UC Davis
Neurology

Title

Acute Predictors of Stroke Recovery: A Feasibility Study

Permalink

https://escholarship.org/uc/item/4d705116

Authors

Zazueta, Christopher

Akhtar, Noshin

McGuirk, Theresa

et al.

Publication Date

2024-04-01

Data Availability

The data associated with this publication are not available for this reason: N/A

Acute Predictors of Stroke Recovery: A Feasibility Study

Christopher Zazueta[2], Noshin Akhtar[1], Theresa McGuirk[1,4], Kwan L Ng[3], Carolynn Patten[1,4]

Biomechanics, Rehabilitation, and Integrative Neuroscience (BRaIN) Lab[1], UC Davis School of Medicine[2], Depts of Neurology[3], PM&R[4]
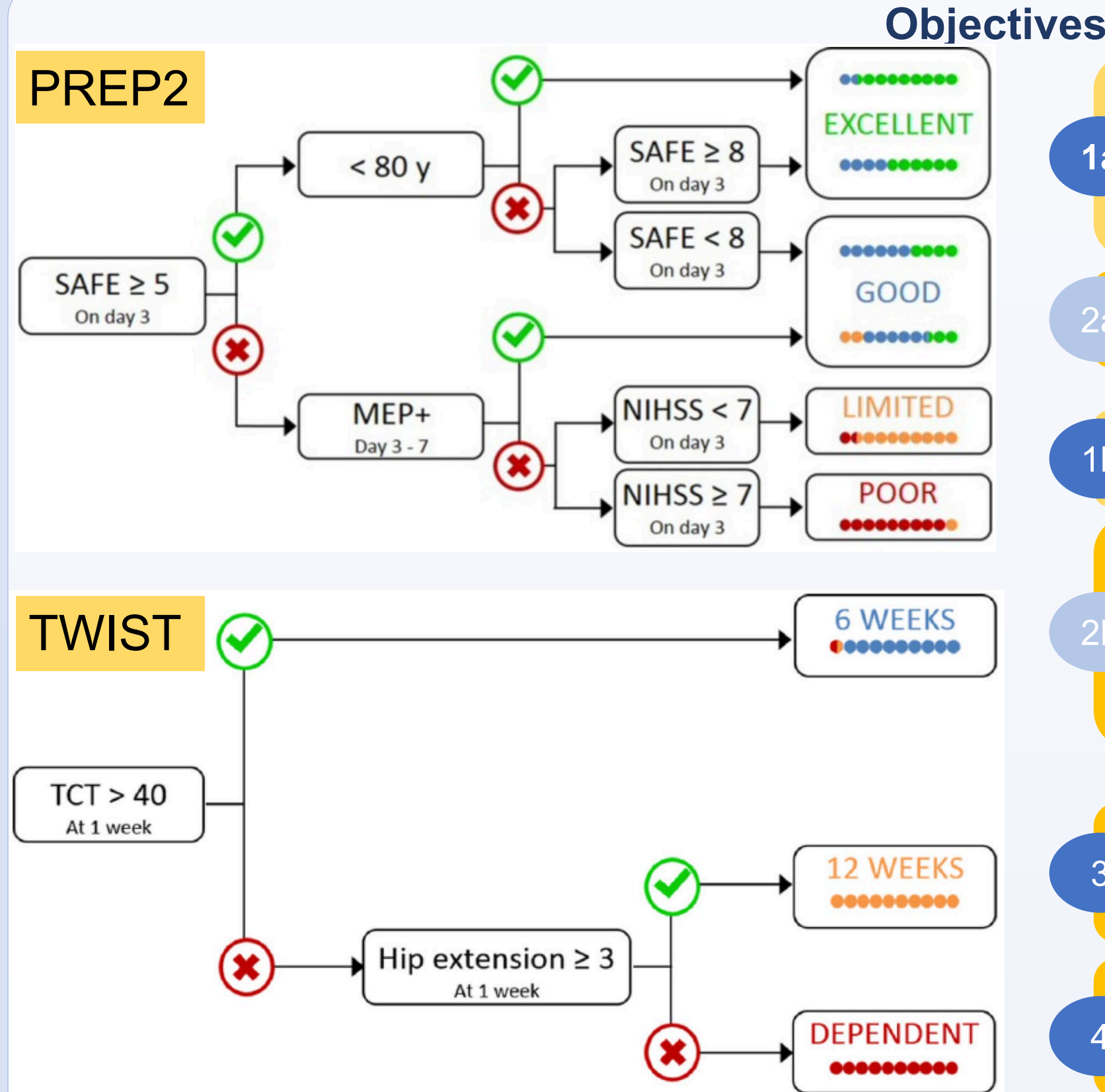
UC DAVIS HEALTH | SCHOOL OF MEDICINE

Background

- Stroke is the leading cause of serious, chronic physical disability in adults worldwide.
- Over 795,000 strokes occur annually in the United States accounting for more than half of all acute inpatient neurological admissions and $53 billion in health care costs. [1]
- There is a critical need to identify prognostic indicators that accurately predict outcome and/or potential for benefit from motor rehabilitation, particularly at a very early stage following stroke.
- The predictive capacity of baseline clinical measures is somewhat improved when combined with measures of brain function (e.g. lesion location, lesion size, their combination, corticospinal tract function) and has led to a nominal UE prediction algorithm (i.e. PREP2) that demonstrates 73% accuracy of the Action Research Arm Test (ARAT) at 3 months post-stroke. [2,3,4,5]
- A related approach targeting LE recovery (e.g. TWIST) used simple bedside measures obtained 1 week post-stroke to predict whether and when a patient walked independently. [6]

Purpose, Aims, Hypotheses of Project

- Our overriding goal is to develop a biomarker signature for use in the peri-acute period following stroke that accurately predicts long term motor outcome and differentiates motor recovery phenotypes (i.e. compensation vs. restoration.)
- We hypothesize: 1) the predictive value of the PREP2 and TWIST algorithms can be improved, and 2) LE recovery outcomes will be more accurate with incorporation of brain measures acquired using transcranial magnetic stimulation (TMS.)
- This MSRF project explored the feasibility of implementing such a study at UC Davis Health considering the patient population, specialty care involved, equipment/training, and interprofessional collaboration required for success.

Objectives

PREP2

- < 80 y
- SAFE ≥ 5 On day 3
- SAFE ≥ 8 On day 3 → EXCELLENT
- SAFE < 8 On day 3 → GOOD
- MEP+ Day 3 - 7
- NIHSS < 7 On day 3 → LIMITED
- NIHSS ≥ 7 On day 3 → POOR

TWIST

- 6 WEEKS
- TCT > 40 At 1 week
- Hip extension ≥ 3 At 1 week
- 12 WEEKS
- DEPENDENT

1a Implement **PREP2 Algorithm** obtain SAFE Score, NIHSS, Age and Presence/Absence of Motor Evoked Potentials in FDI/ECR using TMS

2a Acquire Grip Strength Symmetry UE Fugl-Meyer Assessment

1b Implement **TWIST** Algorithm obtain TCT Score, NIHSS, and Age

2b Presence/Absence of Motor Evoked Potentials in SOL and MG using TMS Acquire Ankle Plantarflexion Strength using instrumented immobilization boot LE Fugl-Meyer Assessment

3 **Monitor Outcomes at 3 months** post-stroke, Modified Rankin Scale, NEURO-QOL PRO Late-Life Function and Disability Indicator

4 **Assess feasibility** determine how many patients qualify based on NIHSS score and average LOS based

Results
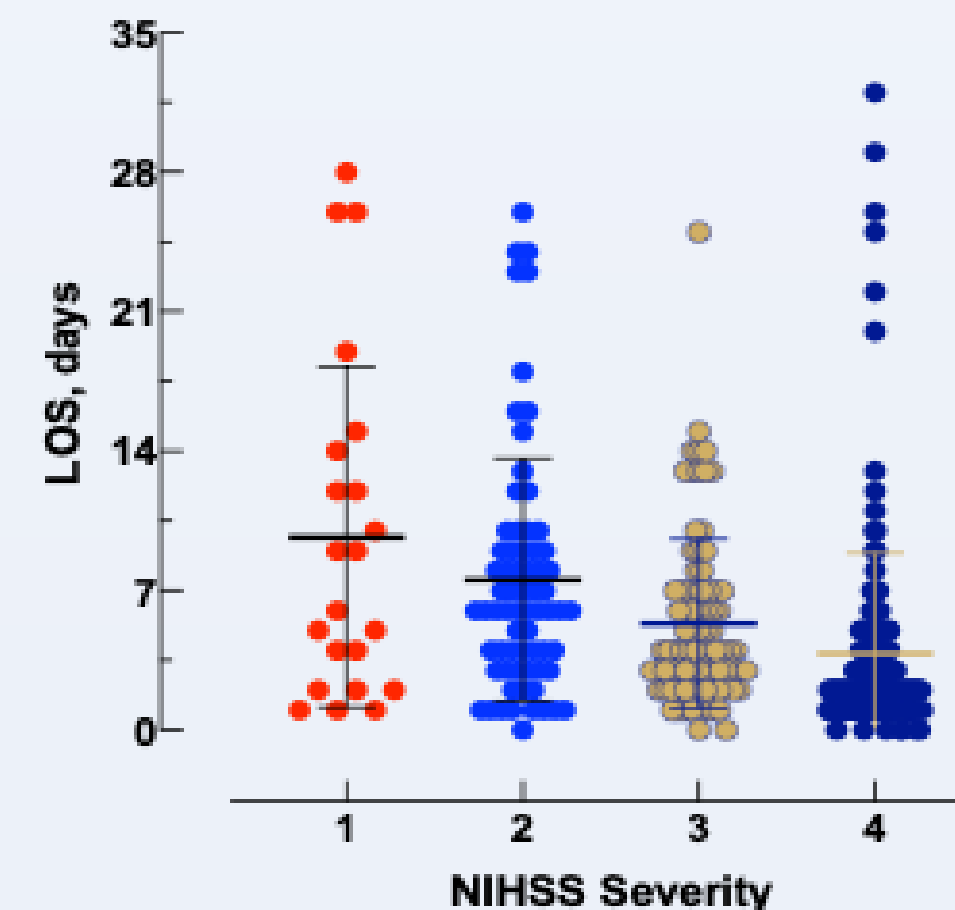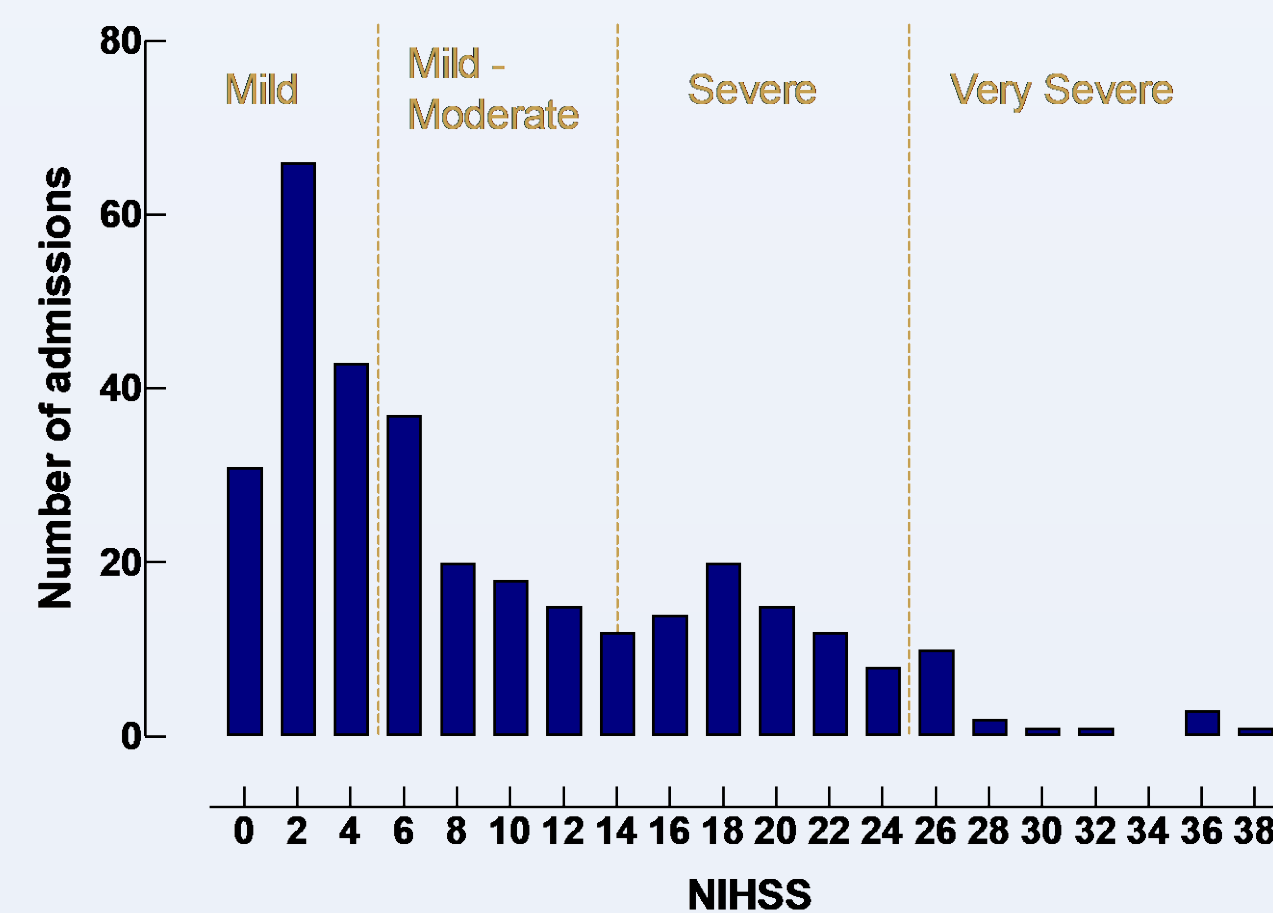
- 333 ischemic stroke patients were admitted in 2023
- Patients with NIHSS severity scores of 1, 2, 3 and 4 have average length of stay (LOS) of 9.7, 7.5, 5.3 and 3.8 days, respectively.

Conclusions

- People in NIHSS severity categories 1 - 3 are likely candidates for this study.
- Patients in severity category 4 may be difficult to include since they are not hospitalized for sufficient time to allow patient identification/location, obtain informed consent, and perform measurements.
- Considering many patients will choose not to enroll, a realistic view would be anywhere from 10 - 15% participation (totaling approximately 33 - 50 patients in a year) effectively 1 patient participating every week. Conduct and implementation of this project at this throughput is highly feasible.
- Barriers to this project include: 1) training to use, record, and understand TMS, and 2) obtaining an area in the hospital setting to store equipment for conducting the assessments.

References

[1] Prevention CfDCa. Stroke Facts. https://www.cdc.gov/stroke/facts.htm. Published 2022. Accessed 2/12/2024, 2024.

[2] Cramer SC, Parrish TB, Levy RM, et al. Predicting functional gains in a stroke trial. *Stroke; a journal of cerebral circulation.* 2007;38(7):2108-2114.

[3] Koski L, Mernar TJ, Dobkin BH. Immediate and long-term changes in corticomotor output in response to rehabilitation: correlation with functional improvements in chronic stroke. *Neurorehabilitation and neural repair.* 2004;18(4):230-249.

[4] Kaczmarczyk K, Wit A, Krawczyk M, Zaborski J, Gajewski J. Associations between gait patterns, brain lesion factors and functional recovery in stroke patients. *Gait & posture.* 2012;35(2):214-217.

[5] Stinear CM, Byblow WD, Ackerley SJ, Smith MC, Borges VM, Barber PA. PREP2: A biomarker-based algorithm for predicting upper limb function after stroke. *Ann Clin Transl Neurol.* 2017;4(11):811-820.

[6] Smith M-C, Barber PA, Stinear CM. The TWIST Algorithm Predicts Time to Walking Independently After Stroke. Neurorehabilitation and Neural Repair. 2017;31(10-11):955-964. doi:10.1177/1545968317736820

Acknowledgements