

## **The Hope Network Acuity Scale (HAS): Development, Validation and Utility of a Neuro Rehabilitation Acuity Measure**

Martin Waalkes, PhD,<sup>a</sup> M. Michele Tomlinson, PhD,<sup>a</sup> Amy Walters, BA, LPN,<sup>a</sup> Lauren Evert, BA<sup>b,a</sup>

<sup>a</sup>Hope Network Neuro Rehabilitation, Grand Rapids, MI

<sup>b</sup>Hope College, Holland, MI

There are no known conflicts of interest including financial, consultant, institutional, and other relationships that might lead to bias or a conflict of interest.

### **Acknowledgments**

The authors would like to thank Nate Kaufman, BS, Holly Cramblet, MA, LLP, BCBA, Hope Network Residential Supervisors, Nurses, and Shift Leads whose development assistance helped make this study possible, and Jacobus Donders, PhD, ABPP for a review of an early draft of this study.

Presented to the Michigan Brain Injury Association, September 9-12, 2019, Lansing, MI, American Medical Rehabilitation Providers Association, October 14-16, 2019, San Diego, CA, the American Congress of Rehabilitation Medicine, November 3-8, 2019, Chicago IL, and the North American Brain Injury Society, February 26-29, 2020, New Orleans, LA.

### **Corresponding Author**

Martin J. Waalkes, PhD, ABPP, Hope Network Neuro Rehabilitation, 1490 E Beltline Ave SE, Grand Rapids, MI 49506. Business Phone: (616) 940-0040. E-mail address: [mwaalkes@hopenetwork.org](mailto:mwaalkes@hopenetwork.org)

### **Reprints**

Reprints available on request. Hope Network Acuity Scale forms available at:

<https://hopenetwork.org/neuro-rehab/hope-network-acuity-scale/>

## Manuscript

**Objective:** Required caregiver effort in neurological rehabilitation encompasses both demands for caregiving needs and protective supervision supports. To quantify this dimension of care, the Hope Network Acuity Scale (HAS) was developed. This study provides a preliminary analysis of the psychometric properties of the HAS, an eight item two-factor (behavioral and medical) scale designed to measure demand on caregiver effort in post-acute brain injury and neurological rehabilitation settings. The HAS quantifies important information that can potentially facilitate staffing, supervision and placement decisions and serve as a relevant functional outcome measure.

**Setting:** Hope Network Neuro Rehabilitation in Grand Rapids, Michigan, a residential rehabilitation center for post-acute (primarily brain injury) neuro rehabilitation; transitional and long-term.

**Design:** Measure development and psychometric analysis. Scale items developed by interdisciplinary team of experts and screened for comprehension by direct service staff. Current long-term and transitional supervised residents, and newly admitted transitional patients were followed through discharge using the HAS. Reliability (internal and interrater), validity (content, construct, discriminant and concurrent) and sensitivity to change were investigated.

**Participants:** HAS data collected from a convenience sample of 240 clients receiving post-acute transitional or long term residential neurological rehabilitation (average age: 48.0 years old; 66.7% male) was used to assess interrater reliability, internal reliability, and construct validity. A smaller cohort of 105 consecutive transitional residential clients (average age: 46.9 years old, 61% male) were followed from admission through discharge (average length of stay: 76.7 days) to assess concurrent and discriminant validity and sensitivity to change.

**Interventions:** Not applicable.

**Main Outcome Measure(s):** Hope Network Acuity Scale (HAS), Mayo-Portland Adaptability Inventory-4 (MPAI-4), and Supervision Rating Scale (SRS).

**Results:** Initial results indicate generally acceptable internal reliability (Cronbach alpha for Medical Acuity = .84, for Behavioral Acuity = .70) and excellent interrater reliability (ICC = .95; 95% CI = .93 - .97). Exploratory factor analysis resulted in a 2-factor solution supporting the proposed correlated medical and behavioral factors (explaining 62.97% of variance), providing evidence of construct validity. The HAS correlated highly with other well-known outcome measures at both admission and discharge (MPAI-4:  $r = .79, .82$ ; and SRS:  $r_s = .53, .66$ ). Additionally, the HAS demonstrated sensitivity to change by showing significant change from admission ( $M = 11.29$ ) to discharge ( $M = 7.81$ ;  $t(101) = 7.04, p < .001$ ). The HAS discharge scores also discriminate between discharge placements. The Kruskal Wallis H test showed a statistically significant difference in discharge Total Acuity score based on discharge location ( $\chi^2(2) = 26.42, p < .001$ ), with a mean rank acuity score of 66.26 for AFC, 40.90 for Living with Family (Supervision) and 24.42 for Independent Living. Bonferroni corrected pairwise comparisons revealed significant differences between each pair of discharge locations.

**Conclusions:** Preliminary development of the HAS shows it to be a promising measure of demand on caregiver effort in post-acute neurological rehabilitation treatment and a practical measure of outcome. While more work is needed, initial results indicate the HAS displays generally sound psychometric properties and potential clinical utility for staffing, supervision, and placement decisions. Currently available functional measures quantify functional ability, but are only indirectly related to care demand. The use of the HAS can improve clinical communication and resource allocation by providing a standardized, quantifiable descriptor of actual required care and supervision demands in neurological rehabilitation.