH (The Ohio State University - Wexner Medical Center, Columbus, OH, USA, Principal Investigator); Chad Miller, MD (The Ohio State University - Wexner Medical Center, Columbus, OH, USA, Principal Investigator, former); Réza Behrouz, DO (The Ohio State University - Wexner Medical Center, Columbus, OH, USA, Principal Investigator, former, currently Associate Professor at the University of Texas Health Science Center - San Antonio); Nirav Patel, MBBS, MPH; (The Ohio State University - Wexner Medical Center, Columbus, OH, USA, Primary Coordinator); Leonard Basobas (The Ohio State University - Wexner Medical Center, Columbus, OH, USA, Primary Coordinator, former).

Galen Henderson, MD (Brigham and Women's Hospital, Boston, MA, USA, Principal Investigator); Sherry Chou, MD (Principal Investigator); Sarah Clark and Simone Renault (Brigham and Women's Hospital, Boston, MA, USA, Primary Coordinators); Gabriela Santos, Sarah Suh, Kristina Lieu, and Ross Merkin (Brigham and Women's Hospital, Boston, MA, USA, Primary Coordinators, former).

Joseph D. Burns, MD (Boston Medical Center, Boston, MA, USA, Principal Investigator); Helena Lau, MSPH, RN (Boston Medical Center, Boston, MA, USA, Primary Coordinator).

Salavador Cruz- Floes, MD (Saint Louis University, Saint Louis, MO, USA, Principal Investigator); Eve M. Holzemer, DNP, ANP- BC ; Susan Eller, MA, RN, CCRC; Susan Brown, RN, CCRC (Saint Louis University, Saint Louis, MO, USA, Primary coordinators); and JoAnn Filla- Taylor, BSN, RN, CCRC (Saint Louis University, Saint Louis, MO, USA, Primary Coordinator, former).

David Brown, MD (Hoag Memorial Hospital Presbyterian, Newport Beach, CA, USA, Principal Investigator); Laura Whitaker (Hoag Memorial Hospital Presbyterian, Newport Beach, CA, USA, Primary Coordinator).

Mu- Chien Sun, MD (Changhua Christian Hospital, Changhua, Taiwan, Principal Investigator); Pi- Ju Hsiao (Changhua Christian Hospital, Changhua, Taiwan, Primary Coordinator).

Dominik Michalski, MD (University Hospital Leipzig, Leipzig, Germany, Principal Investigator, affiliation Department of Neurology, University of Leipzig); Carsten Hobohm, MD (University Hospital Leipzig, Leipzig, Germany, Principal Investigator); Daniela Urban (University Hospital Leipzig, Leipzig, Germany, Primary Coordinator).

Daniel K. Nishijima, MD (UC Davis Medical Center, Sacramento, CA, USA, Principal Investigator); Glen C. Jickling, MD (UC Davis Medical Center, Sacramento, CA, USA, Co- Principal Investigator); Laura Beth Jones (UC Davis Medical Center, Sacramento, CA, USA, Primary Coordinator); Tirath Sanghera, CCRC (UC Davis Medical Center, Sacramento, CA, USA, Primary Coordinator, former).

Anna Khanna, MD (University of Florida Gainesville, Gainesville, FL, USA, Principal Investigator); Vishnumurthy Shushrutha Hedna, MD (University of Florida Gainesville, Gainesville, FL, USA, Principal Investigator, former, now at University of New Mexico); Rosie Kizza, RN (University of Florida Gainesville, Gainesville, FL, USA, Primary Study Coordinator).

Elizabeth Marriott, MD (Aurora St. Luke's Medical Center, Milwaukee, WI, USA, Principal Investigator); Linda Yanny, RN, BSN, CCRC (Aurora St. Luke's Medical Center, Milwaukee, WI, USA, Primary Coordinator).

Jefferson T. Miley, MD (Seton Medical Center Austin, Austin, TX, USA, Principal Investigator); Laura LaChance, MA, CCRP (Seton Medical Center Austin, Austin, TX, USA, Primary Coordinator); Alison M. von Eberstein, PhD, RN, BSN (Seton Medical Center Austin, Austin, TX, USA, Primary Coordinator, former, currently at Florida State University School of Information).

Bradley J. Molyneaux, MD, PhD; Clifton W. Callaway, MD, PhD; and Jon C. Rittenberger, MD (UPMC Mercy Hospital, Pittsburgh, PA, USA, Principal Investigators); Sara Difiore (UPMC Mercy Hospital, Pittsburgh, PA, USA, Primary Coordinator)

Gustavo Pradilla, MD (Emory University Hospital, Atlanta, GA, USA, Principal Investigator); Alex J. Hall, MS, RN (Emory University Hospital, Atlanta, GA, USA, Primary Coordinator); and Michael P. Lunney, MPH, NRP (Emory

University Hospital, Atlanta, GA, USA, Primary Coordinator, former).

Marco Lee, MD, PhD, Dept. of Neurosurgery, Stanford University (Santa Clara Valley Medical Center, San Jose, CA, USA, Principal Investigator); Anita Visweswaran (Santa Clara Valley Medical Center, San Jose, CA, USA, Primary Coordinator).

Robert Swor, DO (William Beaumont Hospital- Royal Oak, Royal Oak, MI, USA, Principal Investigator); Mara Branoff, RN, BSN (William Beaumont Hospital- Royal Oak, Royal Oak, MI, USA, Primary Coordinator/Research Nurse Clinician).

James M. Gebel, MD (Akron General Hospital, Akron, OH, USA, Principal Investigator); Debra Hudock, MSN (Akron General Hospital, Akron, OH, USA, Primary Coordinator).

Darren Lovick, MD (Saint Luke's Marion Bloch Neuroscience Institute, Kansas City, KS, USA, Principal Investigator); Bridget Brion (Saint Luke's Marion Bloch Neuroscience Institute, Kansas City, KS, USA, Primary Coordinator).

Yahia M. Lodi, MD (United Health Services Hospitals, Inc. – Wilson Medical Center, Johnson City, NY, USA, Principal Investigator); Varun Reddy, MD (United Health Services Hospitals, Inc. – Wilson Medical Center, Johnson City, NY, USA, Investigator); Terri Peters (United Health Services Hospitals, Inc. – Wilson Medical Center, Johnson City, NY, USA, Primary Coordinator).

Michael T. Froehler, MD, PhD (Vanderbilt Stroke Center, Nashville, TN, USA, Principal Investigator); Howard S. Kirshner, MD (Vanderbilt Stroke Center, Nashville, TN, USA, Investigator); Matthew M. Warrick (Vanderbilt Stroke Center, Nashville, TN, USA, Primary Coordinator).

Evgeny Sidorov, MD, PhD (Oklahoma University Health Sciences Center (OUHSC), Oklahoma City, OK, USA, Principal Investigator); Akram Shhadeh, MD (Oklahoma University Health Sciences Center (OUHSC), Oklahoma City, OK, USA, Principal Investigator, former); Bradley Hightower (Oklahoma University Health Sciences Center (OUHSC), Oklahoma City, OK, USA, Primary Coordinator).

Kazumi Kimura, MD, PhD (Kawasaki Medical School, Okayama, Japan, Principal Investigator, former, now at Nippon Medical School); Kensaku Shibasaki (Kawasaki Medical School, Okayama, Japan, Primary Coordinator).

Chang- Ming Chern, MD (Taipei Veterans Hospital, Taipei, Taiwan, Principal Investigator); Chia- Hui Lin and Chia- Wei Lin Hsu (Taipei Veterans Hospital, Taipei, Taiwan, Primary Coordinators).

Thorsten Steiner, MD, MME (Department of Neurology at Klinikum Frankfurt Hoechst, Frankfurt, Germany, Principal Investigator); Corina Epple, MD; Mari- Carmen Lichti, MD; Johannes Trabert; and Anna Katharina Flügel, MD, Department of Internal Medicine, Frankfurt University Hospital (Department of Neurology at Klinikum Frankfurt Hoechst, Frankfurt, Germany, Investigators); Sabrina J. Ritter (Department of Neurology at Klinikum Frankfurt Hoechst, Frankfurt, Germany, Primary Coordinator).

Heinrich J. Audebert, MD (Charite Universitätsmedizin Berlin, Berlin, Germany, Principal Investigator); Mrs. Jadranka Denes (Charite Universitätsmedizin Berlin, Berlin, Germany, Primary Coordinator).

United States NETT Network Participating Hubs, listed alphabetically

Columbia University Medical Center
Emory University
Henry Ford Health System
Massachusetts General Hospital
Medical College of Wisconsin
Oregon Health & Science University
Stanford University
SUNY Downstate Medical Center
Temple University
The Ohio State University
University of Arizona
University of California San Francisco
University of Cincinnati
University of Kentucky
University of Minnesota
University of Pennsylvania
University of Pittsburgh
University of Texas –Houston
Virginia Commonwealth University
Wayne State University

A directory listing US network hubs, hub PIs, site Principal Investigators and study coordinators affiliated with the Neurological Emergency Treatment Trials (NETT) Network is available online: <http://nett.umich.edu/directory>