

# Referenced-EEG Guided Medication Predictions in Treatment Refractory Eating Disorder Patients

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## BACKGROUND

Referenced-EEG (rEEG) is a technology that uses quantitative EEG (QEEG) findings as the independent variable to predict medication response for patients with non-psychotic psychiatric disorders. The rEEG compares a patient's drug-free resting EEG patterns to a database of patients of known response to specific classes, subclasses and individual medications<sup>1</sup>. Based on the known medication responses of neurophysiologically similar patients (a phenotype), rEEG provides an objective neurophysiological basis for the consideration of effective psychiatric medications for patients.

Conservative reviews of evidenced based treatments have found few efficacious eating disorder treatments<sup>2</sup>. There are only a few controlled trials available on medication therapies for Anorexia Nervosa (AN) and there are no FDA approved medications for AN. Fluoxetine is the only FDA approved medication for the treatment of Bulimia Nervosa (BN). Many eating disordered patients fail to meet all DSM-IV criteria for AN or BN and need to be classified as Eating Disorder Not Otherwise Specified (ED NOS). There is no research to support medication options for these patients. To further complicate treatment, eating disordered patients have multiple comorbid Axis I disorders with estimates for co-morbid depression ranging as high as 88.9%<sup>3</sup>.

The following information concerns a use that has not been approved by the U.S. Food and Drug Administration.

## OBJECTIVE

The objective of this patient-controlled case series was to explore the use of rEEG to facilitate medication selection for patients with an eating disorder and co-morbid depression. This is a preliminary analysis, which includes patients with a minimum of 6 months follow-up data.

## METHODS

Over a 4 year period, 8 female patients meeting DSM-IV criteria for both an Eating Disorder and a Mood Disorder completed a rEEG and started medications predicted from the database. Patients or families (for adolescents) voluntarily sought a rEEG because their current psychiatric medications were ineffective in controlling eating disordered symptoms. Eight patients were followed for 6 months to two years. All 8 patients followed for 6 months had previously failed outpatient treatment and required inpatient or partial hospitalizations (7 inpatients, 1 partial). Average age of patients was 20.8 (range 16.1 to 29.0) years and average illness duration was 4.7 (range 1.1 to 10.5) years.

Primary outcome measures included the 21-item Hamilton Rating for Depression Scale (HDRS) and the Clinical Global Improvement Scale (CGI) and the Clinical Global Severity Scale (SGS). Some of the criteria used to assess improvement in the CGI included: body dissatisfaction, drive for thinness, compulsive exercising, bingeing and purging. These clinical outcomes were assessed and recorded by the treating psychiatrist at baseline, 8-week, 6 month, and 2-years (4 of 8 patients). Other than the addition of using medication guided by rEEG, these patients were treated similar to other eating disordered patients and received individual psychotherapy and nutritional counseling.

## RESULTS

The rEEG predicted potential efficacy for medications from the following classes: anticonvulsants, antidepressants and stimulants (Table A). Following rEEG medication recommendations, hospitalization days decreased dramatically. At baseline, HDRS scores averaged  $38.8 \pm 7.34$ , indicating all patients suffered from moderate to severe depression symptoms (Figure 1). By week 8, scores decreased to an average of  $16.5 \pm 5.61$ ; and by 6 months, scores decreased to  $11.0 \pm 4.38$ . Paired sample t-tests indicated that these changes were significant at 8 weeks ( $p < .001$ ;  $t = 16.692$ ;  $df = 7$ ) and at 6 months follow-up ( $p < .001$ ;  $t = 14.279$ ;  $df = 7$ ). At baseline, average CGS score was 5.75. This score represents a rated illness severity between 'Severely ill' and 'Markedly ill.' By week 8, CGS scores had decreased to an average of 3.50 representing an illness severity between 'Mildly ill' and 'Moderately ill'; CGS scores further decreased to 2.50 at 6 months, indicating an illness severity between 'Borderline mentally ill' and 'Mildly ill' (Figure 2). CGI scores improved to an average of 2.0 at 8 weeks reflecting a 'much improved' change in symptoms. At 6 months average final CGI was 1.38, representing a CGI category between 'very much improved' (score of 1) and 'much improved' (score of 2) (Figure 3).

Table A : rEEG-Guided Medications

Patient and Eating Disorder Diagnosis <sup>a</sup>		Number of Hospitalizations / Number of Days of Treatment		Months Follow-up After rEEG	Number of Prior Medication Trials	rEEG-Guided Medications
		24 months Prior to rEEG	0-24 months After rEEG Medications			
A	AN	1/13	0/0	33 months	1	Lamotrigine, Amphetamine and D-amphetamine Salt
B	AN	6/182	1/5	38 months	6	Lamotrigine, Selegiline
C	BN	5/35 + 7 <sup>b</sup>	0/0	10 months	6	Oxcarbazepine, Bupropion, Methylphenidate
D	AN	5/41+11 <sup>b</sup>	0/0	42 months	5	Oxcarbazepine, Duloxetine
E	BN	1/25 <sup>b</sup>	0/0	9 months	3	Gabapentin, Amphetamine and D-amphetamine Salt
F	EDNOS	2/40+4 <sup>b</sup>	1/4	15 months	4	Lamotrigine, D-amphetamine
G	AN	4/235	1/3	7 months	7	Oxcarbazepine, Duloxetine
H	EDNOS	8/42+11 <sup>b</sup>	3/9	34 months	10	Divalproex, Bupropion, Aripiprazole <sup>c</sup>

<sup>a</sup>AN = Anorexia Nervosa; BN = Bulimia Nervosa. EDNOS = Eating Disorder Not Otherwise Specified. <sup>b</sup>Partial Hospitalizations. <sup>c</sup>Aripiprazole not in rEEG database. Used based on clinical judgment only.

Figure 1 – Hamilton Depression Scores, Baseline to 2 years

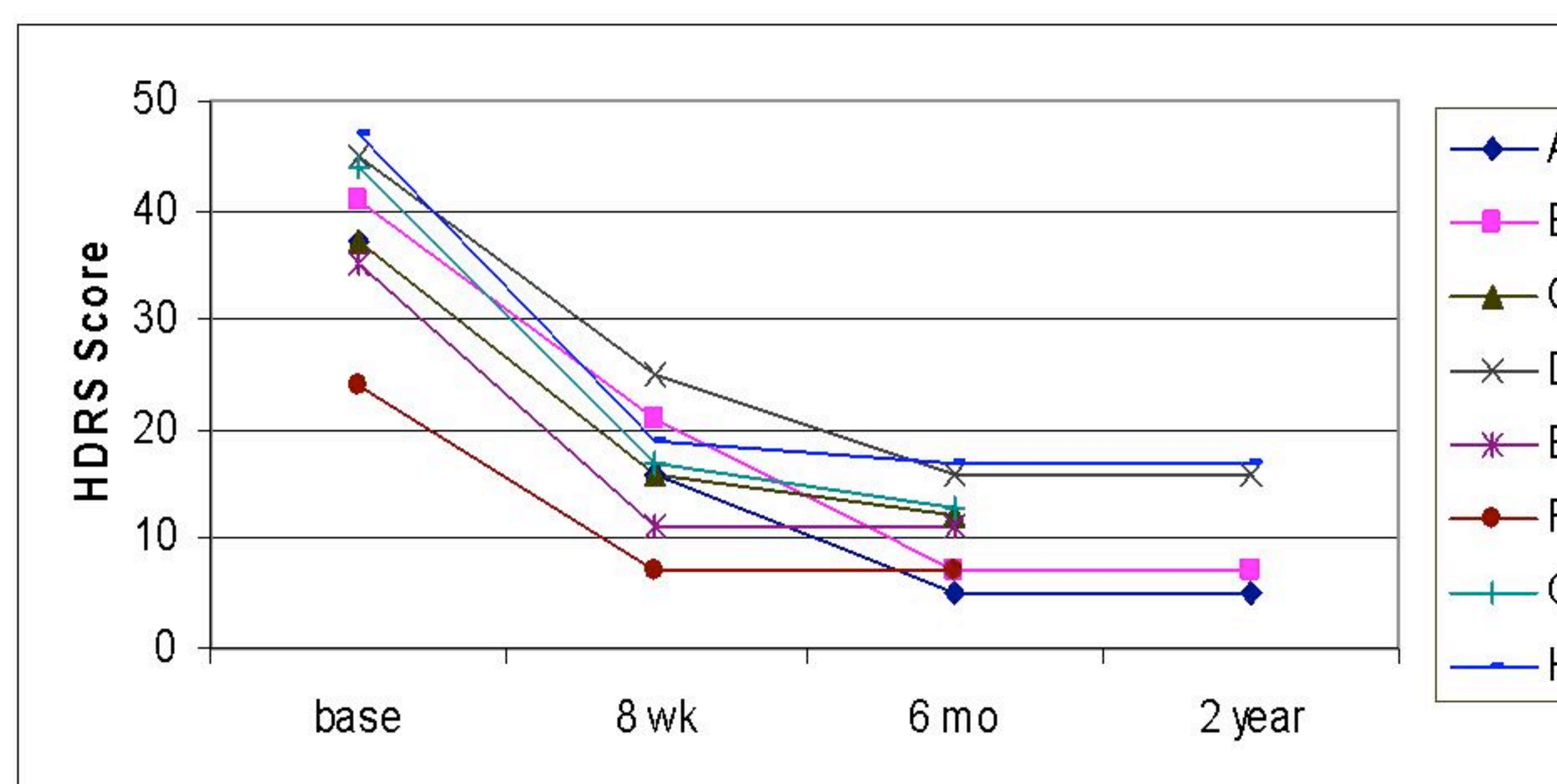


Figure 2 – Clinical Global Severity Scores, Baseline to 2 years

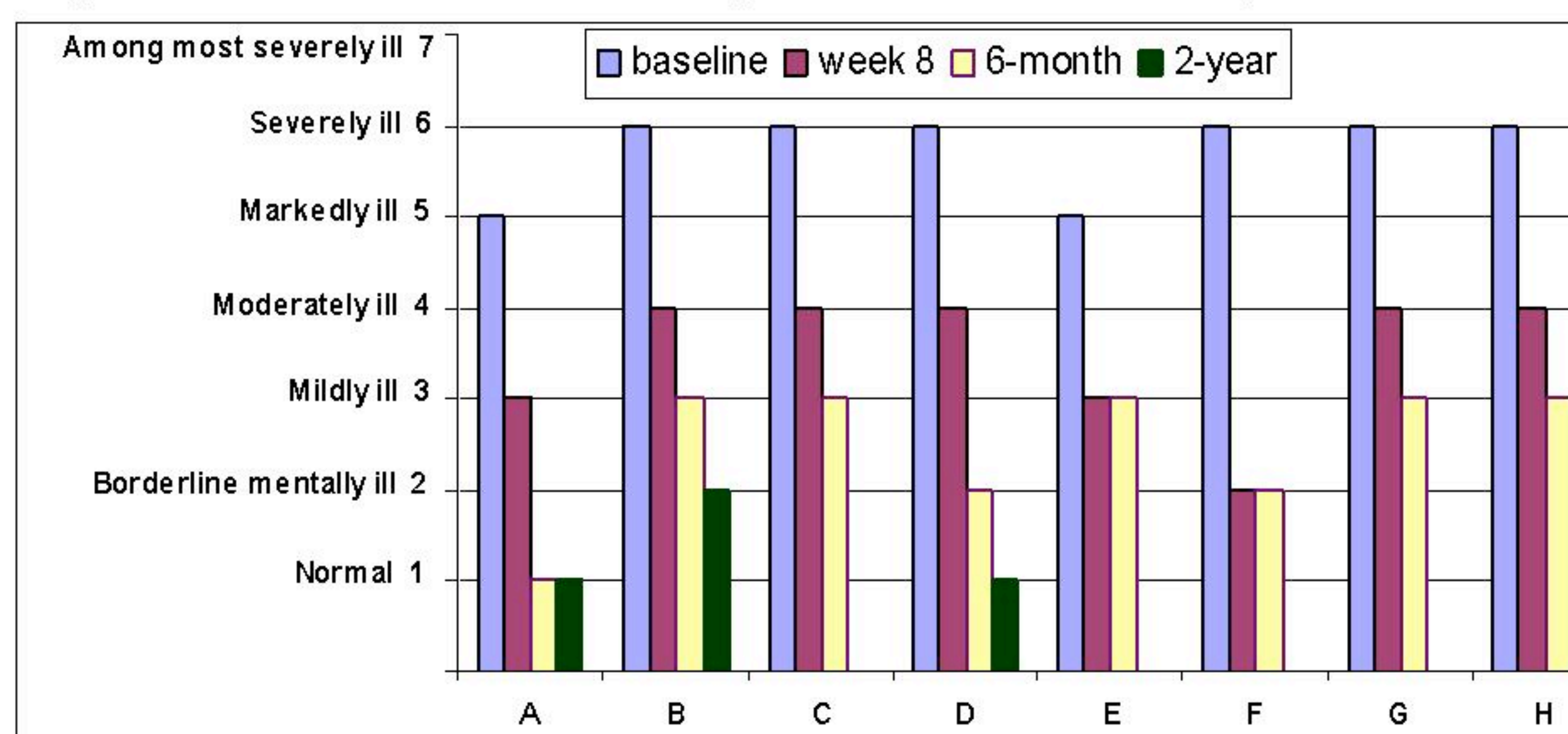
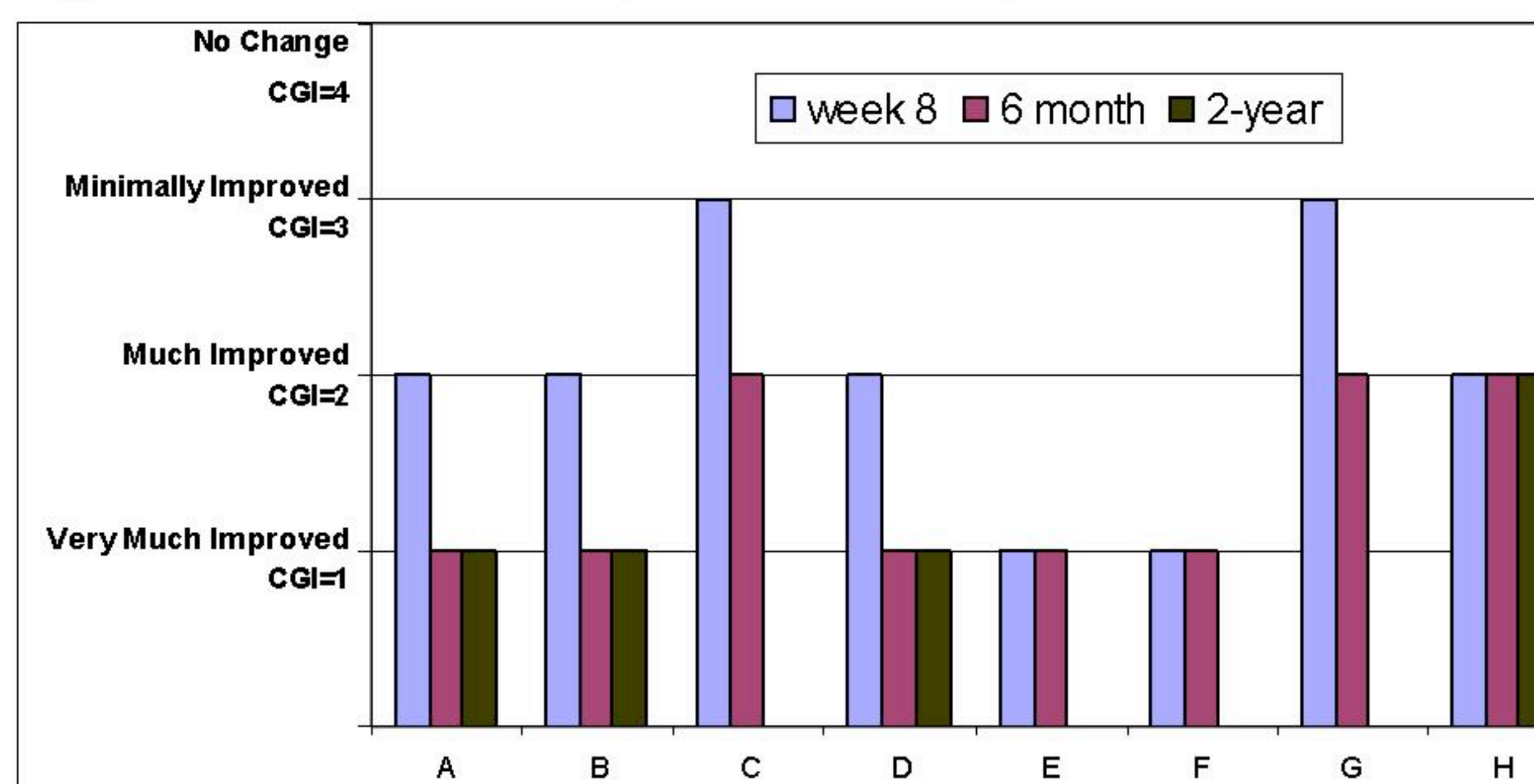


Figure 3 – Clinical Global Improvement Scores, 8 Weeks to 2 Years



## CONCLUSIONS

Medication trials have provided limited insight and guidance in the pharmacological management of eating disorders. This preliminary trial of rEEG guided medication predictions demonstrated an improvement in depression and eating disordered symptoms in treatment refractory patients that had required either partial or inpatient level of care as determined by managed behavioral health care reviewers.

Improvements in both HDRS and CGI scores were evident at 8-weeks, 6-months, and 2 years (for 4 patients). The medications selected from rEEG correlations involved combinations from different classes of medications. Based on rEEG correlations, stimulant medications were used in the treatment of four patients, none of which experienced any appetite suppression or weight loss. These results may support recent findings that ADHD can predict eating disordered pathology in adolescent girls<sup>4</sup>. The decrease in HDRS for these eight patients is striking and similar results are seen in the 8-week data of patients who have not yet completed 6 months of treatment. Though a limited comparative series, the durability of response to rEEG guided medications and the broader options of medication combinations portends well for advancing treatment for eating disordered patients.

Anorexia Nervosa is a potentially fatal illness. Improved pharmacotherapy could decrease the high morbidity and mortality in patients with disordered eating. Further research is needed to determine the full utility and limitations of rEEG in the treatment of eating disordered patients.

## REFERENCES

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