NRI
Outcome Validation Study Highlights for 2018

Demographics and Characteristics

The NRI Outcome Study for the period ending December 31, 2018, addressed the discharges of 31 individuals. There were 24 males and 7 females with ages at admission ranging from 19 to 65 years. The average length of stay (LOS) on the NRI program was 46 weeks with a range of five days to 257 weeks. This compares to an average LOS of 30 weeks in 2016 and 44 weeks in 2017. The distribution of ranges was as follows: Over 1000 days (4), 500 to 999 (4), 61 to 499 (10), 30 to 60 (4), Less than 30 (9). This trend towards a greater number of short stays is partly attributable to the inclusion of four BH/NRI hybrid patients who had an average LOS of 11 days.

Mechanism of Injury

The etiology of the brain injuries for the discharge population in this study includes motor vehicle accidents, anoxia, and physical assault. 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 issues, non-compliance issues, 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 2018, the NRI program expanded its catchment area to several additional states and experienced a moderate increase in average census, averaging 37 patients, compared to 35 in 2017. In March of 2018, Dr. Ros Burrows, Ph.D. took over direction of the program.

The NRI program provides its patients individual and group therapy across a variety of modalities. Individual sessions tend to 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.

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 provided an appropriate level of structure with greater independence and the opportunity to initiate and complete tasks with minimal assistance such as cooking, domestic chores and budget shopping in the community. In addition, new opportunities for volunteer and other prevocational activities are under development with various organizations in the community, including a clubhouse model for higher functioning patients. NRI has developed a more integrated relationship with CNR facilities in Iowa. That has benefitted NRI through additional admissions from that state and allowed a smoother, finely tuned transition for our Iowa patients.

Outcome Measures

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. An additional measure is the Disability Rating Scale (Wright, J. 2000) which was added in 2017. The objective measures above are combined with the subjective categorical measures that have historically been collected at NRI including the areas of Return to Independence, Social Role Return, Vocational Re-entry and Self-Management. Following is the NRI Outcome Validation Study for 2018.

Categorical Data Outcomes 2010-2018

TABLE 1. Return to Independence

The table below indicates that the discharge destination of clients who completed the NRI program primarily returned home or congregate living with minimal to moderate supports for 2018.

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Return to independence with minimal to moderate support <6 hrs/day	13%	6%	24%	35%	17%	26%	17%	19%	15%
Return to congregate living or extended supports in the home >6hrs/day	17%	65%	38%	19%	29%	16%	58%	37%	33%
Return to group home with 24 hr/day support	37%	29%	19%	19%	27%	32%	0%	26%	22%
Return to nursing home or hospital setting 24 hr/day care	33%	0%	19%	27%	27%	26%	25%	19%	26%

TABLE 3. Social Role Return

The return to pre-injury social role is an important outcome measure for neurorehabilitation programs. The rating scale for this domain was modified in 2017, making comparison with prior years difficult. 2018 scores are similar to those from 2017

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Return home with independence and minimal modifications to social role	4%	11%	14%	35%	10%	16%	8%	15%	11%
Return home or congregate living with moderate modifications to social role								33%	33%
Significant modifications required preventing return to social role								52%	52%

TABLE 2. Vocational Re-Entry

The return to meaningful life activities such as work, school, and volunteering is an important outcome measure for neurobehavioral rehabilitation programs. We saw more patients return to some kind of productive programming in 2018 compared to previous years. This trend may have been skewed by the influx of higher functioning patients through the shorter LOS and hybrid program. In 2017 the lowest functioning category from this domain was removed resulted in a skewing of the data toward the "unable to work" category. This appears to give a more accurate depiction of the NRI population as it relates to the vocational re-entry domain. This category may require additional review and training with the clinicians.

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Return to competitive employment, school or vocational training program	0%	6%	19%	11%	10%	5%	0%	11%	15%
Supported employment or volunteer work	13%	22%	9%	0%	17%	26%	25%	15%	22%
Sheltered workshop or day activity program	29%	17%	19%	0%	23%	21%	0%	4%	22%
Unable to work	42%	44%	29%	79%	23%	16%	17%	70%	37%
Requires 24 hr/day supervision	16%	11%	24%	10%	27%	32%	58%		

TABLE 4. Self-Management of Behavior

The self-management of one's behavior is a key factor in long-term success. The bottom two categories for this domain were removed in 2017 to improve specificity relative to this construct. Seventy percent of persons discharged in 2017 required no behavioral support at the time of discharge. The historical average for this category is 25%. In 2018 that category was back down, to 19%. This category may require additional clarification or clinician retraining. The largest category, e.g. weekly contact with a therapist might indicate a greater emphasis on mental health counseling rather than behavioral dyscontrol per se. This data set requires more investigation.

	2010	2011	2012	2013	2014	2015	2016	2017	2018
No behavioral support services required	0%	11%	23%	4%	23%	0%	0%	70%	19%
Weekly contact with therapist, 0-5 outbursts per week	33%	44%	57%	24%	43%	47%	33%	30%	67%
2 or more contacts per week with therapist, 6+ outbursts per week	16%	6%	10%	24%	10%	0%	0%	0%	11%

Objective Measures Outcomes 2018

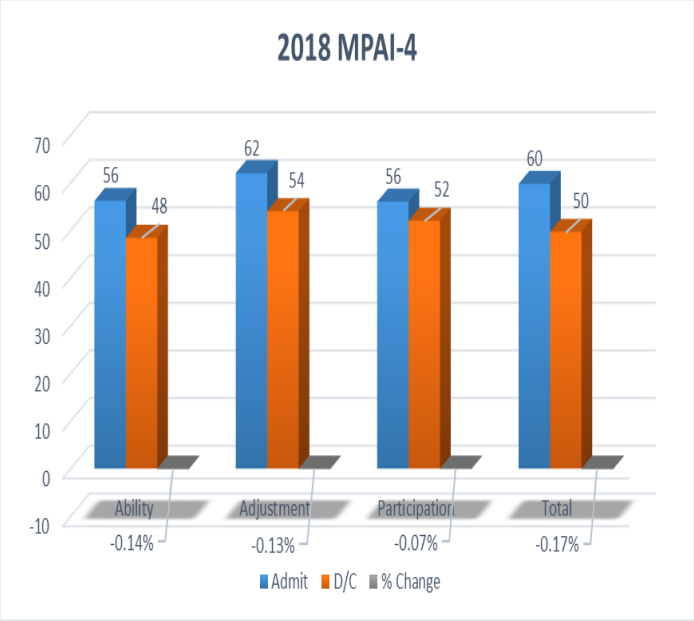
TABLE 5. MPAI-4 Scores

	Mayo-Portland Adaptability Inventory - 4				
	Ability	Adjustment	Participation	Total	(N =)
Admission	56	62	56	60	31
Discharge	48	54	52	50	31
Change	8	8	4	10	
% Chance	14%	13%	7%	17%	

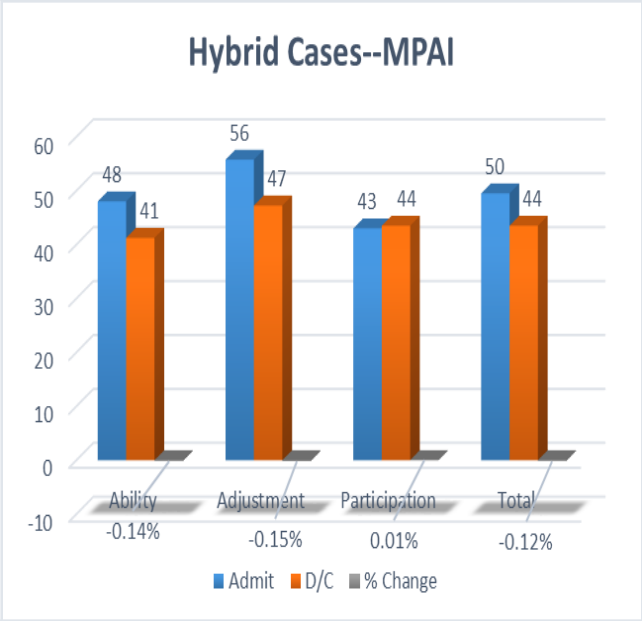
Table Notes

- MPAI-4: Scores reported as t-scores (Mean=50; Standard Deviation=10). Lower scores indicate a better level of functioning.
- MPAI-4: the following score cut-offs are relative to other persons with acquired brain injury:
  - 60 suggests severe limitations
  - 50-60 suggests moderate to severe limitations
  - 40-50 suggests mild to moderate limitations
  - 30-40 suggests mild limitations
  - < 30 suggests relatively good outcome

FIGURES 1 & 2: MPAI and Length of Stay (LOS)



n =31; avg LOS = 321 days

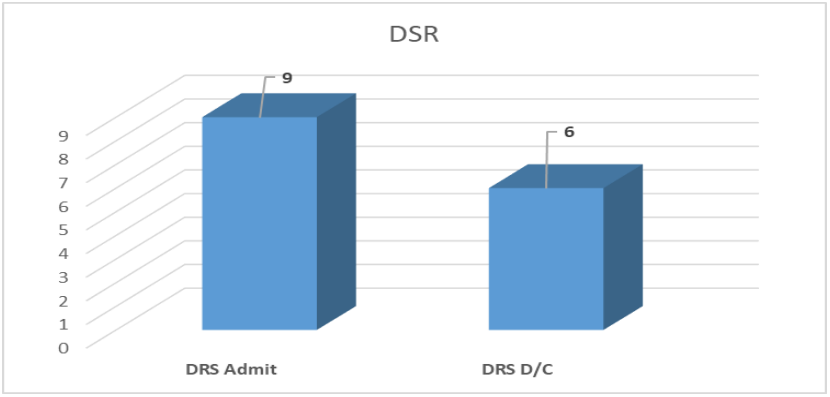


n=4; avg LOS = 11 days

Interpretation

The Mayo-Portland Adaptability Inventory (MPAI-4) average scores indicate significant overall improvement of our patients. Recall that lower scores are reflective of a higher level of functioning on the MPAI-4. Table 5 shows that, upon admission in 2018, patient's average Total score was 60 (Severe), reflecting our patients' severe deficits in body structure/function, activity limitations and participation restrictions. The average NRI discharge score was 50. The overall scores reflected an average improvement of 10 points (17%) demonstrating recovery to the Moderate to Severe category. The magnitude of these outcomes are essentially the same as 2017. A breakout evaluation of hybrid cases (Figure 2), with an average 11-day LOS, reveal a lower level of deficit upon admission (Moderate-Severe), as would be expected. Even with that shorter LOS they made comparable improvements on the Ability and Adjustment subscales, and moderate overall improvement from the Moderate-Severe range to Mild-Moderate.

Figure 3. DRS Scores



Interpretation

We began collecting Disability Rating Scale (DRS) scores in 2017 and Figure 3 shows the change in DRS scores for a sample of 29 patients. For comparison, patients with TBI will, on average admit to acute rehabilitation with a DRS of 12 and discharge with a score of 6. At one and two-years post TBI, scores will average 2.9 and 2.6 respectively. Our patients improved an average of 3 points suggesting continued recovery in this phase of rehabilitation.

Conclusion

The NRI program has used categorical and objective measures for program evaluation for the more than ten years. Taken collectively, 2018 data suggest that NRI continues to admit patients with very severe deficits affecting all domains of function. Despite this fact, NRI programming continues to have a positive impact on its patients.

Respectfully submitted,

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