HOPE NETWORK
NEURO REHABILITATION

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

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Reprints

Reprints available on request. Hope Network Acuity Scale forms available at: https://hopenetwork.org/neuro-rehab/hope-network-acuity-scale/

MANUSCRIPT

Objective: Demonstrate the psychometric properties of the Hope Network Acuity Scale (HAS), an eight item two-factor (medical and behavioral acuity) scale designed to measure demand on caregiver effort in post-acute transitional neurological rehabilitation settings.

Design: Prospective cohort assessed at intake and discharge.

Setting: Hope Network Neuro Rehabilitation in Grand Rapids, Michigan, a residential neurorehabilitation provider.

Participants: Consecutively admitted patients (N = 173) receiving post-acute transitional neurological rehabilitation.

Interventions: Not Applicable.

Main Outcome Measures: HAS, Mayo-Portland Adaptability Inventory-4 (MPAI-4), and Supervision Rating Scale (SRS).

Results: Results indicate acceptable internal reliability (Medical Acuity α = .80; Behavioral Acuity α = .72) and excellent interrater reliability (ICC = .95; 95% CI = .93 - .97). Exploratory factor analysis found a 2-factor solution (Medical and Behavioral Acuity) explaining 60.23% of variance. Concurrent validity supported by significant correlations with the SRS (r_s = .426, p < 001) and MPAI-4 (r = .748, p < .001). The HAS demonstrated sensitivity to change by significant decrease from admission (M = 11.13) to discharge (M = 8.25; t(172) = 8.44, p < .001). The one-way ANOVA revealed differences in discharge HAS based on discharge location (*Welch's* F(2, 91.38) = 60.52, p < .001). The HAS also provided unique contribution over the MPAI-4 for predicting discharge level at intake (χ^2 = 7.205, p = .027), specifically for comparing High Supervision to Medium Supervision levels.

Conclusions: Preliminary evaluations of the HAS display generally sound psychometric properties and support it as a promising and useful measure of demand on caregiver effort in post-acute neurological rehabilitation treatment.

Keywords: Traumatic brain injury; patient acuity; psychometrics; neurorehabilitation; outcome and process assessment.

List of abbreviations:

EFA: Exploratory Factor Analysis
HAS: Hope Network Acuity Scale
ICC: Intraclass Correlation
LOS: Length of Stay
MPAI-4: Mayo-Portland Adaptability Inventory
SRS: Supervision Rating Scale

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

Required effort expended by caregivers in patient treatment and supervision, often referred to as patient acuity in neurological rehabilitation, encompasses demands for caregiving needs, medical treatments, and protective supervision supports. Literature reviews find few acuity measures designed or validated for use within a neurorehabilitation treatment setting. For example, an Acuity tool proposed at Vanderbilt University Hospital incorporates both psychiatric and medical components, but has not been psychometrically validated and many items are specific for a psychiatric setting and not applicable for a person with a traumatic brain injury (TBI).1 The Supervision Rating Scale (SRS) is commonly used in neurorehabilitation settings to describe the supervision needs of patients with TBI.2 However, the SRS categorizes patients based on what care was provided, not what care is needed as a planning tool. Perhaps the closest to fulfilling the needs of an acuity tool within a neurorehabilitation setting is the Care and Needs Scale (CANS).3 The CANS is an 8-level categorical scale measuring the level of support needs of individuals with traumatic brain injury. Although psychometrically validated, the CANS is a categorical tool and does not appear to differentiate between hours of supervision required and intensity of the needs during those hours.

The Hope Network Acuity Scale (HAS) was developed as a measure of required care and supervision needs of persons in neurological rehabilitation. Items were first developed in focus groups based on their contribution to 'effort required' for caring for patients. Consistent with familiar neurorehabilitation rating systems, response categories for the resulting items (0, 1, 2, 3) were created to reflect the levels of assistance required. The resulting HAS is an eight item, two-factor (behavioral and medical) scale with four items on each subscale (see Figure 1). The HAS can be completed without formal training by supervisory or caregiving staff who are familiar with the patient's needs. The present study provides a preliminary analysis of the psychometric properties of the HAS.

Method

Participants

The sample includes all 173 participants consecutively admitted to a post-acute (primarily brain injury) transitional residential rehabilitation at Hope Network Neuro Rehabilitation (HNNR) between September, 2017 and February, 2020. A sample size of at least 20 subjects per rating item was proposed (n = 160) for the analyses given the exploratory nature of this initial scale development [4]. The average age at admission was 46.7 years old (*SD* =16.67, range = 18-89) and 64.7% were male. The average length of stay (LOS) was 71.5 days (*SD* = 62.7, range = 8 – 375) and the median length of time from onset to admission was 56 days with 91% of clients admitted within one year of onset. Participants all demonstrated rehabilitation care needs sufficient to require a supervised treatment placement.

Materials and Procedure

The HAS was completed by supervising residential staff for each participant at admission and discharge. Resulting data was used to assess reliability, construct validity and sensitivity to change over the course of provided rehabilitation interventions. As part of subsequent routine care, independent of the HAS collection, ratings by separate rehabilitation clinicians were completed using two other well-known and validated measures at admission and discharge: The Mayo-Portland Adaptability Inventory-4 (MPAI-4)[5] and the SRS. The MPAI-4 is a treatment outcome measure used to assess physical cognitive emotional, behavioral and social issues that may arise as a result of a TBI. The SRS ranks supervision needs. This data was used to inspect the relationship between the HAS and these existing outcome measures as well as the incremental validity of the admission HAS for predicting discharge outcome.

To assess interrater reliability (IRR), a total of 208 one-time HAS ratings on 104 clients, collected February to March, 2018, were used. IRR data consisted of a convenience cross-section sample of transitional and long-term clients. This sample differs, but overlaps, from the sample used in the remainder of the study. Each client had two HAS ratings done by staff members familiar with the client, one by the Residential Supervisor and one by another similarly qualified staff member. The HAS ratings were independently completed on each client on the same day. All analyses presented were conducted using SPSS statistical package version 25 (SPSS Inc, Chicago, IL) and study was approved by the Hope Network Institutional Review Board.

Results

Item Analysis

Descriptive statistics of the HAS items and scale scores are found in Table 1. With the exception of the Aggression item, which has a slightly lower mean (M = 0.59) and is positively skewed, all items are approximately normally distributed with no significant skew or kurtosis. Acuity Total scores range from 0 – 24 with a mean of 11.13 (SD = 5.33).

Interrater Reliability

A conservative one way Intraclass Correlation (ICC) was used as there are different raters for each participant.6 ICC estimates and their 95% confidence intervals were based on a single measure, absolute-agreement, 1-way random effects model. Using suggested reference points, 7 the ICC estimate for the Total Acuity Score was .95 (95% CI: .93 - .97), indicating excellent reliability; .94 (95% CI: .92 - .96) for the Medical Subscale, indicating excellent reliability; and .90 (95% CI: .86 - .93) for the Behavioral Subscale, indicating good reliability.

Construct Validity

Cronbach's alpha was .80 for the Medical Subscale and .72 for the Behavioral Subscale, indicating good and adequate internal consistency respectively. 8 Deletion of "Skilled Medical Care" increases the internal

consistency of the medical subscale, indicating this item may not relate to the scale as well as might be desired. Corrected item-total correlations for the items in the Medical and Behavioral Subscales ranged from .40 - .74 and are found in Table 1. All items meet the accepted cutoff of .30 often used to distinguish adequate relationships of items to the overall subscale. 9,10

Dimensionality of the HAS was assessed using Exploratory Factor Analysis (EFA). Following methodology recommendations by Costello & Osborne, 11 maximum likelihood extraction was used with oblique rotation. Preliminary analyses revealed the Kaiser-Meyer Olkin Measure of Sampling Adequacy to be .78, above the commonly recommended value of .6, indicating an adequate sample for factor analysis. Bartlett's test of sphericity was performed, revealing an approximate Chi Square of 395.6 ($df = 28$, $p < .001$), demonstrating that correlations in the data are appropriate for factor analysis. EFA results found a two-factor solution (i.e., eigenvalues above 1) that correlate ($r = .39$) and explain approximately 60.3% of the total variance. The Pattern Matrix is found in Table 2. With all items having adequate factor loadings (> 0.4), the hypothesis is supported that acuity is made up of two different, but related, components that align with the concepts of medical and behavioral acuity.

Concurrent Validity

Spearman Correlations between the HAS and SRS at admission and discharge are found in Table 3. With one exception, results show the expected significant positive relationships between SRS ratings and the Acuity Total Score, Medical Subscale Score and Behavioral Subscale Score at both admission and discharge. The only non-significant correlation was between the admission SRS and the medical subscale. However, this may be explained by a limited range for the intake SRS in the data (i.e., 4 of 13 levels represented). As expected, Pearson correlations between MPAI-4 scores and HAS Scores were all positively significantly related at both admission and discharge ($p < .001$; See Table 3). The correlations appear to be high enough to show they are related but not so high as to indicate they are measuring the same thing. Together, these results provide evidence of the concurrent validity of the HAS.

HAS scores were compared based on discharge location following completion of transitional treatment. Due to unequal sample sizes and heteroscedasticity, Welch's F test was used with post hoc comparisons utilizing the Games-Howell post-hoc procedure. As seen in Table 4, discharge locations were divided based on whether they provided a high (24-hour skilled care; $n = 53$), medium (family or structured placements; $n = 45$) or low level of supervision (independent living; $n = 73$). Two clients were discharged to other locations (e.g., jail) and were excluded. The one-way ANOVA of HAS scores revealed a statistically significant main effect, Welch's $F(2, 91.38) = 60.52$, $p < .001$, indicating differences in discharge HAS based on discharge supervision level. Post hoc comparisons, using the Games-Howell post hoc procedure, were conducted to determine which pairs of discharge levels differed significantly. As seen in Table 4, all comparisons were significant, with effect sizes ranging from 0.94 – 2.01). These results provide preliminary evidence of the ability of the HAS to discriminate between discharge locations based on the level of support provided, with higher HAS scores in discharge locations with

higher levels of support/supervision. Additional data is needed to confirm findings and differentiate between other discharge locations.

Incremental Validity

A multinomial logistic regression was performed to model the relationship between intake MPAI-4 and HAS scores to discharge placement based on level of supervision needed (high, medium, low). The goal was to assess whether the HAS provides incremental validity over the MPAI-4 for prediction of discharge placement. Descriptives for the intake MPAI-4 and HAS scores by discharge placement level are found in Table 4. Significance was tested at the .05 level for all tests. Addition of the predictors to a model that contained only the intercept significantly improved the model fit to the data, (χ2 (4, N = 137) = 53.12, p <.01). Models were run first that included age at intake and gender as predictors. Neither made significant contributions so they were excluded in the final model for simplification. As shown in Table 5, intake MPAI-4 and HAS scores made significant contributions in the overall model. Hosmer-Lemeshow tests were conducted for each pair of groups to assess goodness of fit. No tests were significant, indicating good fit.

The reference group was those discharged to a Medium supervision location. As such, each predictor has two parameters, one for predicting membership in the High supervision group rather than the Medium supervision group and one for predicting membership in the Low supervision group rather than the Medium supervision group. Parameter estimates are found in Table 6. The Exp(β) column are the odds ratios for the predictors and indicates how the risk of the outcome discharge group falling in the comparison group compared to the risk of the outcome discharge group falling into the referent group changes with each variable. A one point increase in the total HAS score at intake increases the odds of being in the High Supervision discharge group by 18%, compared to the Medium Supervision group (Exp(β) = 1.183, 95% CI = 1.038 – 1.348). A one point increase in MPAI-4 at intake decreases the odds of being in the Low Supervision discharge group by 16%, compared to the Medium Supervision Group, (Exp(β) = .837, 95% CI = .767 - .914). The final model accurately classified 60.6% of cases (see Table 7). In a model where only MPAI was included as a predictor, 55% of cases were accurately classified.

Sensitivity to Change

Comparison of HAS admission and discharge scores can be seen in Figure 2. The HAS total score demonstrated sensitivity to change by showing significant change from admission (M = 11.13, SD = 5.33) to discharge (M = 8.25, SD = 5.84; t (172) = 8.44, p < .001). The Medical Subscale also showed significant change from admission (M = 6.30, SD = 3.53) to discharge (M = 4.41, SD = 3.58; t (161) = 9.42, p < .001). Similarly, the Behavioral Subscale showed significant change from admission (M = 4.89, SD = 3.01) to discharge (M = 3.97, SD = 3.14; t (161) = 4.21, p <.001). Not only do these results demonstrate the sensitivity of the HAS to detect changes in acuity during the course of treatment, they also highlight the utility of the HAS as a relevant measure of efficacy and outcomes for transitional rehabilitation.

Discussion

Preliminary analyses suggest the HAS is a psychometrically sound and clinically sensitive tool for measuring medical and behavioral acuity in post-acute neurorehabilitation treatment settings. Not only do current results suggest the HAS to be a reliable and valid tool, it also demonstrates sensitivity to change over the course of treatment. The HAS is unique in that it is short, easy to use by any staff familiar with patient needs, does not require training to complete, and it takes into account coverage, frequency, and intensity of supervisory needs of a patient.

Psychometric results for the HAS were overwhelmingly positive with excellent IRR, good internal consistency and a two-factor structure. Yet a few things merit further discussion. First, although the hypothesized factor structure implied by the two subscales of medical and behavioral acuity was supported overall by item analyses and EFA, reliability analyses indicate that deletion of the "skilled medical care" item increases internal reliability of the Medical Subscale from .80 to .82. This finding suggests that this item may differ slightly in relation to medical acuity compared to other items. However, given the high alpha of the subscale, and only modest increase when deleted, removal of this item was not currently deemed necessary. Additionally, other indices of item fit (i.e., EFA, item statistics and face validity) support its inclusion at this point in time. Future confirmatory analyses need before firm conclusions are drawn.

Another finding worth exploring relates to the concurrent validity with the SRS. Because the SRS is related to level of care applied, small to moderate significant relationships were expected with HAS scores at both timepoints. The intake Medical Subscale score was the only one that did not. It is possible that the SRS assessments at intake are less about medical function and more about risks presented by behavior, or that range of scoring is limited based on finite placement options at a residential rehabilitation center. At this time, authors do not believe this detracts from evidence supporting concurrent validity of the HAS.

The HAS was developed to be an easy-to-use tool that can be used in conjunction with other functional measures to aid in decision making and treatment planning. For it to be useful in the manner intended, it must be sensitive to change over time and meaningfully differentiate patients. As expected, not only do the results show significant change in acuity from admission to discharge, they also show the HAS has the potential to distinguish patients based on discharge level at the conclusion of treatment. The ability of the intake HAS to provide unique contribution (over and above the MPAI) in the prediction of discharge placement locations further highlights the potential use of the HAS. Although the finding may be small, it suggests that looking at the Intake HAS scores could help identify the likelihood of discharge to a high vs. medium supervision for some clients. For example, two participants in the sample that had intake MPAI scores of 56 had initial HAS scores of 8 and 17 respectively. Based on predicted probabilities, the client with a HAS score of 17 has an 86% chance of being placed in the High Supervision discharge category whereas the client with a HAS of 8 has only a 57% chance of being in the High Supervision discharge category. While these are predicted probabilities and individuals don't always follow

predicted trajectories because of individual differences in responses to treatment, it may provide some frame of reference for discharge expectations. Current results are from a relatively small sample from one treatment location. However, these results are suggestive and further work is needed to assess the predictive validity of the HAS with larger samples from varying treatment locations.

Another advantage of the HAS being short and easy to administer is its ability to be completed frequently throughout treatment. As opposed to pre/post measures, the HAS may provide consistent and ongoing assessments of patients' acuity needs, allowing care staff to better understand the resources required to support recovery during each step of the treatment process. Additionally, frequent HAS administration allows for more detailed exploration of how acuity changes over time. Future research will look longitudinally at the HAS by administering it in shorter intervals throughout treatment to provide insight into general change in acuity over time.

Further exploration of the psychometric properties of the HAS is necessary, specifically how it relates to the extent and severity of the brain injury, length of time since injury, demographic variables, and their effects on HAS ratings. Future work also is also needed for replication of current findings with HAS data from other post-acute residential settings, particularly inpatient rehabilitation and skilled nursing settings.

Study Limitations

Currently, the HAS has only been developed within specialty post-acute residential neuro-rehabilitation treatment settings. Its utility and validity has yet to be assessed in other treatment locations with different levels of severity in TBIs such as acute-care or community settings. Additionally, it has not been tested for use in pediatric settings.

Conclusion

The current preliminary findings suggest that the HAS is a psychometrically sound tool that provides useful information about medical and behavioral acuity and has the potential to assist in clinical decision making and treatment planning in neurorehabilitation treatment settings. Altogether, the results from this study hold implications for the use of HAS as a placement tool, measure for efficiency, and potentially as a working tool for assigning resources or cost estimating. The HAS is a highly relevant measure for treatment planning, given its ability to quickly assess the intensity and coverage of care over the course of a residential admission. Future research aims to further explore additional application of the HAS for treatment and program planning.

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Figures and Tables

Figure 1

Case #:	Patient Name:	Rater Name:
Date:	Residential Location:	Rater Role:
Rating Interval:	Pre-Admit: ☐ Admit: ☐ Interval: Weekly ☐ Discharge: ☐ Monthly ☐ Other: _____ Quarterly ☐	

Circle areas that apply for each acuity type; should represent the patient's consistent presentation for the reporting period.
Each acuity type is scored from a "0," indicating no care needs associated with that acuity, to a "3," indicating significant care needs.

MEDICAL RATING:	0	1	2	3	SCORES
ADLs/TRANSFERS Global description of assistance needed	Independent; can include independent use of assistive device; no staff assistance or oversight	SBA/contact guard/set up; 1 staff assist; staff required at times to set up, cue, or minimal physical assistance to complete	Minimum to moderate assist, 1 staff assist; staff required for physical assistance — more than hand on patient as CG	Maximum assist; use of transfer device; requires 2 or more staff; 1+ person needed for physical management of care and/or transfers	
MOBILITY/ORTHOTICS Global description of physical assistance needed for mobility in primary environment; independence is rated after transfer to W/C; Not related to orientation	Independent ambulation or independent propelling and maneuvering of W/C both in and out of building	SBA/contact guard; independently uses device to ambulate (i.e. walker, cane); requires AFO to ambulate	Minimum to moderate assistance, 1 staff with walker or W/C; brace schedule requires staff monitoring; staff presence required for physical assistance — more than hand on patient as CG	Maximum assist 2 or more staff with walker; completely dependent for mobility in W/C; 1+ staff needed for physical management of mobility or significant medical devices for stabilization	
SKILLED MEDICAL CARE Separate from bowel/bladder management	No wounds; no PEG; no BS checks; no insulin; no oxygen; no drains or tubes	Simple dressing changes; monitoring of oral intake/food log/calories; non-insulin dependent diabetic; no BS checks; use of inhaler less than 1x/month; use of incentive spirometry	Skilled nursing dressing change; dysphagia diet; PEG for supplemental hydration; non-insulin dependent diabetic with BS checks; status post cranioplasty in last 6 months; seizure Hx longer than 6 months with AED meds; presence of shunt placement longer than 6 months; use of inhaler/ nebulizer PRN in last week	Extensive wound care/clinic; primary PEG feeding; NPO status; insulin dependent with BS checks, craniotomy without replacement; seizure Hx in last 6 months with AED meds; shunt placement or reprogramming in last 6 months; uses oxygen, nebulizer, CPAP/ BiPAP daily; cervical collar, TLSO, halo, or other fixator, presence of tubes/drains; isolation precautions	
BOWEL/BLADDER Patient's level of awareness and ability to physically self-manage	Continent and fully independent with both bowel and bladder; no presence of tubes, drains or other services	Continent of bowel and bladder with cues and/or assistance with brief, clothing, and clean-up management; self-caths independently	Incontinent of bowel and bladder or average of 1+ accidents per shift; 1-2 staff management of brief changes; self-caths with set up assistance	Incontinent of bowel and bladder; requires staff management of catheter, presence of col/urostomy; bowel program ordered with more than oral meds; 2+ staff for care management	
				MEDICAL RATING TOTAL:	

BEHAVIORAL RATING:	0	1	2	3	SCORES
FALL RISK Global description of unplanned descents to floor	No current risk; no impaired safety awareness	Low risk; no current risk for falls but with impaired safety awareness	Moderate risk; use of W/C or bed alarms; Hx of falls in the past 3 months	High risk; W/C and bed alarms with 1:1 staffing for impulsivity and impaired safety awareness; Hx of falls in last month	
AGGRESSION Agitation, anger, or irritability that is unexpected or occurring outside of planned interventions	No aggression; no threats toward self or others	Verbal irritability; mild swearing; responsive only to specific staff; requires infrequent verbal interventions	Significant swearing; under-responsive to program direction on care, scheduled activity routines, and therapy; use of physical and verbal direction 1-3 times/day for aggression; refusals or chronic delays of non-essential treatment	Posturing or verbally threatening imminent harm to self or others; physical aggression towards others or property; presence of self-harm behavior or suicide risk; frequent use of physical and verbal direction 3+ times/ day for aggression	
CONFUSED BEHAVIOR Areas of concern related to orientation and participation in care routines and demands of environment	No impairments or non-contributory (alert and oriented x4)	Readily redirectable; behavior present but doesn't significantly interfere with therapies or routines, requires infrequent verbal intervention for safety	Difficult to redirect at times; behavior interferes with therapies or care in a timely fashion; may require extra time or staffing present to complete care; not attending to pressing personal care needs; confused wandering at facility; requires frequent verbal or physical intervention for safety 1-3 times/day	Persistently difficult to redirect; uncontrolled or constant impulsive behaviors 3+/hour; refusal or unawareness of basic care needs placing patient at risk for safety or medical complexities; pulling at or self/removal of tubes/drains; use of mitts/abdominal binder on a scheduled behavior program; refuses medical devices; requires monitoring for likely AWOL/flight related to confusion; requires verbal or physical intervention for redirection 3+/day	
PRECAUTIONS Specialized supervision; support provisions	No special supervision needs; fits into 1:3 staff to patient ratio or less	1:2 staff to patient ratio	15-minute checks; requires cues or interventions for safety (W/C or bed alarms); wander guard	Line of sight or more intense supervision; wander guard with additional intervention protocol; in-house therapies only; 2 staff for travel outside of building/campus	
				BEHAVIORAL RATING TOTAL:	
				COMBINED TOTAL:	

LIST OF ABBREVIATIONS

AED = Anti-Epileptic Drugs
AFO = Ankle-Foot Orthosis
BiPAP = Bilevel Positive Airway Pressure
BS = Blood Sugar
CG = Contact Guard
CPAP = Continuous Positive Airway Pressure
Hx = Medical History
NPO = Nothing by Mouth
PEG = Percutaneous Endoscopic Gastrostomy
PRN = As Needed
SBA = Stand by Assist
S/P = Status Post
TLSO = Thoracic Lumbar Sacral Orthosis
W/C = Wheelchair

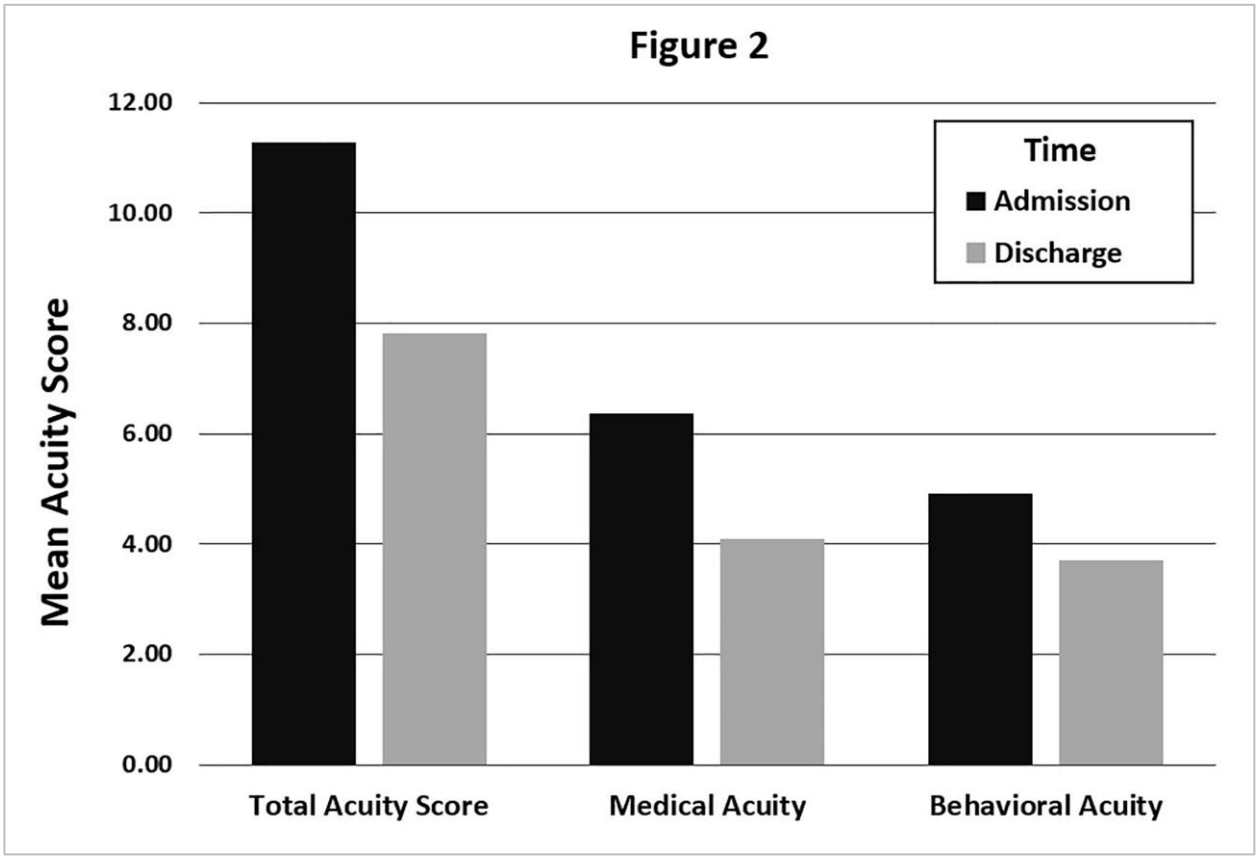
Figure 2
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Mean Acuity Score
Time
Admission
Discharge
Total Acuity Score
Medical Acuity
Behavioral Acuity

Table 1. Descriptive Statistics and Internal Consistency of HAS Items and Scale Scores at Admission

	N	Min	Max	Mean	SD	Skew	Kurtosis	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
ADLs/Transfers	165	0.00	3.00	1.73	0.94	-0.01	-1.18	.74	.70
Mobility/Orthotics	165	0.00	3.00	1.52	1.07	-0.03	-1.25	.65	.74
Skilled Medical Care	165	0.00	3.00	1.75	1.16	-0.28	-1.40	.49	.82
Bowel/Bladder	165	0.00	3.00	1.30	1.25	0.31	-1.55	.63	.75
Medical Total	165	0.00	12.00	6.30	3.55	0.19	-1.13	α = .80	
Fall Risk	165	0.00	3.00	1.35	1.03	0.37	-0.99	.46	.69
Aggression	165	0.00	3.00	0.59	0.89	1.33	0.65	.40	.72
Confused Behavior	162	0.00	3.00	1.30	1.03	0.12	-1.19	.59	.62
Precautions	165	0.00	3.00	1.60	1.14	-0.39	-1.30	.61	.60
Behavioral Total	165	0.00	12.00	4.82	3.03	0.41	-0.62	α = .72	
Acuity Total	173	2.00	24.00	11.13	5.33	0.34	-0.80		

Table 2. EFA: Pattern Matrix*

	Factors (r = .39)	
	1	2
ADLs/Transfers	.937	
Mobility/Orthotics	.726	
Skilled Medical Care	.572	
Bowel/Bladder	.654	
Fall Risk		.609
Aggression		.439
Confused Behavior		.702
Precautions		.761

**loadings under .3 were excluded*

Table 3. Correlations between HAS and SRS and MPAI

	Acuity Total		Medical Subscale		Behavioral Subscale	
	Admission	Discharge	Admission	Discharge	Admission	Discharge
SRS Rating	.426**	.683**	.139	.539**	.306**	.641**
MPAI Total Score	.748**	.814**	.607**	.700**	.670**	.759**
MPAI Abilities Score	.641**	.769**	.576**	.690**	.504**	.672**
MPAI Adjustment Score	.625**	.699**	.439**	.538**	.654**	.720**
MPAI Participation Score	.736**	.789**	.628**	.711**	.618**	.707**

***Significant at .01 level*

Table 4. Discharge Location Level Descriptives and Post Hoc Results

Supervision Level	Discharge Location	n	Total N (%)	Intake HAS	Intake MPAI	Discharge HAS		
				M (SD)	*M (SD)*	*M (SD)*	Mean Difference (Effect Size)	
							Medium	Low
High	Hospital	8	53 (31%)	14.51 (4.90)	60.94 (7.06)	13.51 (5.31)	-5.15** (1.03)	-9.04** (2.01)
	Supervised Residential Home	31						
	Skilled Nursing Facility	14						
Medium	Family - Dependent	44	45 (26%)	11.02 (3.85)	57.48 (6.64)	8.36 (4.72)		3.89** (0.94)
	Supported Living – high needs	1						
Low	Family – Independent	34	73 (43%)	8.62 (4.92)	49.37 (9.34)	4.47 (3.48)		
	Supported Living – low needs	10						
	Independent Living	29						

***p < .001*

Table 5. Predictors Unique Contribution: Overall Effects

Predictor	χ^2	*df*	*p*
Intercept	35.934	2	< .001
Intake HAS total	7.205	2	.027
Intake MPAI Score	23.818	2	< .001

Table 6. Parameter Estimates (N = 137)

		β	*SE*	Wald	*df*	*p*	Exp(β)	95% CI for Exp(β)	
								Lower	Upper
High Supervision Discharge Location	Intercept	-.868	1.965	.195	1	.659			
	HAS Total	.168	.067	6.351	1	.012*	1.183	1.038	1.348
	MPAI T-Score	-.019	.042	.208	1	.648	.981	.904	1.065
Low Supervision Discharge Location	Intercept	8.467	1.972	18.443	1	.000**			
	HAS Total	.122	.070	2.980	1	.084	1.129	.984	1.297
	MPAI T-Score	-.178	.045	15.907	1	.000**	.837	.767	.914

**Reference category is Medium Supervision Discharge Location; *p < .05, **p < .001*

Table 7. Classification in Discharge Category by Final Model

	Predicted			
Observed	High Supervision	Medium Supervision	Low Supervision	Correct
High Supervision	32	9	7	66.7%
Medium Supervision	12	14	14	35.0%
Low Supervision	8	4	37	75.5%
Overall	38.0%	19.7%	42.3%	60.6%