

Brookhaven Neurorehabilitation Institute Outcome Validation Study Highlights for 2023

Demographics and Characteristics

The NRI Outcome Study for the period ending December 31, 2023, addressed the discharges of 9 individuals, six males and three females with ages ranging from 20 to 50 years at the time of admission. Admission post injury ranged from 22 years (MVA) to four months (strangulation). Full ranges were four months, one year, three years, 3.5 years, 19 years, 20 years, 20 years, 21 years, and 22 years. The average length of stay (LOS) on the NRI program was 1257 days with a range of 231 days to 1740 days. Individual lengths of stay, in days were: 231, 1092, 1139, 1151 1325, 1408, 1597, 1628, and 1740. There were two patients identified as outliers, whose data was not included here with prominent substance abuse history, lengths of stay around six weeks and discharging AMA.

Mechanism of Injury

The etiology of the brain injuries for the discharge population in this study includes motor vehicle accidents (4), bicycle on pedestrian accident, CVA, Fetal Alcohol Syndrome, child abuse (2), and suicide attempt by hanging. Patients sustained moderate to severe injuries resulting in significant physical, medical, cognitive, and behavioral deficits. Many showed post-injury history of aggressive behavior including aggression toward self and others, elopement, non-compliance, and impaired impulse control. Patients had a range of cognitive problems involving attention, planning, organization, problem solving, and auditory, verbal, and visual memory.

Program Overview

During 2023, the NRI program experienced continued growth, driving average census to a record high of 57, i.e. compared to averages of 49.63 in 2022, 38.55, in 2019, 37 patients in 2018 and 35 in 2017. Currently, NRI has a neuropsychologist, two full-time clinical psychotherapists and one part-time, two speech/language pathologists, two occupational therapists, an occupational therapy assistant, a recreational therapist, a job coach and student interns in speech, occupational therapy, and occupational therapy assistant.

The NRI program provides its patients individual and group therapy across a variety of modalities. Individual sessions focus on restoration or compensation for those deficits that pose the greatest barrier to independence and community reintegration. Group sessions serve to bolster the gains made in individual sessions by addressing similar deficits but in a group-training context. Recreational therapy, both on and off campus, is offered frequently. For those interested in culinary activities, a cooking class meets weekly for NRI patients. Volunteer opportunities are provided through a local Food Bank and there is regular participation at the Center for Individuals with Physical Disabilities. Each patient is eligible to work on the Job Corp with our jobs coach, and with success, is eligible for a paid position with maintenance, dietary, or housekeeping.

Phases of Programming

The program has three phases to accommodate the patient's current level of cognitive and behavioral capabilities. Most patients begin programming on NRI 1 for assessment, to learn the unit rules and expectations, and to allow for therapeutic relationships to develop between patient and staff. Once they have demonstrated adequate behavioral control and the ability to function with less structure, the patients can begin programming on NRI 2, which offers a lower level of care, fewer rules, opportunities for cafeteria dining, and greater access to the community.

Our community living options (CNR-Oklahoma) continues to offer a less-restrictive environment for our patients that have had successful progress within the inpatient program. Here, patients are provided with an appropriate level of structure with greater independence and the opportunity to initiate and complete tasks with minimal assistance such as cooking, domestic chores, budgeting and shopping in the community. Community activities were restricted in 2021 during the Covid pandemic but have returned to normal. NRI has continued a more integrated relationship with CNR facilities in Iowa. That has benefited NRI through additional admissions from that state and allowed a smoother, finely tuned transition for our Iowa patients.

Objective Measures Outcomes 2023

Overt Behavior Scale: (added in 2022): The OBS is designed to clarify observable challenging behaviors that can occur following acquired brain injury. The scale includes nine categories of behavior rated by severity, frequency, and impact of that behavior. The only objective measure, however, relates to the severity of that behavior, and is the only category which generates the total score. All patients receive OBS updates every 28 days with results reported during treatment team. **Assessment:** this measure has been useful as a prompt for discussing the patient's ongoing behavior. The actual scores are less useful as a finely-tuned way to track individual behaviors. As example, behaviors that fall within the same category do not change the overall severity score. For example, one incident of physical aggression is scored the same score as five incidents. The actual frequency of the behaviors can be noted but are quite hard to track accurately through the medical record. The impact score of those behaviors is also entirely subjective. For NRI purposes we evaluate the impact of those behaviors on future placement, which is heavily influenced by availability of appropriate programs in the patient's home state. The OBS scale is meant to be used no more frequently than three months but, in our program, it works well to review the results each treatment team.

Patient Health Questionnaire Somatic Anxiety Depression Symptoms (PHQ-SADS) added in 2023: This is a standard questionnaire frequently used by primary care physicians and in other medical settings. This instrument includes a nine-item version to assess symptoms of depression (PHQ-9), a seven-item version to assess symptoms of anxiety (GAD-7), a 15-item version to detect somatic symptoms (PHQ-15), and additional questions related specifically to panic attack. All have been well validated. In our program this questionnaire must be administered every 28 days to patients with diagnoses of depression or anxiety. Those scores are reported in the treatment team. Some patients, even with those diagnoses, are not appropriate for the PHQ-SADS due to cognitive or behavioral issues. **Assessment:** This has been a marginally useful addition to the Outcome measures. Patients often do

not respond with introspection, or choose to focus on somatic complaints, rather than the primary depression are anxiety. It does give additional avenues for the patient to report distressing symptoms.

The NRI outcome study continues to include objective outcome measures including the Mayo-Portland Adaptability Inventory (MPAI-4) developed by Malec and Lezak (2003). To expand the utility of the MPAI-4 data we also analyze the tool's subscales. In addition to objective measures NRI collect the following categorical measures for Return to Independence, Social Role Return, Vocational Re-entry and Self-Management.

	Mayo-Portland Adaptability Inventory - 4				
	Ability	Adjustment	Participation	Total	(N =)
Admission	51	58	54	53	9
Discharge	42	48	51	45	9
Change	9	10	3	8	

- **MPAI-4 Scores report as t-scores (Mean=50; Standard Deviation=10). Lower scores indicate better function.**
- 40-50 suggests mild to moderate limitations
- 50-60 suggests moderate to severe limitations
- 60 suggests severe limitations

Interpretation

The Mayo-Portland Adaptability Inventory (MPAI-4) is normed on a national Acquired Brain Injury population. Lower scores indicate better functioning as compared to other patients. A reduction of 5 is considered Clinically Important and a reduction of 9 is a Robust Clinical Difference. Upon admission this group's average Total score of 53 (Moderate to Severe Global Impairment), reflected deficits in bodily function, activity limitations and participation restrictions. Their average Discharge score of 45, an 8-point improvement, reflected a Clinically Important global improvement from Moderate/Severe to Mild/Moderate. The Abilities subscale includes basic physical as well as cognitive capabilities. About half the 2023 admissions had significant physical deficits as well as cognitive deficits. That 9-point improvement (Robust Clinical Improvement) reflected progress in both physical capabilities and attention/concentration, memory and problems solving. The Adjustment subscale reflects depression, anxiety, inappropriate anger, somatization, and social deficits. The 10-point improvement (Robust Clinical Improvement) documents substantial progress towards management of those symptoms. The Participation Scale reflects a patient's ability for social integration in family, employment, money management and self-care, and leisure. The 3 points improvement was short of the mark for significant changes in these higher-level abilities. Many of the patients discharging in 2023 had more significant issues than some years past which hampered their ability to regain those more complex functions. Most discharged to another structured facility, though at a lower level of care.

Categorical Data Outcomes 2023

Return to Independence: The table below indicates that the discharge destination of 2023 patients primarily returned to relative independence, congregate living or group home.

1. Return to independence with minimal to moderate support <6 hrs/day	1
2. Return to congregate living or extended supports in the home >6hrs/day	2
3. Return to group home with 24 hr/day support	5
4. Return to nursing home or hospital setting 24 hr/day care	1

Vocational Reentry: The table below indicates that two patients returned to full employment, while most returned to some type of vocational activity with supports. Three were unable to return in any capacity due to substantial cognitive and behavioral deficits.

1. Competitive Employment	0
2. Supported employment or volunteer work	3
3. Sheltered workshop	3
4. unable to work	3

Social Role Return: The table below indicates that most patients continue to have moderate to significant difficulties resuming their social and interpersonal roles. Three were able to reintegrate in their household and social roles with only minor support of modifications.

1. Return home with independence or minimal modification to social role	1
2. Return home with moderate modifications to social role	4
3. Significant modification preventing a return to social role	4

Self-Management of Behavior: The table below indicates that all patients were able to manage their behavior with no more than weekly therapy contacts. This represents a significant decrease in level of care for behavioral management and is commensurate with outpatient therapy.

1. No behavioral support services required	3
2. Weekly contact with therapist; 0-5 outburst per week	6
3. Twice weekly contact with therapist; 6 or more outbursts per week	0

CONCLUSION: Objective and categorical data from the 9 patients discharging in 2023 reflect robust improvement across three of the four scores as measured by the Mayo Portland Adaptability Inventory-4. The most significant (Robust Clinical Improvement) occurred in areas of psychiatric symptoms, anger management, and improved social interaction, as well as physical and cognitive improvement. A number of the patients discharging in 2023, as compared to previous years, had more significant cognitive and physical deficits related to their injury, allowing for greater improvement in those domains. The severity of those deficits, however, made it more difficult for them to obtain the higher-level goals of independence that some of the past years' discharges have managed. Overall,

however, their MAYO improvement of nine was rated as Clinically Significant. In 2023, five of the nine patients transitioned to CNR-Oklahoma, our community living level of care. Of these five, however, only one was able to transition to independence. This was mostly due to limitations in the availability and appropriateness of in-state discharge sites. Most of those patients continue to have sporadic behavioral or psychiatric issues that prevented discharged to more independent settings though all 9 discharged to a lower level of care than they required upon admission. These results indicate that NRI programming continues to have a positive impact on its patients, improving emotional and social functioning and allowing for discharge to a lower level of care. For this group, length of stay appeared to be a significant factor in achieving these results with our 2023 patients who had more behavioral and physical difficulties than many previous year's discharges.

A handwritten signature in black ink, appearing to read 'R.G. Burrows', followed by a long horizontal flourish.

R.G. Burrows, Ph.D.
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