# Outcome Prediction Following Brain Injury: A Preliminary Model

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## INTRODUCTION:

Currently, there are approximately 5.3 million Americans living with disabilities related to traumatic brain injury (TBI; Thurman et al., 1999). The ability to predict outcome and lasting impairments in the domains of cognitive, vocational, physical and psychological functioning is essential in the rehabilitation of individuals with TBI. Early prediction of outcome aids the rehabilitation process by supporting clinical decision-making, and providing accurate, realistic and evidence-based expectations to patients, relatives and insurance companies.

### Objectives of the current study:

Develop & validate a predictive outcome model using admission information to predict outcome at discharge after mild, moderate and severe TBI.

## METHODS:

**Outcome Prediction Model:**

**N=443 TBIs (Admitted 1980-2004)**

Admission Variables:

Age
Gender
Latency
Level of Disability: Disability Rating Scale (DRS)
CNS Ability Scale (CNS)
Living Status Scale (LSS) Occupational Status Scale (OSS)
Independent Living Scale (ILS)

**PREDICTS**

Discharge Variables

Cost
Length of Stay
Outcome

## RESULTS:

**Prediction Equations: Based on data from the baseline group (N=443):**

**Program Cost**=29.364 (latency)+1544.505 (ILS entry)+4511.625 (CNS entry) +529974.19

**LOS**=.041 (latency)-3.453 (CNS entry) +354.165

**CNS exit**=-.002(Latency) + .595 (CNS entry) + .164 (ILS entry) +21.145

**ILS exit**= .218 (CNS entry) + .490 (ILS entry)-3.361 (Gender) + .655 (LSS entry) +41.463

**DRS exit**=.001 (latency)+ .065 (CNS entry) + .963 (DRS entry)-6.535

**LSS exit**=-.043 (CNS entry) - .024 (ILS entry) +6.5359

**OSS exit**=-.142 (CNS entry) + .001 (latency) + .056 (age)+ .469 (OSS entry) +7.606

**R Squares for Regression Equations**

| Predicted Variable | R | $R^2$ |
|---|---|---|
| Program Cost | .52 | .27 |
| LOS | .34 | .12 |
| CNS exit | .81 | .66 |
| ILS exit | .78 | .60 |
| DRS exit | .80 | .64 |
| LSS exit | .54 | .30 |
| OSS exit | .47 | .22 |

## RESULTS:

| Variable | Baseline Group (N=443) | | Outcome Group (N=55) | |
|---|---|---|---|---|
| | Mean | SD | Mean | SD |
| DRS-entry | 7.56 | 4.64 | 8.09 | 4.72 |
| DRS-exit | 4.27 | 4.85 | 4.79 | 5.02 |
| LSS-entry | 6.01 | 2.78 | 5.71 | 2.76 |
| LSS-exit | 2.59 | 1.90 | 3.00 | 2.39 |
| OSS-entry | 14.66 | 1.70 | 14.44 | 2.52 |
| OSS-exit | 10.03 | 4.97 | 9.26 | 5.62 |
| ILS-entry | 75.97 | 21.85 | 73.65 | 25.75 |
| ILS-exit | 88.85 | 15.91 | 84.03 | 24.90 |
| CNS-entry | 47.66 | 12.72 | 47.79 | 14.18 |
| CNS-exit | 60.80 | 13.80 | 60.68 | 17.33 |
| Age | 34.88 | 13.19 | 39.41 | 12.78 |
| Gender | Male=380 | Female=63 | Male=27 | Female=8 |
| Latency | 497.34 | 890.21 | 285.53 | 335.54 |
| LOS | 212.01 | 175.10 | 201.26 | 104.78 |
| Program Cost | 215,763.84 | 176,066.68 | 210,954.70 | 146,352.73 |

## Outcome Predictions—How Good is Our Model?

| Variable | Obtained | Predicted | Difference | % Difference |
|---|---|---|---|---|
| Program Cost | $210,954.70 | $208,504.87 | $2,449.80 | 1.16% |
| LOS | 201.26 | 200.84 | 0.42 | 0.42% |
| CNS exit | 60.68 | 61.14 | -0.46 | 0.75% |
| ILS exit | 84.03 | 87.56 | -3.53 | 4.19% |
| DRS exit | 4.79 | 4.84 | -0.05 | 1.04% |
| LSS exit | 3.00 | 2.71 | 0.29 | 9.67% |
| OSS exit | 9.26 | 8.10 | 1.16 | 12.53% |

## DISCUSSION:

From the results of this study, it appears that our outcome model can predict program cost, length of stay, and outcome on the Disability Rating Scale, CNS Ability Scale, Independent Living Scale, Occupational Status Scale, and the Living Status Scale within a small range of the actual program cost, length of stay and outcome obtained.

## FUTURE DIRECTIONS:

- Determine if this outcome prediction model is generalizable to other post-acute rehabilitation facilities.
- Assess whether this outcome model can accommodate complications such as seizures, neurobehavioral issues and other complications seen following a traumatic brain injury.

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