Practice Parameter for Use of Electroconvulsive Therapy With Adolescents

ABSTRACT

Electroconvulsive therapy (ECT) may be an effective treatment for adolescents with severe mood disorders and other Axis I psychiatric disorders when more conservative treatments have been unsuccessful. ECT may be considered when there is a lack of response to two or more trials of pharmacotherapy or when the severity of symptoms precludes waiting for a response to pharmacological treatment. The literature on ECT in adolescents, including studies and case reports, was reviewed and then integrated into clinically relevant guidelines for practitioners. Mood disorders have a high rate of response to ECT (75%–100%), whereas psychotic disorders have a lower response rate (50%–60%). Consent of the adolescent's legal guardian is mandatory, and the patient's consent or assent should be obtained. State legal guidelines and institutional guidelines must be followed. ECT techniques associated with the fewest adverse effects and greatest efficacy should be used. The presence of comorbid psychiatric disorder is not a contraindication. Systematic pretreatment and posttreatment evaluation, including symptom and cognitive assessment, is recommended. *J. Am. Acad. Child Adolesc. Psychiatry,* 2004;43(12):1521–1539. **Key Words:** practice parameters, practice guidelines, child and adolescent psychiatry, electroconvulsive therapy.

Electroconvulsive therapy (ECT) is an effective treatment for some individuals with severe neuropsychiatric illness. Reports of historical misuse and inaccurate media portrayal have created public concern about the intervention. Some policymakers have tried to prohibit its use in all cases, potentially denying some individuals effective treatment. Often, clinicians who work with adolescents are not familiar with ECT, primarily because it is rarely indicated in this age group. However, when an appropriate clinical situation does present, the clinician should consider its use.

This practice parameter was developed to help the clinician in the decision-making process. It does not address the use of ECT in preadolescent children because of insufficient data and clinical experience. Informed consent must be obtained in accordance with state laws. The process of consultation and the proper medical procedures for the safe administration of ECT must be followed.

For the purposes of this practice parameter, the physician providing ECT is a psychiatrist with formal training in using ECT, consistent with institutional privileging criteria. The term *parent* is used to mean the biological, foster, and adoptive parent as well as the legal guardian.

This practice parameter is designed to (1) provide the reader with a review of literature pertinent to the use of ECT for the treatment of adolescents, (2) provide guidelines for the safe administration of ECT and the recognition of possible side effects, and (3) address ethical and legal issues in the treatment of adolescents with ECT.

EXECUTIVE SUMMARY

This executive summary provides an overview of the important points and recommendations that are made

in this practice parameter. As the treatment of patients requires consideration of many factors that cannot be conveyed fully in a brief summary, the reader is encouraged to review the entire practice parameter. Each recommendation in the executive summary is identified as falling into one of the following categories of endorsement, indicated by an abbreviation in brackets following the statement. These categories indicate the degree of importance or certainty of each recommendation.

"Minimal Standards" [MS] are recommendations that are based on substantial empirical evidence (such as well-controlled double-blind trials) or expert clinical consensus. Minimal standards are expected to apply more than 95% of the time, i.e., in almost all cases. When the practitioner does not follow this standard in a particular case, the medical record should indicate the reason for noncompliance.

"Clinical Guidelines" [CG] are recommendations that are based on empirical evidence (such as case series, open trials) and/or clinical consensus. Clinical guidelines may be expected to apply in approximately 75% of cases. These recommendations should always be considered by the clinician, but there are exceptions to their application.

"Options" [OP] are practices that are acceptable but not required. There may be insufficient empirical evidence to support recommending these practices as minimal standards or clinical guidelines, or more than one approach demonstrates similar levels of supportive evidence. If possible, these practice parameters will explain the pros and cons of these options.

"Not Endorsed" [NE] refers to practices that are known to be ineffective or contraindicated.

INDICATIONS

Before an adolescent is considered for ECT, he/she must meet three criteria:

1. Diagnosis: Severe, persistent major depression or mania with or without psychotic features, schizoaffective disorder, or, less often, schizophrenia. ECT may also be used to treat catatonia and neuroleptic malignant syndrome [MS].
2. Severity of symptoms: The patient's symptoms must be severe, persistent, and significantly disabling. They may include life-threatening symptoms such as the refusal to eat or drink, severe suicidality, uncontrollable mania, and florid psychosis [MS].
3. Lack of treatment response: Failure to respond to at least two adequate trials of appropriate psychopharmacological agents accompanied by other appropriate treatment modalities. Both duration and dose determine the adequacy of medication trials. It may be necessary to conduct these trials in a hospital setting. ECT may be considered earlier in cases in which (a) adequate medication trials are not possible because of the patient's inability to tolerate psychopharmacological treatment, (b) the adolescent is grossly incapacitated and thus cannot take medication, or (c) waiting for a response to a psychopharmacological treatment may endanger the life of the adolescent [MS].

CONTRAINDICATIONS

There are no absolute contraindications to the use of ECT in adult patients. It has been beneficially used in patients with mood disorders who have coexisting cardiovascular conditions, neurological conditions, and other medical disorders. Although there are insufficient data to generalize these findings to adolescent patients, the available literature demonstrates similar directions. Tumors of the central nervous system associated with elevated cerebrospinal fluid levels, active chest infection, and recent myocardial infarction may be considered relative contraindications in adolescents. Prudent practice includes a medical consultation when the treating psychiatrist is faced with a patient who has a concurrent physical illness. Pregnancy is not a contraindication to the use of ECT, nor is a comorbid psychiatric condition.

ASSESSMENT

Psychiatric Evaluation

The clinician determines that the patient has a condition qualifying for ECT by careful psychiatric and medical evaluation [MS]. The psychiatric evaluation must include a detailed clinical interview, collateral information from parents or other informants, and documentation of target symptoms by using reliable rating instruments, when appropriate. It is essential that the severity of illness be carefully assessed.

Review of Past Treatments

Past treatments should be carefully reviewed and documented. Documentation of previous pharmacotherapy should include the following: each medication prescribed, dosage, duration of each trial, compliance, response, side effects, and response to augmentation strategies where appropriate [MS]. Because adolescents often do not fully comply with taking psychotropic medication, medication adherence should be explored by direct methods (i.e., serum or urine drug levels) [CG]. Psychotherapeutic treatments and psychosocial interventions, including but not limited to individual psychotherapy, family psychotherapy, cognitive-behavioral therapy, interpersonal therapy, and hospital milieu, should be reviewed [MS].

Physical Examination and Laboratory Investigation

Although there are no absolute medical contraindications for ECT, there may be relative contraindications that require identification before ECT. Every patient considered for ECT must receive a comprehensive physical evaluation [MS].

Evaluation of physiological parameters must be completed before the administration of ECT or anesthesia. Appropriate laboratory investigation, required for the diagnosis of a medical condition, must be completed [MS]. Laboratory investigation is dictated by clinical assessment [OP] and may include a complete blood cell count, differential white blood cell count, thyroid function tests, liver function tests, urinalysis and toxicology screen, electrocardiogram, EEG, and computed tomography (CT) or magnetic resonance imaging (MRI) of the brain. All female patients must have a serum or urine pregnancy test [MS].

Cognitive Assessment

Every adolescent undergoing ECT must have a memory assessment before treatment, at treatment termination, and at an appropriate time after treatment (usually between 3 and 6 months post-treatment) [MS].

Informed Consent

Every attempt must be made to educate the adolescent and parents regarding the procedure and its risks and benefits [MS]. This education must be provided with sensitivity to racial, cultural, and developmental issues [MS]. Written informed consent for ECT must be obtained from a parent [MS]. In addition, the consent or assent of the adolescent should be obtained [MS]. The adolescent's ability to consent/assent will depend on his/her cognitive maturity and the severity of psychiatric symptoms.

Some states specify a mandatory minimal waiting period (usually 72 hours) between signing the consent document and commencing treatment. During this period, consent may be withdrawn. However, parents and adolescents should be informed that they may withdraw consent for ECT at any time [MS].

Familiarity with state and institutional guidelines is necessary to ensure that treatment requirements mandated by the state or the institution are met [MS]. Several states have age-related restrictions regarding the use of ECT.

Second Opinion

Every patient being considered for ECT should receive an independent evaluation from a psychiatrist who is knowledgeable about ECT and not directly responsible for the treatment of the patient [MS]. The psychiatrist providing the second opinion should review the diagnosis, confirm illness severity and treatment resistance, corroborate the advisability of ECT, and review the adequacy of the workup.

Concurrent Treatment

Supportive treatment of the adolescent should continue during the course of ECT. The severity of symptoms and post-ECT monitoring require placement in an inpatient setting [MS]. The patient should participate in the hospital milieu therapy, and support should be offered to the family.

Particular medications are known to interfere with ECT in adults. It is advised that, whenever possible, ECT be administered without concurrent medications [CG]. Some psychotropic medications may be used with appropriate monitoring.

ECT PROCEDURE

The following steps are recommended after the decision to treat with ECT has been made by the physician, the appropriate assessments have been conducted, the independent psychiatrist has provided the second opinion, and informed consent has been obtained.

Anesthesia

Anesthesia should be administered by qualified personnel experienced in treating adolescents [MS]. The anesthetic agent commonly used is methohexital. Muscle relaxation is achieved with succinylcholine. Intravenous atropine or glycopyrrolate may be administered immediately before ECT to protect from vagally induced bradycardia and arrhythmias. However, at the present time, there is a lack of consensus as to whether atropine should be administered routinely. Patients are ventilated with 100% oxygen before administration of the electrical stimulation.

Administering ECT

After an overnight fast, the patient is moved to a specially designated area where ECT is administered [MS]. The treatment team should include a psychiatrist, personnel experienced in anesthesia, and nursing staff trained in the use of ECT [MS]. Treatment may begin at either two or three times weekly, with changes to the schedule if the patient experiences a significant degree of confusion [CG].

Unilateral electrode application to the nondominant hemisphere is the preferred method. In a critically ill patient (refusal to eat or drink, severe suicidality, florid psychosis, catatonia), treatment may commence with the bilateral electrode placement. Use of brief pulse and an adequate dose of electricity is recommended [CG].

Patient Monitoring

Close monitoring should be provided during and after treatment until the patient is fully recovered from anesthesia. During treatment, monitoring should include observation of seizure duration, airway patency, agitation, vital signs, and adverse effects. After treatment, observation should be provided in a designated recovery area with provision for expert nursing care. Patients should be monitored for at least 24 hours for late seizures that may occur after the ECT session (tardive seizures) [MS]. A neurology consultation should be obtained if recurrent prolonged seizures or tardive seizures occur [CG]. Changing from bilateral to unilateral ECT may be indicated for patients who become manic during the course of treatment.

Adverse Effects

Adverse effects of ECT may include impairment of memory and new learning, tardive seizures, prolonged seizures, and risks associated with general anesthesia. In adults, the fatality rate associated with ECT is 0.2 per 10,000 treatments and the anesthesia-related mortality rate is 1.1 per 10,000. Adolescents are not believed to be at additional risk from ECT, nor are they are at increased risk of anesthesia-related complications in the immediate recovery period.

Tardive seizures are a rare but potentially serious side effect. These usually are encountered in adolescents who have a normal EEG before treatment and are not receiving seizure-lowering medications during treatment. Seizures that last longer than 180 seconds are considered, by convention, to be prolonged seizures. A prolonged seizure can be effectively terminated with additional methohexital, diazepam, or lorazepam. Prolonged seizures are clinically significant because they are associated with greater postictal confusion and amnesia and inadequate oxygenation, resulting in increased hypoxia-related risks (cerebral and cardiovascular complications). Appropriate medical consultation should be considered if difficulties are experienced in terminating a prolonged seizure, if spontaneous seizures occur, or if neurological or other physical sequelae appear to be present. In such cases, ECT should be resumed only after the assessment of treatment risks and benefits.

Other minor side effects include headache, nausea, vomiting, muscle aches, confusion, and agitation. These usually do not persist beyond the day of the treatment. Some of these are secondary to the anesthetic and some are secondary to the ECT treatment itself. These should be managed conservatively.

Patient Management After ECT

Although ECT is an effective treatment of an illness episode, there is no evidence that effective treatment of any given episode prevents future relapse. Therefore, ECT should be regarded as an intervention during the acute phase of the illness. Pharmacotherapy and/or other maintenance treatment (in some cases, maintenance ECT) should be initiated after the last ECT treatment [MS]. However, at this time, there is no experience with maintenance ECT in adolescents.

LITERATURE REVIEW

A review of literature regarding ECT in adolescents was completed with a *Medline* search using the key

words "electroconvulsive therapy," "children," and "adolescents." Articles published before 1965 that were not available on *Medline* were collected from citations found in published articles.

HISTORY AND CURRENT PRACTICE

EARLY STUDIES

In 1942 Heuyer and his colleagues reported to the Société Médico-Psychologique of Paris regarding the positive effects of ECT in two teenagers (Heuyer et al., 1942). A year later, Heuyer and his colleagues published the use of ECT in 40 children and adolescents with a variety of psychiatric conditions (Heuyer et al., 1943). Bender (1947) described marked improvement in 98 children with "childhood schizophrenia" who each received a total of 20 treatments, administered on a daily basis. Despite obvious limitations imposed by diagnostic and methodological issues, Bender's study was noteworthy for improvement observed in all but two cases, the absence of serious side effects, the lack of intellectual decline, and the absence of a lasting effect on the EEG. The applicability of this historical study to current practice is, however, limited because Bender's patients were diagnosed using a diagnostic system different from today's system. This study also lacked objective outcome criteria.

Bender's publication was followed by several case reports, the majority of which involved either a single case or a small number of cases. In a review article, Bertagnoli and Borchardt (1990) summarized the reports published between 1947 and 1990. Most of these studies had methodological problems, including lack of diagnostic clarity and heterogeneous diagnoses among patients who had received ECT. These problems render their results difficult to interpret. Early studies also generally relied on retrospective study design and small sample sizes, and they lacked objective outcome criteria (Bender, 1947; Berman and Wolpert, 1987; Bertagnoli and Borchardt, 1990; Black et al., 1985; Carr et al., 1983; Cizadlo and Wheaton, 1995; Clardy and Rumpf, 1954; Guttmacher and Cretella, 1988; Hassanyeh, 1980; Hift et al., 1960; Mansheim, 1983; Paillere-Martinot et al., 1990; Schneekloth et al., 1993). Although the methodological limitations of these studies are acknowledged, it is noteworthy that, with the exception of a single report of the lack of efficacy by Guttmacher and Cretella (1988), ECT was found to be effective in all the published reports listed above, no serious side effects were reported, and no fatality with the use of ECT in adolescents was ever reported.

Guttmacher and Cretella (1988) noted that ECT was ineffective in three of four cases (major depression in two cases, schizophrenia in one case, and Tourette's disorder in one case). They also noted prolonged seizures (>4 minutes) in three of their four subjects. On the basis of these observations, they concluded that adolescents respond poorly to ECT and may be more prone to prolonged seizures at energy levels lower than those generally used for adults. The reasons for the exceptionally poor outcome reported by Guttmacher and Cretella are unclear. However, this negative outcome study was an exception, and all others reported successful outcomes.

LATER STUDIES

Recent studies have found that ECT may benefit adolescents with a variety of psychiatric disorders. The most benefit, however, has been reported among adolescents with unipolar or bipolar mood disorders. Table 1 summarizes publications since 1990. Several of these represent significant improvements on earlier studies because of larger sample sizes, standardized diagnostic and outcome assessment criteria, and modern ECT techniques.

Paillere-Martinot et al. (1990) reported an 88% response rate among patients aged 15 to 19 years with heterogeneous diagnoses. Schneekloth et al. (1993), in a retrospective chart review, found a 65% response rate in 20 adolescents aged 13 to 18 years. They reported a lack of correlation between electrode placement and response. There was no evidence of prolonged seizures in subjects younger than age 15. This review, like a more extensive review by Rey and Walter (1997), emphasized the lack of data-based results.

Kutcher and Robertson (1995) systematically studied 16 bipolar subjects who accepted ECT and compared them with 16 bipolar subjects who had been offered but refused ECT. The group who accepted ECT (eight bipolar-manic and eight bipolar-depressed subjects) improved significantly compared with those who refused the treatment. The patients treated with ECT also had a shorter mean duration of hospital stay (73.8 days vs. 176 days).

TABLE 1
Selected Electroconvulsive Therapy Publications Since 1990

Study	Study Design	N	Age Range (yr)	Diagnoses	Outcome Criteria	Response Rate
Paillere-Martinot et al. (1990)	Retrospective	8	15–19	2 schizophrenia, 2 delusional depression, 3 delusional mania, 1 posttraumatic head injury	Clinical impression, GAF	88%
Schneekloth et al. (1993)	Retrospective	20	13–18	4 depression; 4 bipolar; 12 schizophrenia, schizophreniform, schizoaffective	Clinical impression	65%
Kutcher and Robertson (1995)	Retrospective	16	16–22	8 bipolar-mania, 8 bipolar-depressed	Compared with treatment refusers	Significantly better than those who refused
Ghaziuddin et al. (1996)	Retrospective	11	13–18	9 major depression, 1 bipolar-depressed, 1 organic mood disorder	Pre- and posttreatment ratings on CDRS, GAF	64%
Moise and Petrides (1996)	Retrospective	13	16–18	3 major depression, 2 bipolar disorder, 8 mixed diagnoses	Clinical impression	76%
Rey and Walter (1997)	Review of 60 studies	396	7–18[a]	Mixed diagnoses	Clinical impression	63% depression, 80% mania, 42% schizophrenia
Walter and Rey (1997)	Retrospective	42	14–17	Mixed diagnoses	Clinical impression	51% improvement across diagnosis, 100% mania, 85% psychotic depression, 51% all diagnoses
Cohen et al. (1997)	Retrospective	21	14–19	10 major depression with psychotic symptoms, 4 bipolar-manic, 7 schizophrenia	Clinical impression	100% for depressed, 75% for bipolar-mania, partial response in schizophrenic patients
Strober et al. (1998)	Retrospective	10	13–17	7 major depression, 3 bipolar-depressed	CGI, HAM-D	60% complete remission, 40% partial remission

Note: GAF = Global Assessment of Functioning Scale; CDRS = Children's Depression Rating Scale; CGI = Clinical Global Impressions; HAM-D = Hamilton Rating Scale for Depression.
[a] Five patients were reported prepubertal. Unspecified age for many patients.

Ghaziuddin et al. (1996) reported a 64% response rate in 11 depressed adolescents, aged 13 to 18 years, who had been unresponsive to three or more antidepressant trials. In another report, Moise and Petrides (1996) described 13 adolescents aged 16 to 18 years who had been treated with ECT between 1984 and 1993. They found a 76% response rate. The three nonresponders had psychosis not otherwise specified (*n* = 2) and bipolar mood disorder (*n* = 1).

Rey and Walter (1997) reviewed 60 studies involving 396 patients younger than 18 years of age and found a 63% remission rate for the patients with depression, 80% for those with mania, and 42% for those with schizophrenia. This review article noted that the overall quality of studies was poor: approximately half (43%) of the studies failed to mention diagnoses, and a majority (62%) did not mention details of treatment including electrode placement, frequency of treatment, and the total number of treatments. Deficiencies in describing short- and long-term outcome were also noted. The same investigators conducted a study of ECT in 42 patients, aged 14 to 18 years, and found a

51% overall response rate across diagnoses. Examination of subgroups revealed an 85% response rate among those with psychotic depression and 100% for those with mania (Walter and Rey, 1997).

In a study of 21 adolescents aged 14 to 19 years, ECT effected a 100% response rate in patients with depression, a 75% response in patients with bipolar-mania, and a partial response in a schizophrenic subgroup (Cohen et al., 1997). Strober et al. (1998) studied 10 adolescents treated at the University of California, Los Angeles, between 1978 and 1996, ranging in age from 13 to 17 years, with bipolar-depression or major depressive disorder. ECT effected complete remission in 60% and partial remission in 40%. Improvement was maintained at 1-month follow-up, although systematic follow-up data were not reported.

In summary, publications since 1990 report more studies with objective outcome criteria and have relatively greater diagnostic clarity. Despite improved quality, only one study, that by Kutcher and Robertson (1995), compared treated patients with those who refused treatment. As judged by a review of studies since 1990, the overall rate of response to ECT among adolescents varies between 50% and 100%, with a higher response rate reported for subjects with a mood disorder.

ECT USE

Data from national and international studies regarding the use of ECT in patients younger than age 18 indicate that ECT is infrequently used to treat adolescents.

Examination of data from the National Institute of Mental Health regarding ECT use in the United States during 1980 revealed that of 33,384 patients who had been treated with ECT, only 500 or 1.5% were between 11 and 20 years of age (Thompson and Blaine, 1987). A 1981 mail survey of attitudes toward ECT, conducted in the United Kingdom, revealed that less than 7% of child and adolescent psychiatrists would consider the use of ECT for an adolescent patient (Pippard and Ellam, 1981). A hospital chart survey conducted in New South Wales, Australia, revealed that between 1990 and 1995, only 42 (0.93%) patients treated with ECT were younger than age 18 (Rey and Walter, 1997). From a university center in Bangalore, India, 14 children and adolescents (4.08% of all child/adolescent admissions during 1990–1991) of a total of 343 admissions to an inpatient unit were treated with ECT (Hedge et al., 1997). From these studies, it is evident that only a small number of children and adolescents receive ECT. Determination of the exact frequency of its current use may be possible only if a nationwide mandatory reporting system is established.

The use of ECT for adults varies widely among states. For instance, a study measuring ECT use rates across 317 metropolitan statistical areas of the United States found that annual ECT use varied from 0.4 to 81.2 patients per 10,000 population. Predictors of higher use were the number of psychiatrists in a given area, number of beds per capita, and stringency of state regulations (Herman et al., 1995). A study of Medicare beneficiaries reported that the number of patients who received ECT increased from 12,000 in 1987 to 15,560 in 1992. These reports suggest high between-region variability, a trend toward increased use of ECT, and increased use for particular subgroups (Rosenbach et al., 1997). Because of the lack of data, no such overviews are available regarding the use of ECT in adolescents.

EXPERIENCE AND ATTITUDES OF PATIENTS AND PARENTS

Research suggests that most adolescents who have been treated with ECT view the treatment as less aversive than the illness itself and would recommend the treatment to others (Walter et al., 1999b). These authors reported that 69% of patients who had ECT said that they would do so again if the treatment was advised by their doctor, and 77% would recommend it to family or friends if the treatment was medically advised. Walter et al. (1999a), in a study involving parents of adolescents who had received ECT, found that 21 of 28 parents had a favorable view of the treatment, the parents generally had adequate information about ECT, and the majority perceived illness and not ECT as the more aversive experience. Only a very small number of patients or parents had negative views of ECT. Patients who believed that they did not benefit were more likely to say they would never agree to have ECT again (54% vs. 8%) and also were more likely to hide that they had received the treatment (69% vs. 23%).

INDICATIONS

There are few data-based indicators regarding when to offer ECT to an adolescent. Also, there is inadequate information in the literature regarding exactly who should receive ECT, the number of failed previous interventions (if any) that should precede the use of ECT, the definition of the adequacy of previous and unsuccessful treatments before consideration of ECT, and the optimal number of ECT treatments that would constitute a "course" of ECT. Therefore, our recommendations are based on the review of the available literature about the use of ECT in adolescents, review of the extensive literature on the treatment of adults with ECT, and clinical experience.

Before an adolescent is considered for ECT, he/she must meet three criteria:

1. Diagnosis: Severe, persistent major depression or mania with or without psychotic features, schizoaffective disorder, or, less often, schizophrenia. ECT may also be used to treat catatonia and neuroleptic malignant syndrome.
2. Severity of symptoms: The patient's symptoms must be severe, persistent, and significantly disabling. They may include life-threatening symptoms such as the refusal to eat or drink, severe suicidality, uncontrollable mania, and florid psychosis.
3. Lack of treatment response: Failure to respond to at least two adequate trials of appropriate psychopharmacological agents accompanied by other appropriate treatment modalities. Both duration and dose determine the adequacy of medication trials. It may be necessary to conduct these trials in a hospital setting.

Patients with an Axis I disorder with prominent affective symptoms may respond to ECT. Although there are no systematic studies of ECT use in adolescents with schizophrenia, controlled investigations of adults show that some schizophrenic episodes respond to ECT, especially when affective symptoms are prominent (Brandon et al., 1985; Taylor and Fleminger, 1980). ECT may be considered either when a patient is unable to tolerate neuroleptic medication at the therapeutic dose or when prominent affective symptoms or catatonia is present.

Neuroleptic malignant syndrome is a serious iatrogenic condition associated with the use of antipsychotic medication. Case reports suggest that ECT may be a useful treatment for neuroleptic malignant syndrome (Chandler, 1991; Magen and D'Mello, 1995; McKinney and Kellner, 1997; Nolen and Zwaan, 1990; Zwil and Pelchat, 1994).

ECT is generally reserved for adolescents with "treatment-resistant" conditions. The criteria defining treatment-resistant vary among investigators (Cohen et al., 1997; Ghaziuddin et al., 1996; Kutcher and Robertson, 1995). At present, there is no consensus as to what constitutes an adequate medication trial for an adolescent with a severe mood disorder. On the basis of the adult literature, an adolescent should receive at least 8 to 10 weeks of treatment with an antidepressant agent at a therapeutic dose before a treatment regimen is considered to be an adequate trial. In adolescents with unipolar depression, two adequate antidepressant medication trials should be conducted before the use of ECT is recommended. If the patient has bipolar disorder, a trial of a mood stabilizer alone or in combination with a neuroleptic is recommended before ECT. Because noncompliance with medication may be high in adolescents (Ghaziuddin et al., 1999b; Korsch et al., 1978; Sleator, 1985), significant efforts must be made to confirm whether the medication prescribed was taken appropriately. This may involve the monitoring of medication use by a parent, pill counts at regular intervals, and/or examination of serum levels of the medication as appropriate.

The total number of medication trials before consideration of ECT may depend on the clinical condition of the adolescent. In a severely ill adolescent, ECT may be considered sooner in cases in which adequate medication trials are not possible because of the patient's inability to tolerate psychopharmacological treatment, when the adolescent is too grossly incapacitated to take medication, or when waiting for a response to a psychopharmacological treatment may endanger the life of the adolescent.

In any use of ECT in severely ill adolescents, the goals of treatment should be realistic, with the greatest improvement to be expected in affective symptoms and general functioning.

CONTRAINDICATIONS

There are no absolute contraindications to ECT in adult patients. The presence of a cerebral tumor, an

active chest infection, or a recent myocardial infarction is no longer considered an absolute contraindication. Studies conducted among adult patients referred for ECT suggest that structural abnormalities of the central nervous system may be more common in patients with refractory mood disorders and particular clinical conditions than in patients without those conditions. Although these abnormalities may affect treatment outcome, there are reports of successful ECT use in patients with cerebral lesions including tumor, venous shunts, and a history of craniotomy. For example, Zwil et al. (1990), in their review of the adult literature, identified 40 patients who had been treated with ECT who also had an intracranial tumor. They found that only 15% of patients had prior knowledge of the neoplasm. They concluded that ECT may be safely administered after prospective assessment of risk of neurological complications has been completed. Similarly, there have been other reports of the successful use of ECT in adult patients with a history of craniotomy for an intracranial tumor (Starkstein and Migliorelli, 1993) and other neurologically compromised patients (Hartman and Saldivia, 1990). Cautious use of ECT in the presence of an intracranial tumor has been endorsed also by the American Psychiatric Association (1990).

There are insufficient data, however, to allow firm conclusions to be drawn regarding absolute contraindications to ECT use in adolescents. That ECT may contribute to a positive outcome in neurologically compromised adolescents is supported by a report of successful treatment of a depressed 17-year-old male adolescent with meningomyelocele, hydrocephalus, and seizure disorder (Mansheim, 1983). Similarly, Ghaziuddin et al. (1999a) reported the successful use of ECT in a patient with a cerebral brain tumor who had undergone craniotomy. No adverse reactions were reported in either of these cases. Although little information is available regarding the effect of ECT in adolescents with a concurrent seizure disorder, adult data indicate that ECT does not have a long-term effect on seizure threshold and may even be a treatment option in some patients with intractable seizures. Viparelli and Viparelli (1992) reported that appropriate use of ECT may reduce the frequency of seizures in patients refractory to anticonvulsive treatment. In view of the demonstrated usefulness of ECT in patients with seizure disorders, ECT may be used in the presence of a seizure disorder when indicated for a psychiatric illness.

The primary diagnostic consideration for ECT in adolescents is a severe mood disorder. On the basis of data from adults, psychiatric comorbidity should not be considered a contraindication for ECT. Disorders frequently comorbid with severe mood disorders are personality disorders, conduct disorder, oppositional defiant disorder, posttraumatic stress disorder, attention-deficit/hyperactivity disorder, and eating disorders. No systematic studies in adolescents describe treatment outcome of ECT for severe mood disorders with comorbid Axis I disorders.

There also are insufficient data regarding the use of ECT in adolescents with comorbid personality disorders. This issue is compounded by several factors. First, little is known about the validity of personality disorder diagnoses in children and adolescents (Brent et al., 1990). Second, studies involving adults and adolescents indicate that many patients who meet criteria for personality disorder during an affective episode may no longer do so when euthymic (Joffe and Regan, 1988; Korenblum et al., 1988). Third, similar short-term response to ECT has been noted among depressed adult patients with and without comorbid personality disorders (Zimmerman et al., 1986). Fourth, the presence of personality disorder may increase the risk of completed suicide in teenagers (Brent et al., 1994). Fifth, comorbid diagnosis of personality disorder in adolescents treated with ECT was negatively associated with good response of depressive symptoms (Walter and Rey, 1997). Thus, on the basis of the available data, the diagnosis of personality disorder in an adolescent with severe mood disorder does not contraindicate the use of ECT.

Mental retardation (MR) is not a contraindication for ECT. There are reports of successful use of ECT in adult patients with mild to profound MR who had severe mood symptoms, psychosis, or self-injurious behaviors. Thuppal and Fink (1999) reported five cases ranging in age from 18 to 64 years who responded favorably to ECT after multiple medication trials had failed. They concluded that the benefits of ECT in patients with MR were similar to those in patients without MR and that this population was not at additional risk of side effects. However, informed consent is an issue with patients with MR. State guidelines should be followed for obtaining consent from a parent.

Nevertheless, because experience with adolescents is sparse, due caution should be observed. This includes consultation with appropriate specialty physicians and additional investigation.

ASSESSMENT

PSYCHIATRIC EVALUATION

The clinical decision to prescribe ECT should made by the psychiatrist who is responsible for the patient. This should be done in consultation with the treatment team after a careful psychiatric evaluation that must include a detailed clinical interview, collateral information from parents or other reliable informants, documentation of target symptoms, and measurement of symptoms with reliable rating instruments, when appropriate. Illness severity measures should also include a standardized evaluation of functioning across the following domains: interpersonal, peer, social, family, and academic/vocational.

REVIEW OF PAST TREATMENTS

ECT should be considered a treatment option when previous appropriate and adequately applied interventions have been ineffective. Before the initiation of ECT, the attending clinician must review in detail past pharmacological and psychological treatments. For pharmacotherapies, the total daily dose, duration of treatment, response (none or partial), and adverse effects must be documented. Augmentation and/or combination strategies must also be identified with similar criteria. Adequacy of treatment adherence is always an issue to be considered when past treatments are reviewed. Whenever possible, direct or indirect measures of pharmacological treatment should be identified (for example, serum lithium levels). Consideration of the adequacy of previous pharmacological treatments can be made only after such a review.

Psychotherapeutic and psychosocial treatment approaches must also be reviewed. These should include appropriate and adequate application of individual, group, and family psychotherapy and other interventions.

PHYSICAL EXAMINATION AND LABORATORY INVESTIGATION

There are no absolute medical contraindications for ECT. However, there may be relative contraindications that require identification before ECT. The standard of care requires that every patient considered for ECT receive a complete physical examination, appropriate laboratory and radiological investigations arising from the medical history and physical examination, and laboratory evaluation of physiological parameters that may affect administration of ECT or anesthesia.

Laboratory investigations may include complete blood cell count, differential white blood cell count, electrolyte levels, liver and thyroid function tests, urinalysis and toxicology screen, and electrocardiogram. Female patients must have a serum or urine pregnancy test so that if they are pregnant, appropriate precautions may be taken to minimize potential risks (Miller, 1994; Walker and Swartz, 1994). Other laboratory investigations should be obtained on a case-by-case basis. Investigations such as EEG, MRI, CT, or skeletal x-rays may be indicated in some cases. Studies among adults referred for ECT have revealed a greater number of pathological lesions of the central nervous system that were identified by a CT or MRI scan. It has been suggested, although not verified, that some of these lesions may affect treatment outcome or seizure duration (Coffey, 1994). Therefore, an MRI or CT scan may be indicated in some adolescents, if not already completed as part of a workup for treatment-refractory depression.

COGNITIVE ASSESSMENT

Every adolescent being treated with ECT must undergo age-appropriate memory assessment before treatment, at treatment termination, and at an appropriate time after treatment (usually between 3 and 6 months post-treatment). Cognitive testing should focus on short-term memory and new knowledge acquisition.

INFORMED CONSENT

Adolescents and parents should be fully informed about the procedure. Written consent of a parent must be obtained. Consent or assent of the adolescent should be obtained whenever possible. However, an adolescent who is manic, confused, psychotic, or severely incapacitated due to other reasons may not be able to assent. Candidates for ECT should be informed that the benefits of ECT are short-lived without active continued treatment and that there may be some risk of permanent severe memory loss after ECT (U.S. Department

of Health and Human Services, 1999). Consent is usually obtained for a treatment course, which may vary between 6 and 15 treatments or as clinically indicated. Some states mandate a waiting period between consent and onset of treatment. The parent and the patient should be informed of the waiting period during which consent may be withdrawn. However, consent may be withdrawn at any time during the treatment course. A sample consent form is provided in the Appendix.

Every attempt should be made to educate the adolescent and parents about ECT. This should include discussion with the physician, written materials, and, if possible, a videotape explaining the procedure (Walter and Rey, 1999a). Educational videotapes that include interviews with former patients who received ECT may be useful (Ghaziuddin et al., 1996). Some services have facilitated discussion between families and patients who have undergone ECT and those for whom it has been recommended.

Salzman (1977), in reference to adult patients receiving ECT, stated that concerns regarding informed consent are particularly difficult to resolve because ECT is used primarily for severely ill patients who often are unable to participate fully in the decision-making process. Adolescents who are candidates for ECT may be further disadvantaged, both by limited cognitive competence essential for informed decision making and by the presence of severe psychiatric illness. However, this problem is not unique to ECT, and many parallel situations (seriously physically ill teenagers and the use of invasive treatment procedures) are found in the practice of medicine. All discussions regarding consent and the right to refuse treatment must include the issue of the right to receive effective treatment.

In addition, ECT may bring about a change in the adolescent's capacity to consent or assent during the course of treatment. Thus, it is important that the treating physician understand that informed consent is a process occurring within a therapeutic alliance and not a legal transaction occurring at a single point in time.

Familiarity with state and institutional guidelines is essential to ensure that legal requirements are met. Several states have age-related restrictions for the use of ECT. For instance, ECT is not permitted for patients younger than age 16 in Texas and Colorado, those younger than age 14 in Tennessee, and those younger than age 12 in California.

SECOND OPINION

In accordance with the ECT guidelines for adults (American Psychiatric Association, 1990), the initial decision to treat with ECT must be followed by a consultation with at least one other psychiatrist. The second psychiatrist should be experienced in the treatment of adolescents. He or she should not have been involved in the patient's ongoing clinical care and should be experienced in the use of ECT and in the treatment of the illness experienced by the patient for whom ECT is being considered. The second opinion process should include a review of the comprehensiveness, intensity, and appropriateness of previous treatment efforts.

CONCURRENT TREATMENT

The severity of symptoms and the post-ECT monitoring require placement in an inpatient setting. The patient should participate in the hospital milieu therapy, and support should be offered to the family. Supportive treatment of the adolescent should continue during the course of ECT.

There is evidence to suggest that some medications may interfere with ECT, either by lowering the seizure threshold or by increasing side effects. However, there is no consensus on which psychotropic medications, if any, are absolutely contraindicated with concurrent ECT. It is advised that, whenever possible, ECT be administered without concurrent medications. Some psychotropic medications may be used with appropriate monitoring.

There are conflicting reports regarding the safety of lithium treatment with ECT. Of note, there are reports of an acute brain syndrome in individuals treated with ECT concurrent with lithium use (Penny et al., 1990). Because of unclear data, if clinically possible, it may be better to avoid this medication during ECT. Adverse side effects (namely, prolonged seizures during ECT) have also been reported with the concurrent use of trazodone (Lanes and Ravaris, 1993). Failure to induce a seizure has been reported in a patient receiving carbamazepine (Roberts and Attah, 1988). Theophylline, at both therapeutic and toxic levels, is known to prolong seizure duration (Zwillich et al., 1975). Benzodiazepines may increase the seizure threshold.

Therefore, whenever possible, it may be useful to discontinue all medications, particularly psychotropics, while a patient is receiving ECT (Klapheke, 1993). If clinically necessary, medications may be administered accompanied by appropriate monitoring. Pritchett et al. (1993) provided a comprehensive review of interactions between medications and ECT.

ECT PROCEDURE

Adolescents who are receiving ECT are usually hospitalized. Treatment response, duration and intensity of seizures, and recovery after anesthesia are better monitored when the adolescent is in the hospital. Adolescents may have lower seizure threshold and more prolonged seizures with ECT than adults (Ghaziuddin et al., 1996; Schneekloth et al., 1993). Although this cannot be confirmed until seizure threshold and duration in adolescents are better understood, it is recommended that ECT be administered only on an inpatient basis.

ANESTHESIA

Standard procedure for administration of ECT should always include consultation with an anesthesiologist, preferably one who is experienced in the treatment of adolescents. Other specialists should be consulted if there is evidence of concurrent medical pathology.

The anesthetic agent commonly used is methohexital. Muscle relaxation is achieved with succinylcholine. Acceptable alternatives for methohexital are etomidate, thiopental sodium, and ketamine. Alternatives for succinylcholine are atracurium and mivacurium. Intravenous atropine and, alternatively, glycopyrrolate are acceptable anticholinergic medications in common use. These may be administered immediately before ECT to prevent bradycardia, arrhythmia, or occasional ECT-induced cardiac asystole. Premedication with atropine or glycopyrrolate is required before the seizure threshold is determined by dose titration method and before the first treatment with right unilateral electrode placement. This is to protect the cardiovascular system from vagal discharge in instances of incomplete or missed seizures. Patients are ventilated with 100% oxygen before administration of the electrical stimulus.

ADMINISTERING ECT

ECT should be administered in a specially designated area by a team of clinicians, which should include a psychiatrist, an anesthesiologist, and nursing staff experienced in the use of ECT. The patient should have fasted for approximately 12 hours before the procedure. The treating physician should be familiar with features of the ECT device. Because monitoring for seizure adequacy and evidence of prolonged seizures is an important part of current practice, it is necessary to use an ECT device with the capacity for making EEG recordings. After ECT, the patient should recover in a specially designated area for observation where nursing care is provided.

Most centers in the United States administer ECT three times weekly to both adults and adolescents. This practice contrasts with that in several other countries (including Britain and Canada), where biweekly administration may be the most common treatment schedule. At present, it is not known which schedule might be best for adolescents. Treatment may begin at three times per week and be titrated down to twice weekly if there is evidence of significant cognitive impairment. Alternatively, a twice-weekly administration cycle may be used from the onset of treatment.

The total number of ECT procedures administered during a treatment course should be determined by clinical response, although a usual course consists of 10 to 12 treatments. Patient response is usually measured after the first five or six treatments, when initial improvement is often observed. However, there are reports of patients displaying improvement late in a treatment course (Cizadlo and Wheaton, 1995). The decision whether to continue with ECT in an adolescent who has not displayed an acceptable response at the preliminary evaluation (treatment 5 or 6) should be based on careful evaluation of each target symptom and assessment of overall functioning. Care must be taken not to overtreat or undertreat with ECT.

The use of unilateral electrode placement applied to the nondominant cerebral hemisphere (usually the right brain in most right-handed persons) is one factor identified with less memory impairment in the immediate posttreatment period.

The usual practice in a severe major depression is to begin ECT with unilateral treatment and to change to bilateral treatment if the response is inadequate. Occa-

sionally, ECT may commence with bilateral treatment in a very ill patient or when speed of response is critical (e.g., refusal to eat or drink, severe suicidality, florid psychosis, catatonia). There is also evidence to suggest that bilateral ECT may be more effective for manic patients. Because efficacy is clearly more important than the cognitive side effects, which are reversible and no longer measurable a few months after the last treatment, the decision of unilateral versus bilateral treatment should be made on a case-by-case basis.

Some studies suggest that unilateral ECT may be less effective and the memory impairment similar to that associated with bilateral ECT after a relatively brief interval after treatment. For instance, Sackeim et al. (1993) noted that the response rate after low-dose unilateral ECT was lower than the response rate after either high-dose unilateral or low-dose bilateral treatment in adults. He also found no significant differences between the unilateral and bilateral groups in their cognitive effects 2 months after treatment. These observations in adults indicate that bilateral ECT may be more effective and possibly no more damaging to cognition than unilateral electrode treatment. Nevertheless, studies comparing the two modes of electrode placement in adolescents are necessary before definitive conclusions can be drawn for this age group. Until more experience is gained, it is recommended that treatment begin with unilateral electrode placement (exceptions are mania and situations in which urgency of response is paramount); then patient response should be evaluated at treatment 3 or 4 to determine whether bilateral placement is warranted.

The following methods are recommended to determine cerebral dominance for language and verbal memory. The site of application of a unilateral electrode may be decided according to these methods. Approximately 70% of left-handed people lateralize language functions to the left hemisphere, as do all right-handed people. Fifteen percent of left-handed people have bilateral representation of language, and 15% have reversal of the typical pattern and demonstrate right hemisphere superiority for language function (Bryden, 1982). Therefore, irrespective of handedness, only a small number of individuals are right cerebral hemisphere dominant for language.

Identification of the preferred hand for writing may be insufficient to determine cerebral dominance for language and verbal memory. Therefore, it is recom-

mended to inquire as to the preferred hand for throwing a ball, using scissors, knife and fork, etc. Standard tests are also available for determining cerebral dominance such as the Duke University Medical Center ECT Cerebral Dominance Test (Harris, 1988). This or a similar protocol may be used in situations in which there is doubt about cerebral dominance.

Also recommended to minimize cognitive impact of ECT is the use of brief pulse (instead of sine wave) and a lower dose of electricity, which is moderately above the threshold for inducing seizure of adequate duration.

Estimation of electrical dose is usually done by the "half age method" or by the "titration method." However, both methods have been studied only in adult subjects and their relevance to adolescents is not known. The age method uses a person's age to determine the energy level (dose = $0.5 \times$ patient's age). In the dose titration method, the initial dose may not result in a seizure. If so, additional stimuli are administered at 30-second intervals using 40% to 60% dose increments. A maximum of four stimulations is generally permitted. To protect the heart from the risk of vagally induced bradycardia or arrhythmia, premedication with atropine or glycopyrrolate is highly recommended when the titration method is used. Despite the increased cardiovascular risk associated with the titration method, it may be the preferred method for establishing the adequate dose of electrical impulse in the initial treatment.

Research indicates that an adequate convulsive dose should be used to produce an EEG seizure lasting 30 to 90 seconds. Electrode placement and electricity dose strongly influence clinical outcome. The poorest treatment response has been found with low-dose unilateral treatment. Although seizure threshold varies widely among individuals, a high seizure threshold is not a problem associated with adolescents. A lower seizure threshold is characteristic of young people.

In the rare instance in which there is failure to induce an adequate seizure in an adolescent, an increase in stimulus dose may be considered. Alternatively, caffeine augmentation is another option that involves the administration of a single dose of intravenous caffeine given approximately 2 to 3 minutes before ECT. Caffeine augmentation of ECT, however, has been studied only in adult patients. Although seizure duration may be lengthened, this procedure may be associated with

untoward side effects. Furthermore, there is no evidence to support that treatment outcome may be improved.

Seizure duration may be monitored with simultaneous EEG recording or the "cuff method." In the cuff method, a blood pressure cuff is applied to a lower limb (right lower limb in a patient receiving right unilateral ECT) and inflated above the systolic blood pressure. This isolates the limb from the effect of circulating muscle relaxant, thus permitting the observation of an unmodified seizure. The cuff may be applied to either lower limb in a patient receiving bilateral ECT.

PATIENT MONITORING

Immediately after ECT, for a period of 1 to 2 hours (or as clinically necessary), a nurse who is skilled in the care of unconscious patients should observe the patient in an area designated for ECT recovery. Monitoring should include vital signs, adverse events, and airway patency. Resources necessary for the management of agitation or seizures must be available. After each ECT procedure, patients should be monitored for a period of 24 to 48 hours for tardive seizures (late-onset seizures that may occur after full recovery from anesthesia).

A prolonged seizure during treatment (lasting more than 180 seconds monitored by EEG) should be treated with additional methohexital, diazepam, or lorazepam. Recurrent prolonged seizures may herald a tardive seizure, and patients who have recurrent prolonged seizures or tardive seizures should be evaluated by a neurologist.

After ECT, the usual procedure is for the patient to rest quietly in a supine position. Headaches occurring during this time may be treated with acetaminophen. Manic or hypomanic symptoms may manifest themselves during the recovery period and indeed may be induced during a course of ECT. If this occurs, a change from unilateral to bilateral ECT may be indicated and treatment should be continued until symptom resolution has been achieved.

ADVERSE EFFECTS

Adverse effects of ECT may include impairment of memory and new learning, tardive seizures, prolonged seizures, and risks associated with general anesthesia. Other minor side effects may include headache, nausea, vomiting, muscle aches, confusion, and agitation.

The main risks of ECT have been outlined in the U.S. Surgeon General's report (U.S. Department of Health and Human Services, 1999). However, because the report is based exclusively on adult data, this information may not be generalizable to the adolescent population. The report states that the major risks associated with ECT are those of brief general anesthesia (U.S. Department of Health and Human Services, 1999). The report also states that the most common adverse effects of this treatment are confusion and memory loss for events surrounding the period of ECT treatment. In rare instances, permanent or severe memory deficits may occur.

The confusion and disorientation seen upon awakening after ECT typically clear within an hour. More persistent memory problems are variable. Most typical with standard, bilateral electrode placement has been a pattern of loss of memories for the time of the ECT series and extending back an average of 6 months, combined with impairment of learning new information, which continues for perhaps 2 months after ECT (NIH and NIMH Consensus Conference, 1985). Well-designed neuropsychological studies have consistently shown that by several months after completion of ECT, the ability to learn and remember are normal (Calev, 1994). Although most patients return to full functioning after successful ECT, the degree of post-treatment memory impairment and resulting impact on functioning are highly variable across individuals (NIH and NIMH Consensus Conference, 1985) (U.S. Department of Health and Human Services, 1999, p. 259).

To date, only two publications have addressed the cognitive effects of ECT in adolescents. Cohen et al. (2000) reported on 10 adolescents with severe mood disorders who had been treated with ECT; follow-up assessment was conducted an average of 3.5 years after completion of treatment. This group of adolescents was compared with psychiatric controls matched for gender, age, and diagnosis. All patients except one who was mildly hypomanic were in remission at the time of the follow-up assessment. Objective test results did not reveal significant group differences on tests of short-term memory, attention, new learning, and objective memory scores. They also found that poorer cognitive performance was significantly associated with greater psychopathology. The main finding of this study was that 3.5 years after completion of treatment, the memory functions of adolescents treated with ECT were similar to those of psychiatric controls who had not received ECT.

The second study was by Ghaziuddin et al. (2001b). They studied cognitive deficits and recovery of cogni-

tive functions among 16 adolescents treated with ECT. The authors compared cognitive tests completed before ECT with those at 7.0 ± 10.3 days after the last treatment (first post-ECT) and at 8.5 ± 4.9 months after the last treatment (second post-ECT). Comparison of the pre-ECT and the first post-ECT cognitive test results yielded significant impairments of concentration and attention, verbal and visual delayed recall, and verbal fluency. However, complete recovery with return to pre-ECT functioning was noted at the second post-ECT testing.

These studies by Cohen et al. (2000) and Ghaziuddin et al. (2001b) provide preliminary evidence that the cognitive functioning of adolescents treated with ECT is similar to that of psychiatric controls and that the cognitive functioning is likely to return to its baseline level several months after ECT. However, these data should be considered preliminary; large-scale studies are necessary before final conclusions can be drawn.

In adults, the fatality rate associated with ECT is 0.2 per 10,000 treatments and the anesthesia-related mortality rate is 1.1 per 10,000. Adolescents are not believed to be at additional risk from ECT, nor are they are at increased risk of anesthesia-related complications in the immediate recovery period (Aubas et al., 1991). Rey and Walter (1997) noted that there has never been a fatality associated with ECT in adolescents. However, they added that any conclusions regarding ECT-related fatalities in adolescents can only be drawn from larger series than those available within the current literature.

Tardive seizures are a rare but potentially serious side effect. These usually are encountered in adolescents who have a normal EEG before treatment and are not receiving seizure-lowering medications during treatment. Ghaziuddin et al. (1996) observed a tardive seizure 6 hours after the seventh treatment in one of their patients. Likewise, Schneekloth et al. (1993) observed a single spontaneous seizure in 1 of 20 adolescent patients treated with ECT. In such cases, neurological consultation is advised. Depending on the results of that consultation, antiepileptic medications may be indicated after the patient has completed the course of ECT. Follow-up of these two cases was limited to a few months, when the patients were successfully weaned off antiepileptic medications. Of note, tardive seizures are not unique to adolescents and also have been reported in adults who received ECT.

Seizures that last longer than 180 seconds are considered, by convention, to be prolonged seizures. A prolonged seizure can be effectively terminated with additional methohexital, diazepam, or lorazepam. Prolonged seizures are clinically significant because they are associated with greater postictal confusion and amnesia and inadequate oxygenation resulting in increased hypoxia-related risks (cerebral and cardiovascular complications). In animal studies, seizures exceeding 30 minutes produce structural damage and cardiovascular and cardiopulmonary complications. Recently, there has been a concern that prolonged seizures during ECT may be more common in adolescents, but, lacking epidemiological data, this remains unknown (Walter and Rey, 1998).

Moise and Petrides (1996) noted prolonged seizures (defined as greater than 180 seconds) in 3 of their 13 patients but did not find an associated difference in treatment responsivity or adverse side effects. Ghaziuddin et al. (1996) noted a prolonged seizure (defined as longer than 150 seconds) in 9.6% of a total of 135 treatments in 11 patients. Seven of their 11 patients experienced at least one prolonged seizure according to these criteria. One of these patients had a tardive seizure during the first 12 hours post-treatment. Follow-up 6 months later did not reveal seizure recurrence. Hill et al. (1997) observed two prolonged seizures (defined as longer than 150 seconds) in 24 treatments administered to two patients, rendering an occurrence rate of 8.3%. Walter and Rey (1997) found prolonged seizures in 2 of 49 courses given to 42 patients. However, Kutcher and Robertson (1995), in their group of 16 patients, did not note any prolonged seizures (defined as longer than 180 seconds). This limited experience indicates that prolonged seizures may occur during 0% to 10% of treatments.

Appropriate medical consultation should be considered if difficulties are experienced in terminating a prolonged seizure, if spontaneous seizures occur, or if neurological or other physical sequelae appear to be present. In such cases, ECT should be resumed only after the assessment of treatment risks and benefits.

Other minor side effects include headache, nausea, vomiting, muscle aches, confusion, and agitation. These usually do not persist beyond the day of the treatment. Some of these are secondary to the anesthetic and some secondary to the ECT treatment itself. These should be managed conservatively.

PATIENT MANAGEMENT AFTER ECT

ECT is effective only in resolving an acute illness and will not prevent relapse. Thus, an effective treatment strategy for continuation and maintenance of treatment response is necessary.

SHORT-TERM MANAGEMENT

ECT, which is effective in resolving an acute illness presentation, will not prevent relapse. Thus, an effective treatment strategy for continuation and maintenance of treatment response is necessary.

At this time, there are no data available to guide the clinician regarding the use of maintenance ECT in adolescents, although this is successfully and commonly used in adults with mood disorders. After successful ECT treatment, the adolescent should be placed on an appropriate therapeutic regimen designed to maintain treatment response. This treatment regimen should be tailored to the presenting disorder and may include an antidepressant in unipolar major depressive disorder, a mood stabilizer in bipolar illness, and judicious use of combined pharmacotherapies.

LONG-TERM MANAGEMENT

The adolescent patient should be monitored for mood changes or signs of suicidal ideation for several weeks after ECT. He or she should also be seen at regular intervals to monitor other psychiatric symptoms and medications and for psychotherapy, if indicated.

Pharmacological treatment of depression should be determined before the completion of the ECT course. Many adolescents treated with ECT are likely to have a history of inadequate or no response to one or more antidepressant agents. Therefore, choosing the appropriate antidepressant agent is likely to be difficult. Choice of the agent may be based on the patient's history of treatment response, family history of response, or the use of a novel agent. A mood stabilizer and/or a neuroleptic agent may be added to the regimen, if necessary.

Individual psychotherapy should be tailored to patient needs and may include supportive or cognitive-behavioral therapy. Family therapy may be included, if indicated.

Systematic assessment of treatment outcome is necessary to evaluate therapeutic response and adverse effects. These assessments should include evaluation of cognition, mood, psychosis, and other psychiatric symptoms using, whenever possible, standardized rating scales appropriate to the item under consideration. For example, depressive symptoms may be monitored with the Children's Depression Rating Scale or another validated tool. Manic symptoms may be monitored with the Young Mania Scale or the Modified Mania Scale. Side effects should be systematically assessed with an appropriate side effect scale before the initiation of ECT and at treatment completion. It is recommended that symptom-specific ratings be undertaken at specific intervals during the treatment and at completion of the treatment course. Side effect evaluation should occur after every treatment, and cognitive evaluation should occur as indicated above.

FURTHER STUDY AND EDUCATION

Recent studies have demonstrated that many child and adolescent psychiatrists lack the necessary experience to objectively evaluate ECT or to administer ECT. Also, some members of the public and some mental health professionals may regard ECT as a controversial or unethical treatment. Recognizing that the foundation of ethical decision-making should be scientific information, this practice parameter seeks to gather and organize existing information on this topic. Statutory and regulatory processes should incorporate scientific findings.

Several studies have attempted to identify attitude and knowledge of ECT among child and adolescent psychiatrists. For instance, Parmar (1993) found that 79% of child and adolescent psychiatrists in the United Kingdom, identified via a mail survey, had never used ECT in adolescents. Using a similar study design in child psychiatrists in Australia and New Zealand, Walter and Rey (1997) reported that 40% of the respondents rated their experience and knowledge of ECT to be "minimal." Similarly, Ghaziuddin et al. (2001a) found that 54% of child and adolescent psychiatrists and doctoral-level psychologists rated their knowledge as minimal, and 75% lacked the confidence to give a second opinion. Therefore, findings indicate that lack of knowledge and experience with the use of ECT

among child and adolescent psychiatrists is an obstacle to its appropriate use. There is a critical need for the education of psychiatrists and other clinicians who treat adolescents in the proper practice of ECT and for establishing appropriate safety guidelines based on scientific evidence.

CONFLICT OF INTEREST

As a matter of policy, some of the authors of this practice parameter are in active clinical practice and have received income related to treatments discussed in this parameter. Some authors may be involved primarily in research or other academic endeavors and also may have received income related to treatments discussed in this parameter. To minimize the potential for this parameter to contain biased recommendations due to conflict of interests, the parameter was reviewed extensively by Work Group members, consultants, and AACAP members. Authors and reviewers were asked to base their recommendations on an objective evaluation of the available evidence. Authors and reviewers who believed that they may have a conflict of interest that would bias or appear to bias their work on this parameter were asked to notify the AACAP.

SCIENTIFIC DATA AND CLINICAL CONSENSUS

Practice parameters are strategies for patient management developed to assist clinicians in psychiatric decision making. This parameter, based on evaluation of the scientific literature and relative clinical consensus, describes generally accepted approaches to assess and treat specific disorders or to perform specific medical procedures. The validity of scientific findings is judged by design, sample selection and size, inclusion of comparison groups, generalizability, and agreement with other studies. Clinical consensus was determined through extensive review by the members of the Work Group on Quality Issues, child and adolescent psychiatry consultants with expertise in the content area, the entire AACAP membership, and the AACAP Assembly and Council.

This parameter is not intended to define the standard of care, nor should it be deemed inclusive of all proper methods of care or exclusive of other methods of care directed at obtaining the desired results. The ultimate judgment regarding the care of a particular patient must be made by the clinician in light of all the circumstances presented by the patient and his or her family, the diagnostic and treatment options available, and available resources. Given inevitable changes in scientific information and technology, this parameter will be reviewed periodically and updated when appropriate.

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APPENDIX
Consent for Electroconvulsive Therapy[a]

Birthdate:

Name

Reg. No.

Dr. _____ has told me that I have the following condition: _____

The doctor has therefore recommended electroconvulsive therapy as an appropriate treatment.

The doctor has explained to me that:

a. This treatment generally consists of the following: I will be taken to a treatment room in the morning before breakfast. I will be attended by an anesthetist and a physician. A needle will be placed in my vein through which anesthetic will be injected and I will become drowsy and fall asleep. Then I will receive a muscle relaxant. I will be given oxygen through a mask and it may be necessary for the anesthetist to assist my breathing.

   The electroconvulsive therapy will take place while I am anesthetized. Brief electric currents will be passed through electrodes placed on my scalp. The electric currents will stimulate my brain. Treatments are given every other day, and I may require more treatments. The average number of treatments is nine, although some patients require fewer and others require more. The treatment is designed to reverse my current condition of _____ .

b. The following risks are involved with this treatment:

   Two separate types of risks are involved. First, there are some risks related to anesthesia. Those risks consist of the following: respiratory arrest, cardiac arrest, and even death. Second, there are some risks related to the treatment itself: memory for recent events may be disturbed and dates, names of friends, public events, telephone numbers, and addresses may be difficult to recall. In most patients, memory returns to normal within 4 weeks after the last treatment, but in some cases memory problems remain for months and even years. Additionally, in very rare cases, there is the risk of seizures, bone fractures, and even death. The risk is negligible (less than 1 in 10,000 cases) but has been documented.

c. My condition could also be treated in the following ways, but they are not recommended at this time: _____

d. There is no guarantee that this treatment will improve my condition, and even after improvement, the benefit obtained may be transient.

I understand that this consent form covers a maximum of 12 treatments to be administered in a series over a 4-week period. However, since the average number of treatments administered is 9, I may not require all 12 treatments.

I understand that I may discontinue treatment at any time, although my physician would like me to continue until an adequate course is completed.

I understand the treatment and have discussed it with Dr. _____ .

Dr. _____ has answered all my questions.

I therefore permit the physician (and such other persons as are needed to assist) to administer this treatment to me. I further permit the anesthetist (and such persons as are needed to assist) to administer anesthetic to me in connection with the procedure.

_____   _____   _____
Patient   Witness   Date

The patient is unable to consent because: _____

_____

and I, as his/her legally authorized representative, therefore consent for the patient:

_____   _____   _____
Legally Authorized Representative   Witness   Date

_____
Relationship to Patient

This signed consent is valid until _____
                                                            Date

[a] This is a sample consent form currently in use by the University of Michigan, Ann Arbor. Other forms may be modified along these lines.