

# ECT Use in Adolescents at Mayo Clinic: A 20-Year Practice and Outcomes Review

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## Abstract

**Background:** Electroconvulsive therapy (ECT) remains one of the most effective treatments for major depression in adults with acute response rates that are higher than most monotherapy pharmacotherapies.<sup>1</sup> Current literature supports the use of ECT in children and adolescents with reports suggesting similar clinical outcomes as adults<sup>2</sup> and are congruent with the Treatment Parameters for Adolescent ECT set forth by the American Academy of Child and Adolescent Psychiatry.<sup>3</sup> However, due to a number of factors such as negative public image of ECT, fear of side effects of ECT, and most notably lack of controlled investigation, patients, families, and practitioners are hesitant to use ECT as a treatment option in the pediatric population despite its recognized efficacy.<sup>4</sup>

**Objectives:** The objective of this project was to describe common practice approaches and post-treatment outcomes in a group of pediatric patients treated with ECT within the Mayo Clinic practice over the past 20 years. These data extend the research described in a previous Mayo Clinic adolescent cohort by Schneekloth and colleagues.<sup>5</sup>

**Methods:** A retrospective analysis of the Mayo Clinic electronic medical record was performed using procedures within the IRB-approved protocol (07-003005) for all patients ages 18 and younger who had received ECT treatment at Mayo Clinic. Patients were identified using a traditional query of the medical record from 1993 through 2012 and an advanced electronic query using the Data Discovery and Query Builder (DDQB).

The DDQB is a tool that allows authorized research users to access clinical and administrative data stored in the Mayo Clinic Life Sciences System (MCLSS), a clinical data warehouse developed through a Mayo/IBM collaboration.

Each patient's medical chart was reviewed to verify ECT administration during their care at Mayo Clinic. All available treatment settings, side-effects, medications and diagnoses were recorded. Where possible, pre-ECT and post-ECT clinical data were recorded.

### Results

A total of 46 adolescents treated with ECT from 1993 to 2012 were identified (Table 1). 67% (n=31) of patients were treated bitemporally, while 24%, 7%, and 2% (n=11, 3, 1) were treated with right unilateral, bitemporal + right unilateral, and bifrontal modes, respectively. On average, patients received 10.4 ECT treatments per treatment series, and patients most often required only one series of treatment (76%, n=35), although some required two (22%, n=10) or even three series (2%, n=1; Table 1).

EEG seizure duration tended to trend downward as patients increased in age, although 22% (n=99) of induced seizures were prolonged by definition (longer than 120 seconds; Figure 1).

Most adolescents who received ECT were taking one less medication one year after ECT than they were at initiation of ECT, and the average change in number of medications prescribed pre- and one year post-ECT was -0.74 (Figure 2).

ECT appeared to be effective in reducing symptoms of affective (major depressive disorder, bipolar affective disorder), psychotic (psychosis NOS, schizophrenia, steroid-induced psychosis), and other disorders (schizoaffective disorder, depression with psychotic features, catatonia, anorexia nervosa) as measured by Clinical Global Impression scales of Symptoms and Improvement upon independent retrospective analysis by a board-certified Child and Adolescent Psychiatrist and a PGY-2 Psychiatry resident (Figure 3).

The most commonly described side effect from ECT treatment was nausea (15%, n=7), followed by headache (13%, n=6), post-emergence agitation (9%, n=4), spontaneous seizure (4%, n=2), status epilepticus (2%, n=1), and urinary retention (2%, n=1; Figure 4).

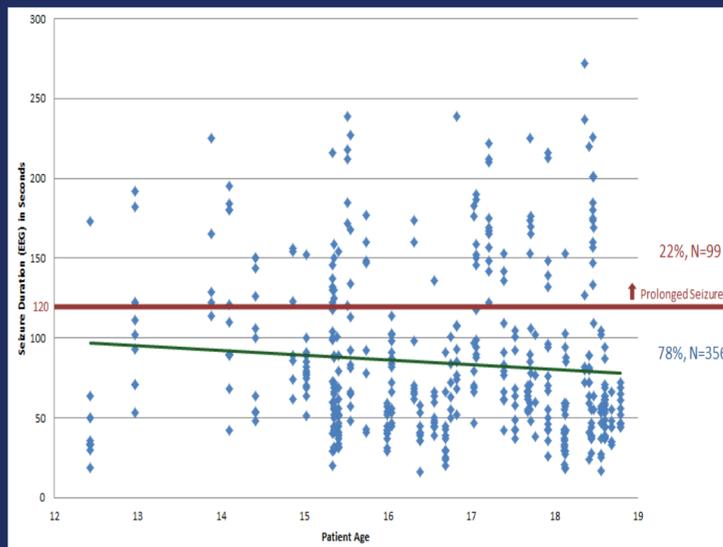
### Conclusions

These data suggest ECT practice in adolescents is relatively similar to adult ECT practice as it relates to electrode placement, settings, number of treatment sessions per series and reported side effects. Overall, seizure duration in adolescents tends to be more frequently prolonged compared to adults receiving ECT. Adolescents receiving ECT were eventually diagnosed with personality disorders approximately 13% of the time upon reaching adulthood.

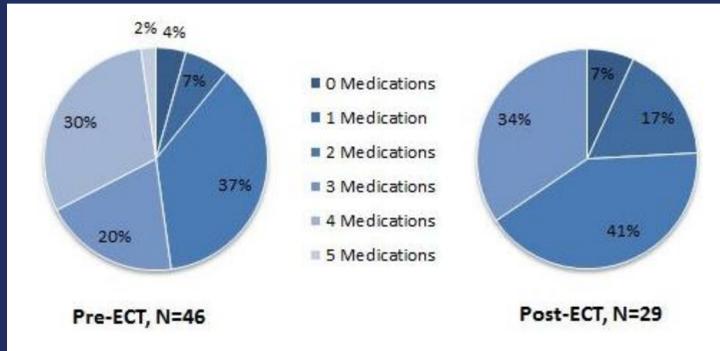
**Table 1. Demographic and Treatment Characteristics of Adolescent ECT Patients**

Sex	Male	39% (n=18)
	Female	61% (n=28)
Age (years)	Average	16.7
	Standard Deviation	1.6
	Range	12-19
	Mode	16
Race	Caucasian	91% (n=41)
	African-American	2% (n=1)
	Asian	2% (n=1)
	Hispanic	2% (n=1)
	Kuwaiti	2% (n=1)
	Other	2% (n=1)
Electrode Placement	Bitemporal	67% (n=31)
	Right Unilateral	24% (n=11)
	Bitemporal + Right Unilateral	7% (n=3)
	Bifrontal	2% (n=1)
Final ECT Setting	Modal	30
	Range	10-100
Number of Treatments per Patient	Average	10.4
	Standard Deviation	4.9
	Range	4-27
Number of Treatment Series per Patient	One	76% (n=35)
	Two	22% (n=10)
	Three	2% (n=1)
Seizure Duration (sec)	Average (EEG)	84.4
	Standard Deviation	51.1
	Range	16-272
	Mode	61
Patients with Incidence of Prolonged Seizure (EEG Seizure in sec)	>180	16
	121-180	12
	61-120	14
	<61	4
Prolonged Seizure Events (EEG Seizure in sec)	>180	28
	121-18	71
	61-120	164
	Mode	61

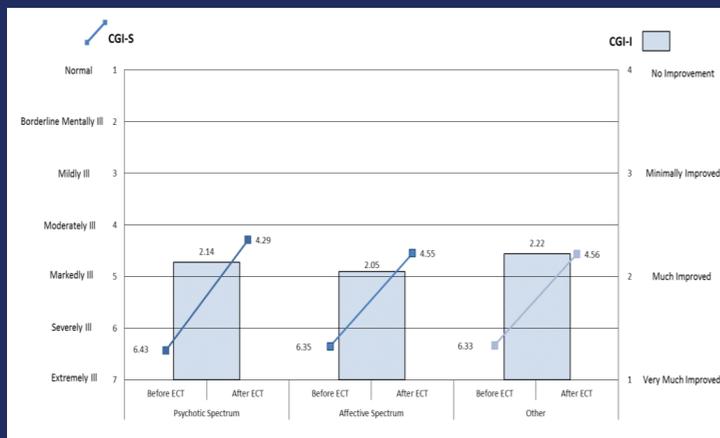
**Figure 1. Seizure Duration (EEG) by Patient Age**



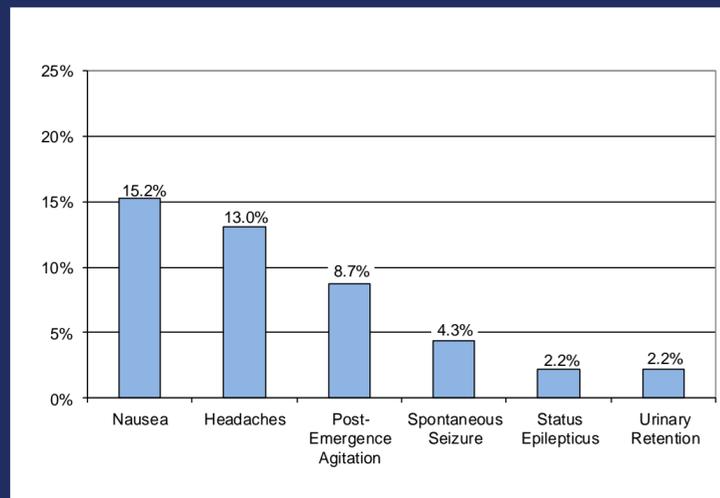
**Figure 2. Number of Medications Prescribed Before ECT and 1 Year Post ECT**



**Figure 3. Average CGI-S and CGI-I in Adolescents Treated With ECT**



**Figure 4. Commonly Observed ECT Side Effects in Adolescents**



## Discussion

- Of the 46 pediatric patients treated with ECT over the past 20 years, 29 had 1-year follow-up data.
- As expected, the majority of pediatric patients treated with ECT were suffering from severe, recalcitrant, and frequently comorbid mood, anxiety, and psychotic illnesses.
  - No completed suicides were noted for any of the patients treated with ECT.
- On average, adolescents were prescribed 1 fewer medication 1 year after ECT than prior to ECT.
- Retrospective CGI-S and CGI-I analysis showed significant improvement in ECT-treated adolescents.
- Side effects mirrored those of adults: typically headaches, nausea, and agitation.
  - Systematic measurement of cognitive side-effects of ECT was not available.
- Prolonged seizures (>120 sec) were noted by EEG 22% of the time; higher than expected in adults.
  - Seizure duration tends to decrease as patient age increases.
- On average, adolescents required 10 treatments per treatment series, and typically required only 1 series.

## Conclusions

- Despite controversy on ECT use in adolescents, these data suggest it is a safe, reasonably well-tolerated and effective treatment for the most severely ill adolescents resistant to pharmacotherapy and psychotherapy.
- Although improvement with ECT is robust, patients remain moderately ill (by CGI-Severity scores), suggesting that post-ECT support and treatment interventions must be carefully formulated.
- While the average ECT course was 10.4 treatments, as a group adolescents tended to show meaningful clinical improvement within the first 2-3 treatment sessions.
- Despite its acute efficacy, 24% of adolescents returned for at least 1 more ECT course, suggesting the need for further research into continuation ECT protocols and/or new strategies for maintenance pharmacotherapy.

## References

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