

Title: Autonomic nervous system dysfunction is a potential cause of racial disparities in stroke rehabilitation

Authors: Ifeoma Anunoby^{1,2}, Justin Pearre, BS, M2^{3,2}, Bruce Green, BA, MA, M2^{3,2}, Alex Brown, BS⁴, Vovanti Jones, MD², Bradley Ferguson, PhD⁵, Carmen M. Cirstea, MD, PhD, FAHA²

¹Biological Sciences, ²Physical Medicine & Rehabilitation, ³School of Medicine, ⁴Psychological Sciences, ⁵Health Psychology, University of Missouri, Columbia, MO, USA

Introduction: Recent advances in acute stroke management lead to a growing population of stroke survivors. More than 2/3 of these receive rehabilitation service. Current rehabilitation is of limited effectiveness, particularly in minorities. Autonomic nervous system (ANS) dysfunction is an underrecognized cause of poor outcomes after stroke. ANS dysfunction is more common in minorities. Our objective was to examine the nature and functional relevance of the ANS dysfunction at admission to stroke rehabilitation. We hypothesized such dysfunction is associated with poor rehabilitation outcomes and is more prevalent in minorities.

Methods: ANS function was measured for 24h with a biosensor that passively collects heart rate variability-HRV (n=1 patient & 3 age/sex-matched healthy controls). Macro/microscopic profiles of two major ANS centers, insula and locus coeruleus-LC, were assessed via MRI. The effects of a therapy reversing ANS dysfunction (beta-blockers) on rehabilitation outcomes was also studied (n=6 patients, 3 Black & 3 age/sex/stroke characteristics-matched White).

Results: HRV was objectively and continuously quantified in real-world in all participants; the patient (59-year female, 11 days after left basal ganglia/corona radiata stroke) showed a slightly increased stress index vs. a matched control (19 vs. 18). A trend toward lower insular volumes was found in patient vs. control (mean for both hemispheres, 5512 vs. 7325mm³). Insula microscopic and LC macroscopic analyses are still an ongoing process. Rehabilitation outcomes were worse in Black (31.1±30.1% functional improvement from baseline) compared to White (117.1±43.6%) patients (p=0.048); this finding corroborates well with literature. There was no significant difference in rehabilitation outcomes between beta-blockers users vs. non-users (p=0.7); small sample size and/or the use of hypertension-related beta-blockers doses may explain this finding.

Conclusions: If, as our preliminary data suggest, our results provide further support for the hypothesis, these findings will improve our understanding of the ANS dysfunction in racial disparities in stroke rehabilitation.

July 29, 2021