

ELECTROCONVULSIVE THERAPY

ASCP Psychopharmacology Curriculum

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Pretest Question 1

ECT has demonstrated efficacy in the treatment of:

- A. Depressive Episodes
- B. Manic Episodes
- C. Catatonia
- D. Acute Psychotic Episodes
- E. All of the above

Pretest Question 2

Methohexital is the preferred anesthetic agent for ECT because:

- A. It is relatively inexpensive
- B. It is only moderately anticonvulsant
- C. It has quick onset of action
- D. It has brief duration of action
- E. All of the above

Pretest Question 3

Which best describes the role of the medical consultant in the pre-ECT evaluation?

- A. To provide clearance to undergo ECT
- B. To help optimize the patient's medical condition prior to ECT
- C. To tell the psychiatrist if ECT is appropriate for the patient
- D. To identify contraindications to ECT

Pretest Question 4

Which is NOT true concerning the seizure during ECT?

- A. Should be monitored with EEG
- B. Should be monitored with EMG
- C. Cumulative seizure length during a course of ECT is closely correlated with clinical outcome
- D. Failure to elicit a seizure is associated with lack of efficacy
- E. Seizure threshold increases during the treatment course

Pretest Question 5

Discovery of which of the following medical conditions in a patient being evaluated for ECT is most concerning?

- A. Type II Diabetes
- B. Recent Myocardial Infarction
- C. HIV/AIDS
- D. Psoriasis
- E. Epilepsy

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1985 NIMH Consensus Conference

“Medical school curricula should include education in the use of ECT. Psychiatric residency programs should include complete ECT training: indications, contraindications, risks, clinical management, informed consent, and evaluation of outcome. The American Board of Psychiatry and Neurology should include questions about ECT in its oral and written examinations.”

ACGME Competencies

July 1, 2007

Section IV: Educational Program; Item 3 (d)

“Residents must be able to provide patient care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health. Residents:

“(3) should develop competence in:

“(d) understanding the indications and uses of electroconvulsive therapy.”

Major Teaching Points

- ECT is the most effective acute treatment for major depression
- It is typically reserved for patients with treatment resistant illness
- Although performed by only a small percentage of psychiatrists, all psychiatrists should know enough to refer when appropriate

Major Teaching Points

- ECT is the induction of a generalized seizure under general anesthesia for therapeutic purposes
- Two treatment schedules are used:
 - An acute course (2-3 times per week) achieves current episode remission
 - Continuation/Maintenance ECT consolidates the benefits and inhibits recurrence
- ECT is increasingly performed on an outpatient basis

History

Ladislas Meduna



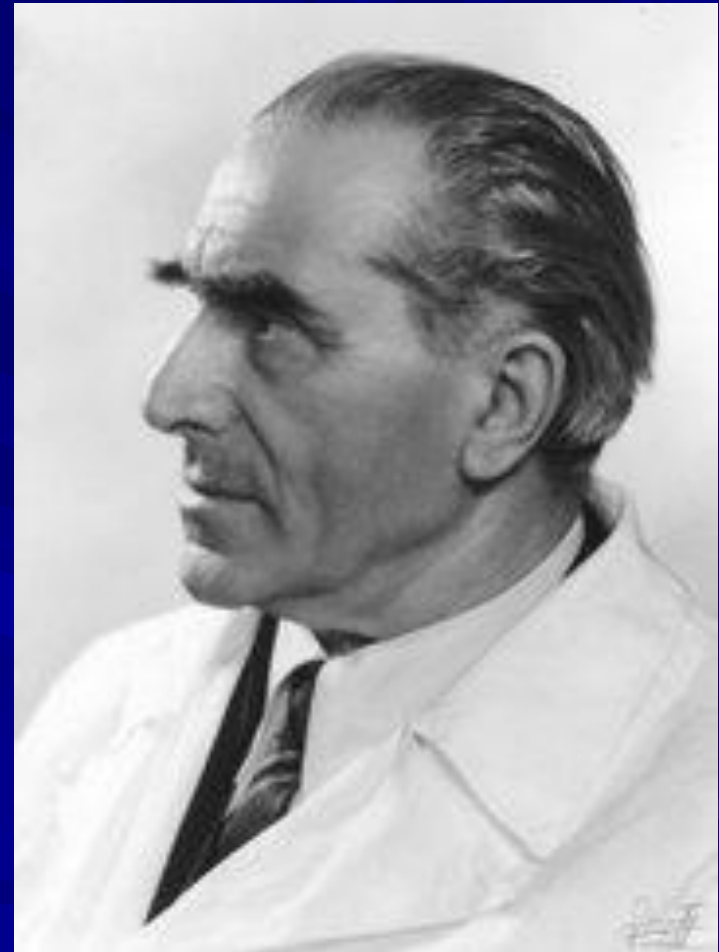
Meduna (1896-1964)

- “Biological Antagonism”
 - Observation that epilepsy and schizophrenia rarely co-existed in the same patient
 - Differing glial concentrations in brains of patients with epilepsy versus psychosis
- Psychosis improved after seizures
- Used intramuscular camphor injections and later intravenous pentylenetetrazol to induce seizures
- First treated patient with catatonia in 1934

History

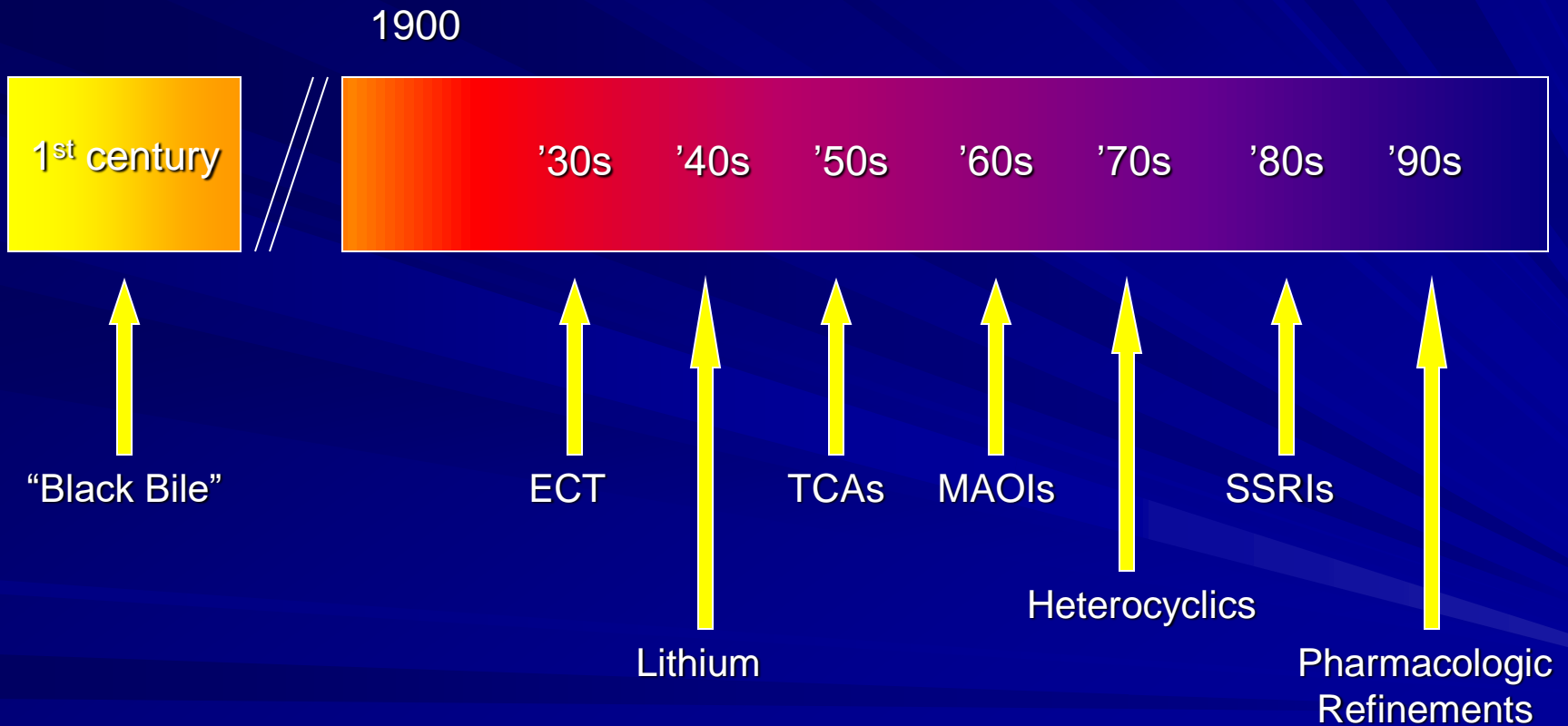
Ugo Cerletti

- Along with Lucio Bini in 1937 first to use electricity to induce seizures
- Electrically-induced seizures are more reliably produced than those chemically-induced
- First treated a patient with catatonia in 1938



Ugo Cerletti (1877-1963)

Developments in Medical Treatment of Depression



Advances in Anesthesiology

- Early ECT was associated with patient discomfort and injury, including fractures suffered during motor seizure
- 1940 Abram E. Bennett, an American psychiatrist, used curare for muscle paralysis
 - 1951 Succinylcholine developed
- In the 1950's short-acting barbiturates were used to produce amnesia for feelings of smothering as respiration was inhibited

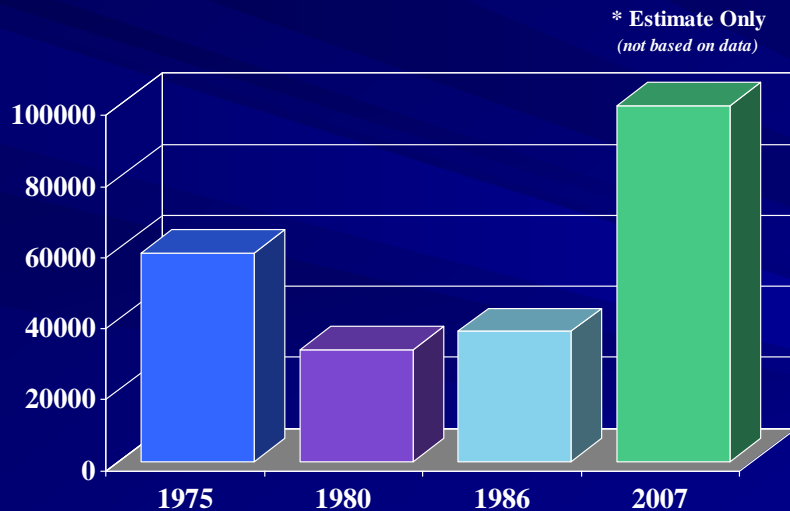
Advances in Anesthesiology

- Use of general anesthesia is considered a major advancement in how modern ECT is performed



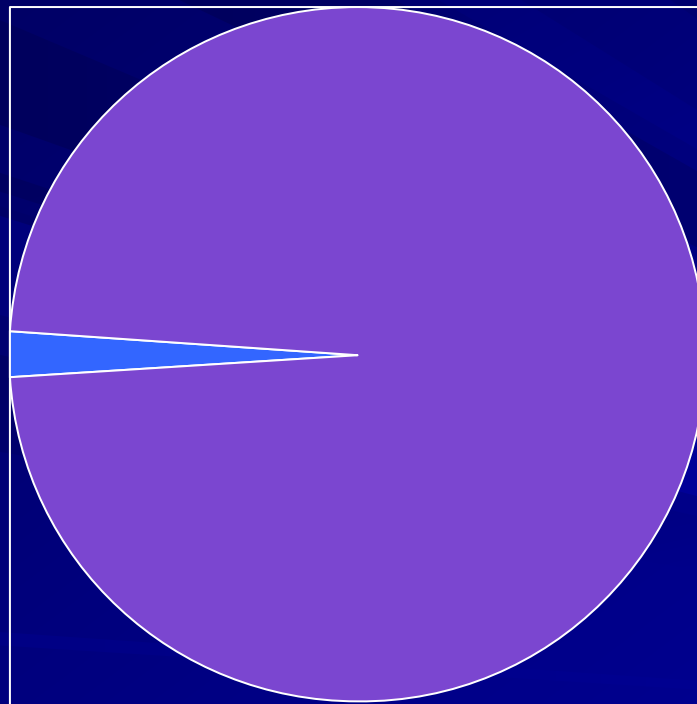
Epidemiology

Use of ECT in the United States



- Approximately 100,000 patients/year receive ECT in the USA
- In the USA ECT is one of the most common procedures performed under anesthesia
- 1 - 2 million patients/year probably receive ECT worldwide

ECT is Small Piece of Pie

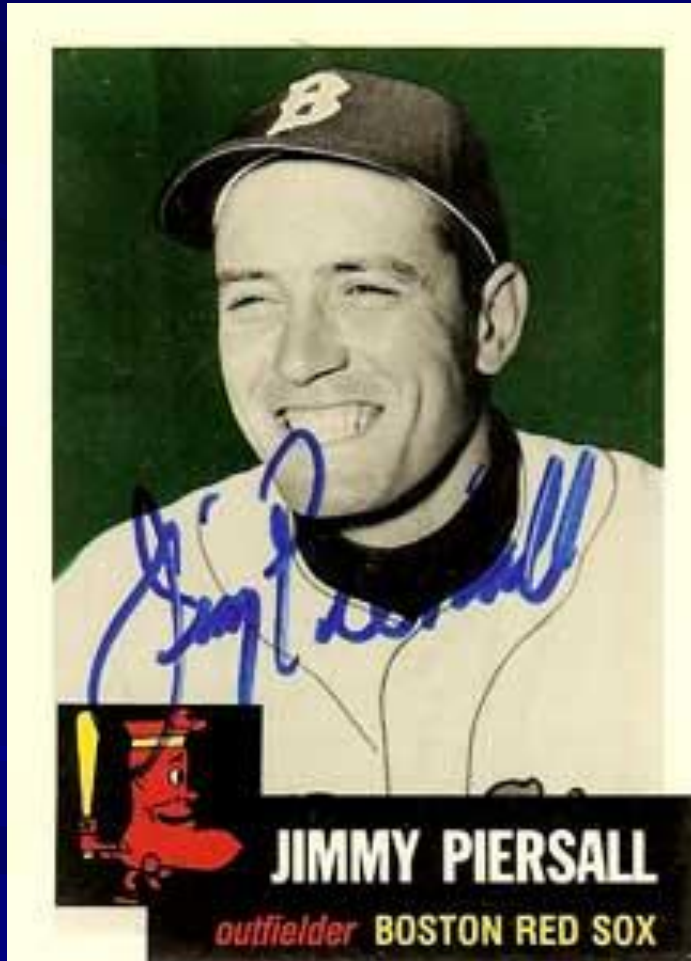


- **ECT**
100,000/year
- **Depression in US: 21 million/year**

Patient Selection/ECT Consultation

- Three Questions Should Be Answered as Part of an ECT Consultation:
 - Does the patient have an ECT-responsive illness?
(Indications/Benefit)
 - Does the patient have any medical conditions that require modifications of technique or increase the risk of the procedure? *(Risk/Contraindications)*
 - Has appropriate informed consent been obtained?
(Capacity)

Indications



ECT Recipient Jimmy Piersall (1929 – Present)

- Major Depressive Episode
 - Unipolar and Bipolar
- Mania
- Mixed Affective State
- Catatonia
- Schizophrenia
- Schizoaffective Disorder

Use of ECT

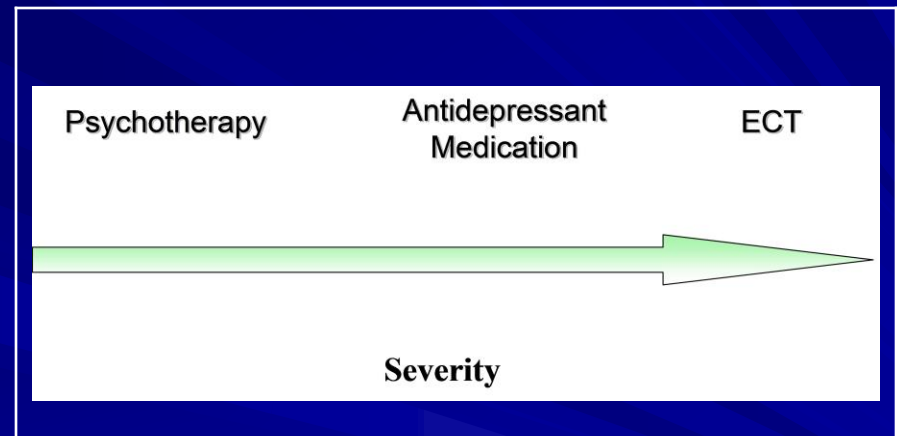
Primary (as a first-line treatment)

- Suicide risk
- Psychosis/Agitation
- Malnutrition/Inanition
- Catatonia

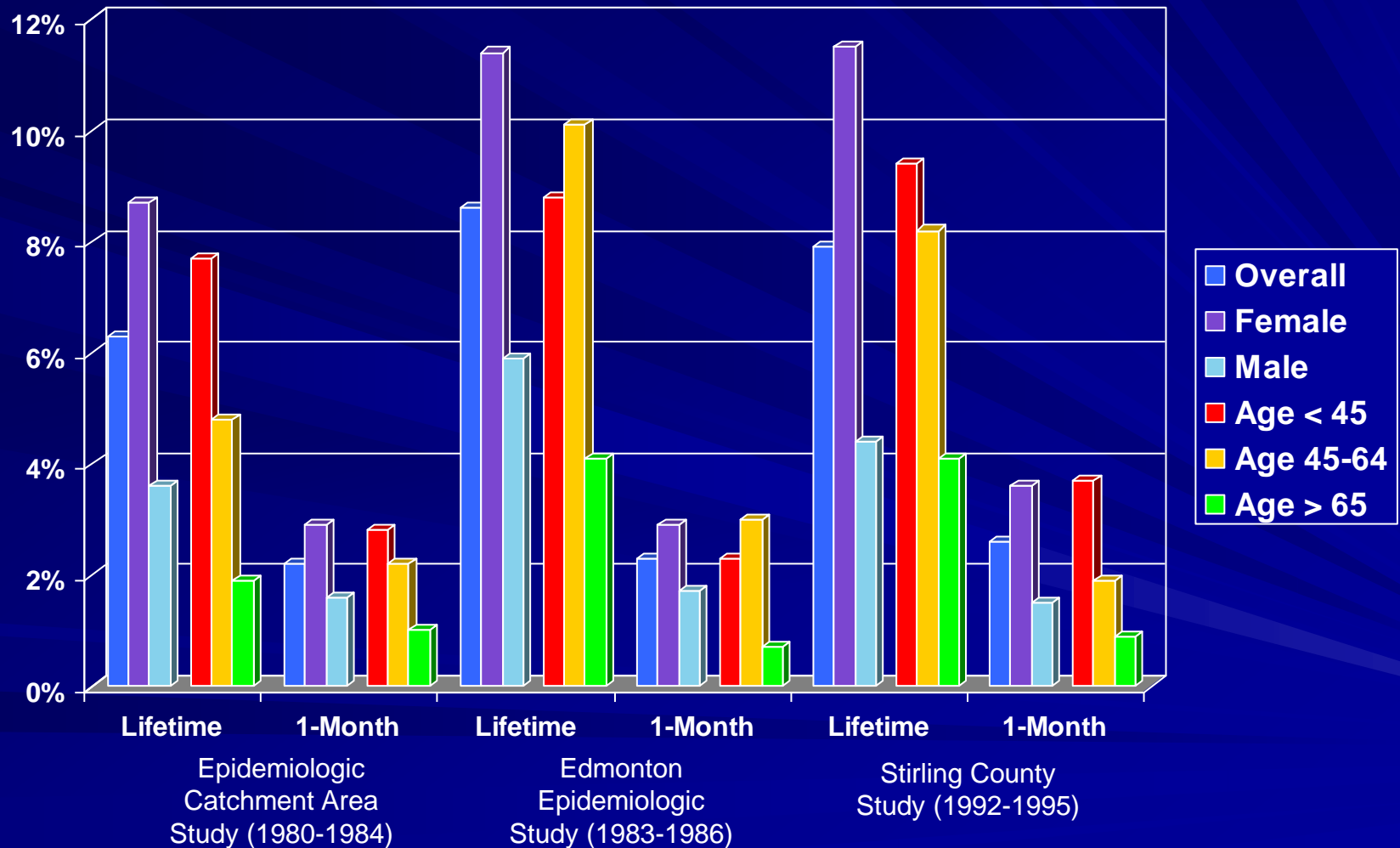
Secondary (when other treatments fail or cannot be used)

- Medication failure
- Medication intolerance

Choice of Treatment Modality in Depression



Lifetime and 1-Month Prevalence Rates of Major Depression in 3 North American Studies



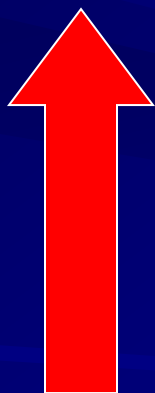
ECT in Depression

- ECT is the most effective short-term treatment for major depression
 - Remission rates > 80%
- No other treatment is superior to ECT in:
 - Likelihood of remission
 - Quality of remission
 - Speed of remission
- Prompt use of ECT for inpatients is associated with shorter and less costly hospital stays
 - 1993 Healthcare Cost and Utilization Project of the Agency for Health Care Policy

Morbidity & Mortality of Depression

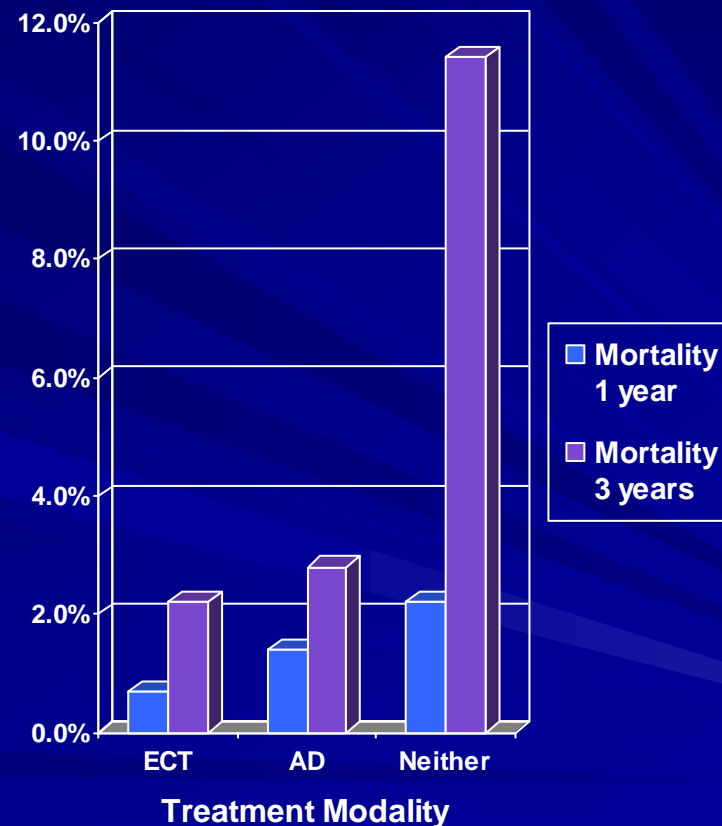
Importance of Aggressive Treatment

Incomplete Remission
Associated With:



Chronicity
Risk of Relapse
Functional
Impairment
Suicide⁷

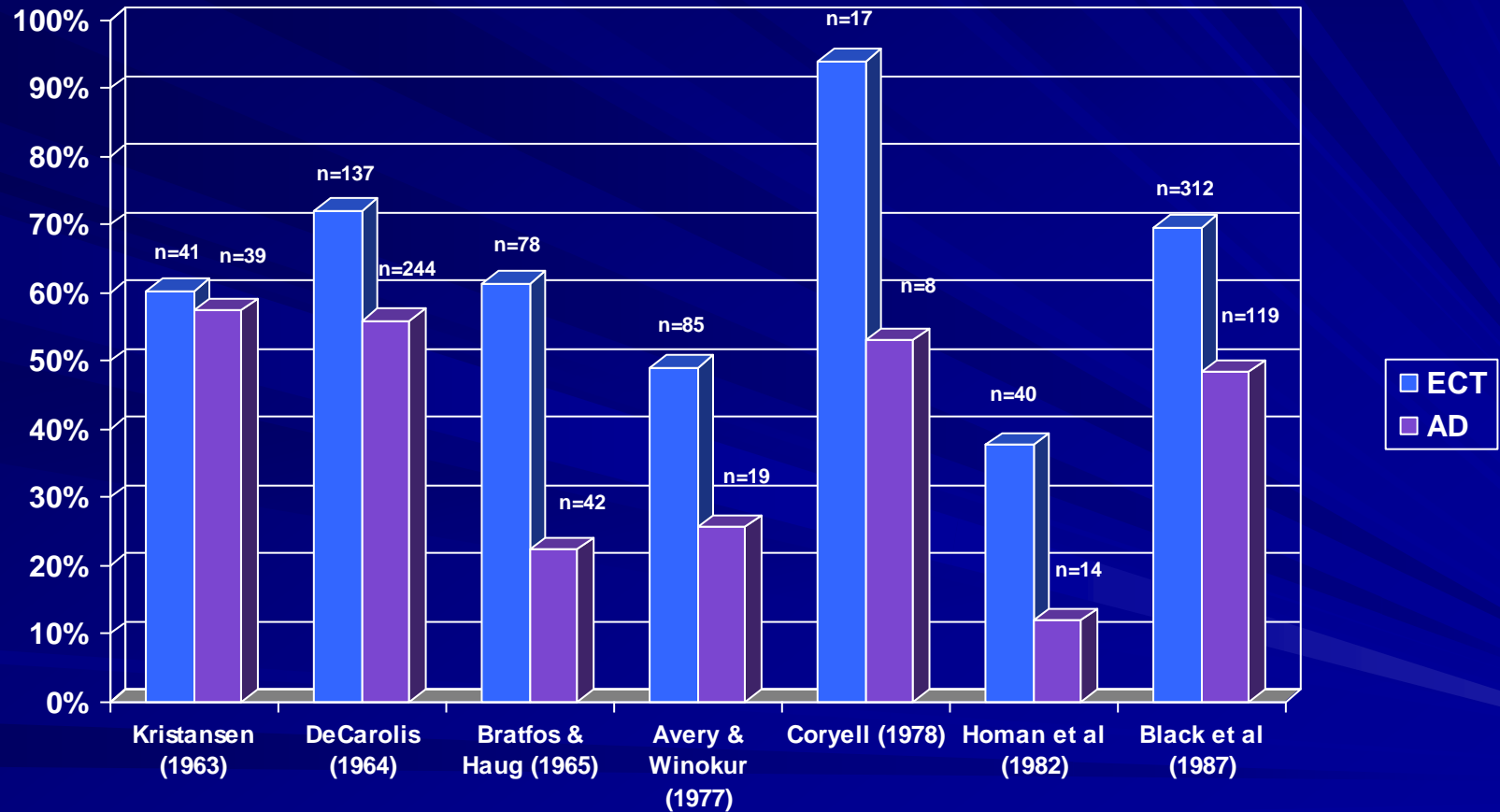
Mortality in Depression



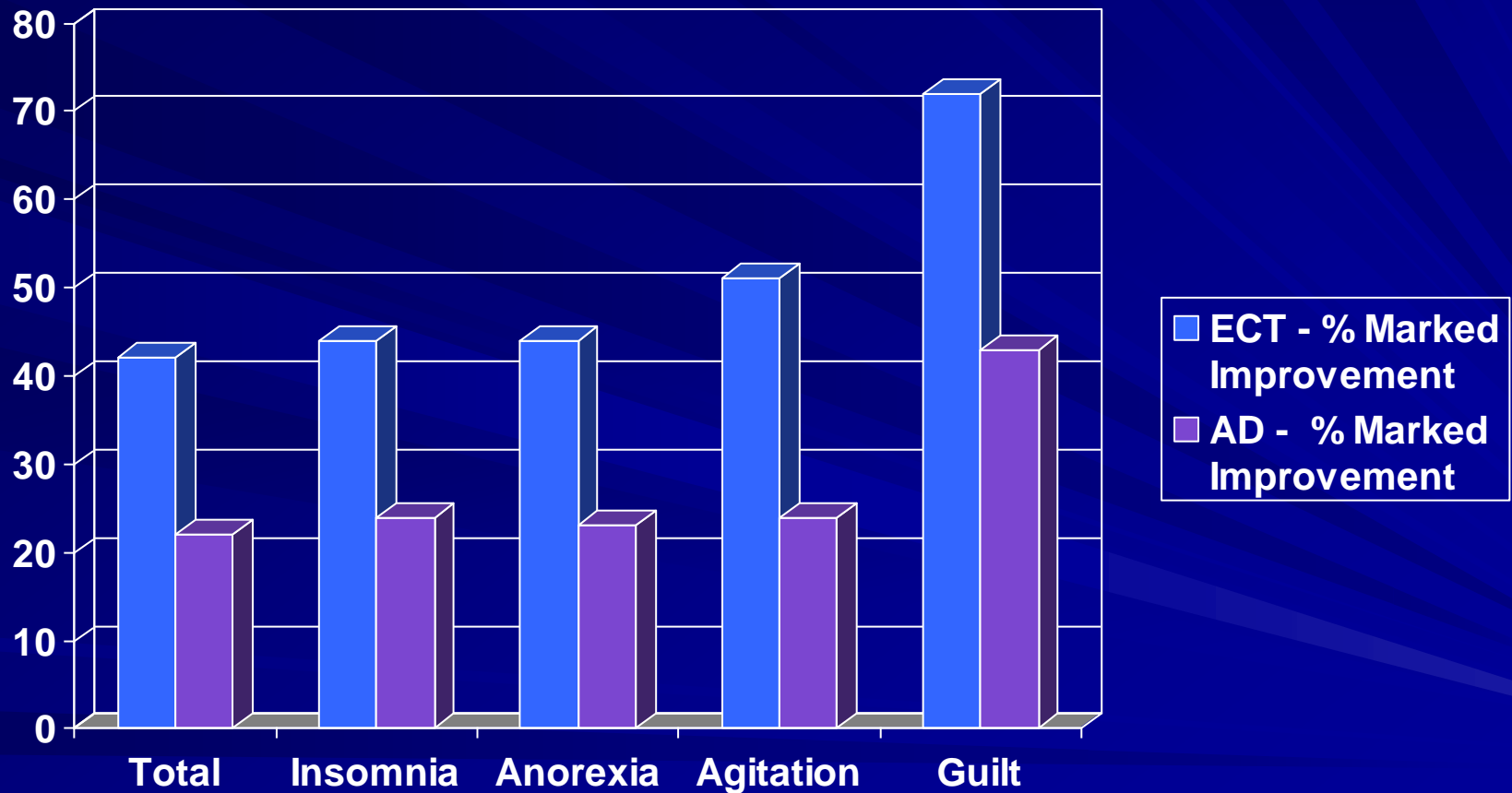
Efficacy in Depression

- Patients who fail to respond to one or more adequate medication trials have lower response rates to ECT
 - 50 – 60%
- When ECT is used as a first line treatment or for those who have received inadequate pharmacotherapy
 - Response rates approximately 80% – 90%

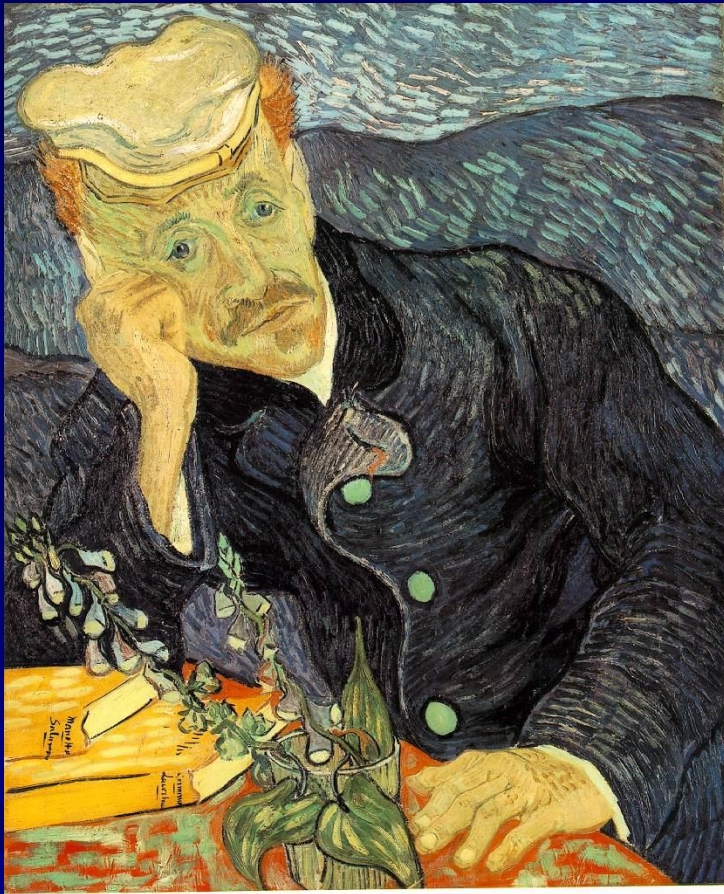
Rate of Response of ECT and Antidepressants in Randomized Controlled Trials



Relative Efficacy of ECT vs. Antidepressants in Symptom Response



Predictors of Good Outcome in ECT



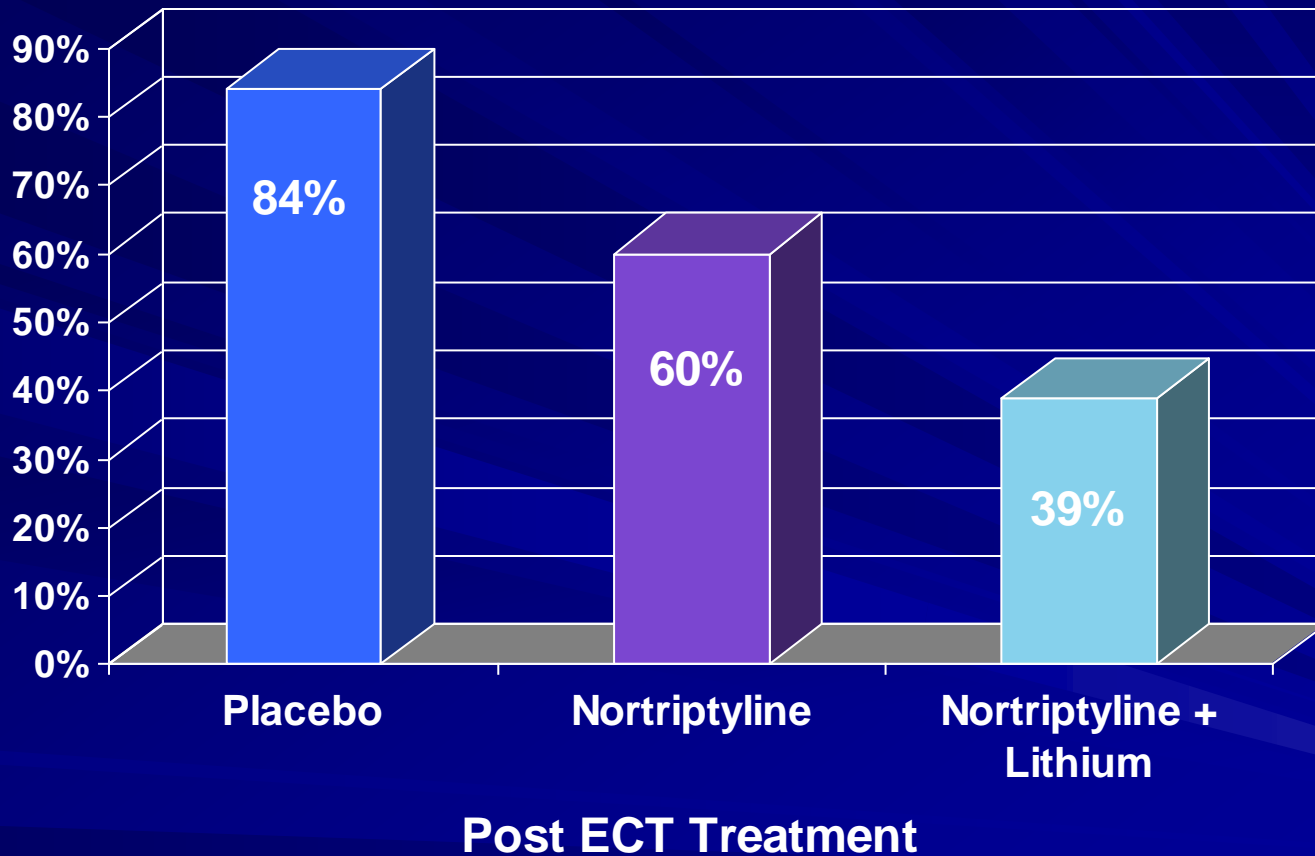
- Acute onset
- Age over 50 years
- Psychosis (delusions) prominent
- Vegetative signs severe
- Severe starvation and >10% weight loss
- Acute suicide risk
- Catatonia
- Stupor
- Delirium
- Previous good response to ECT

Predictors of Poor Outcome in ECT

- Character pathology prominent (Axis II DSM)
- Prolonged illness (chronicity)
- “Neurotic signs” prominent
 - Anxiety
 - Somatization
- Comorbid alcoholism, substance abuse
- Lack of response to tricyclic antidepressants



Relapse After ECT



Suicide and ECT

- Suicide is a major, preventable health problem
- Suicide in 2004
 - 32,439 deaths
 - 11th leading cause of death
 - Overall rate is 10.9 per 100,000
 - 14.3 per 100,000 age 65 and over
 - Estimated 8 to 25 attempts per completed suicide
- ECT reduces suicide risk and suicidal drive

Efficacy of ECT in Major Depression

Findings from the
Consortium for Research in
ECT (CORE) Study

The CORE Study



TRIAL DESIGN

Acute Phase (Phase I): *Thrice Weekly ECT*

Remitters

HAM-D ≤ 10 & HAM-D Reduction $\geq 60\%$

Interim Week

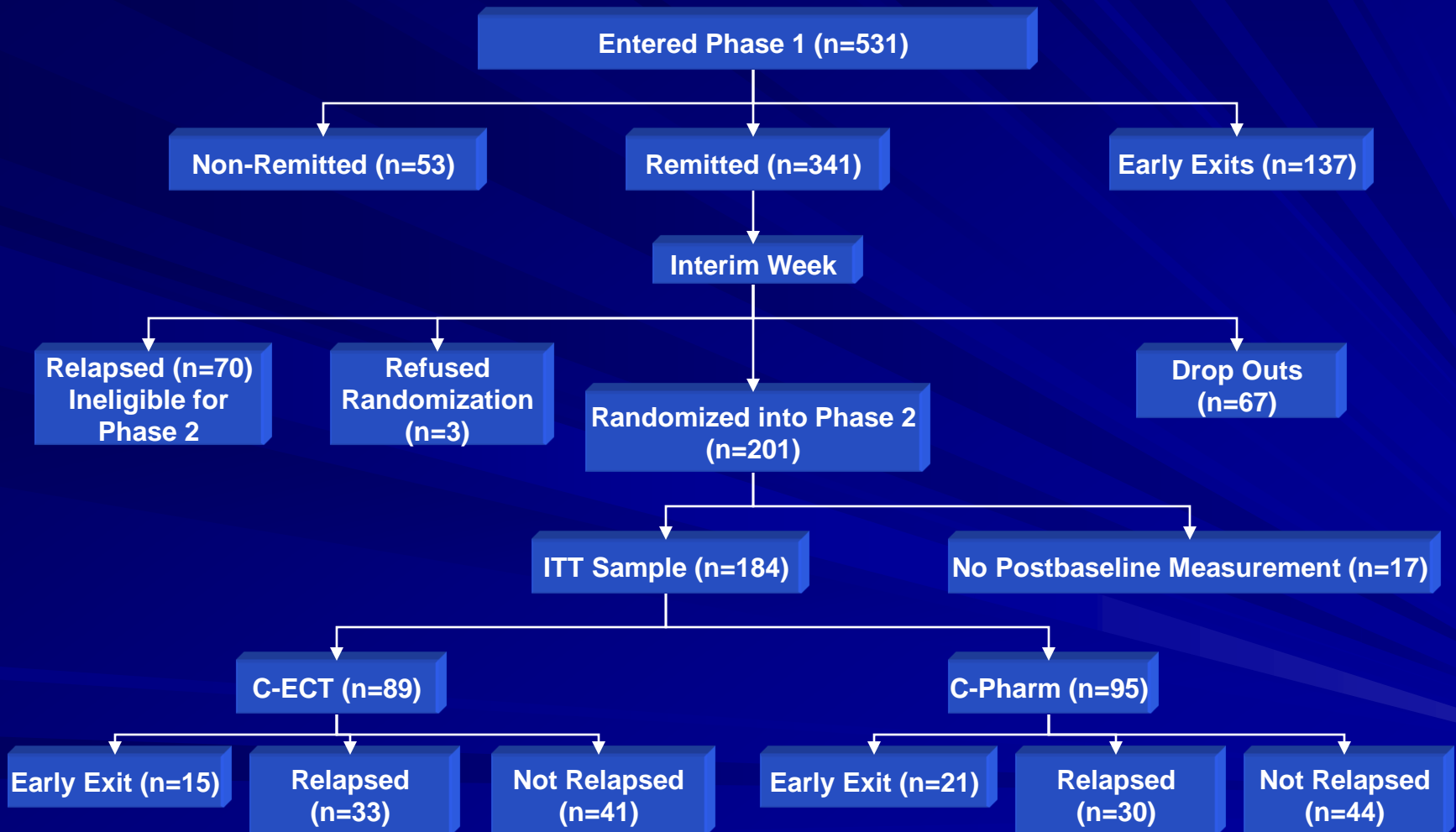
Remain Remitted for 1 Week

Randomized Phase (Phase II): *Randomized to:*

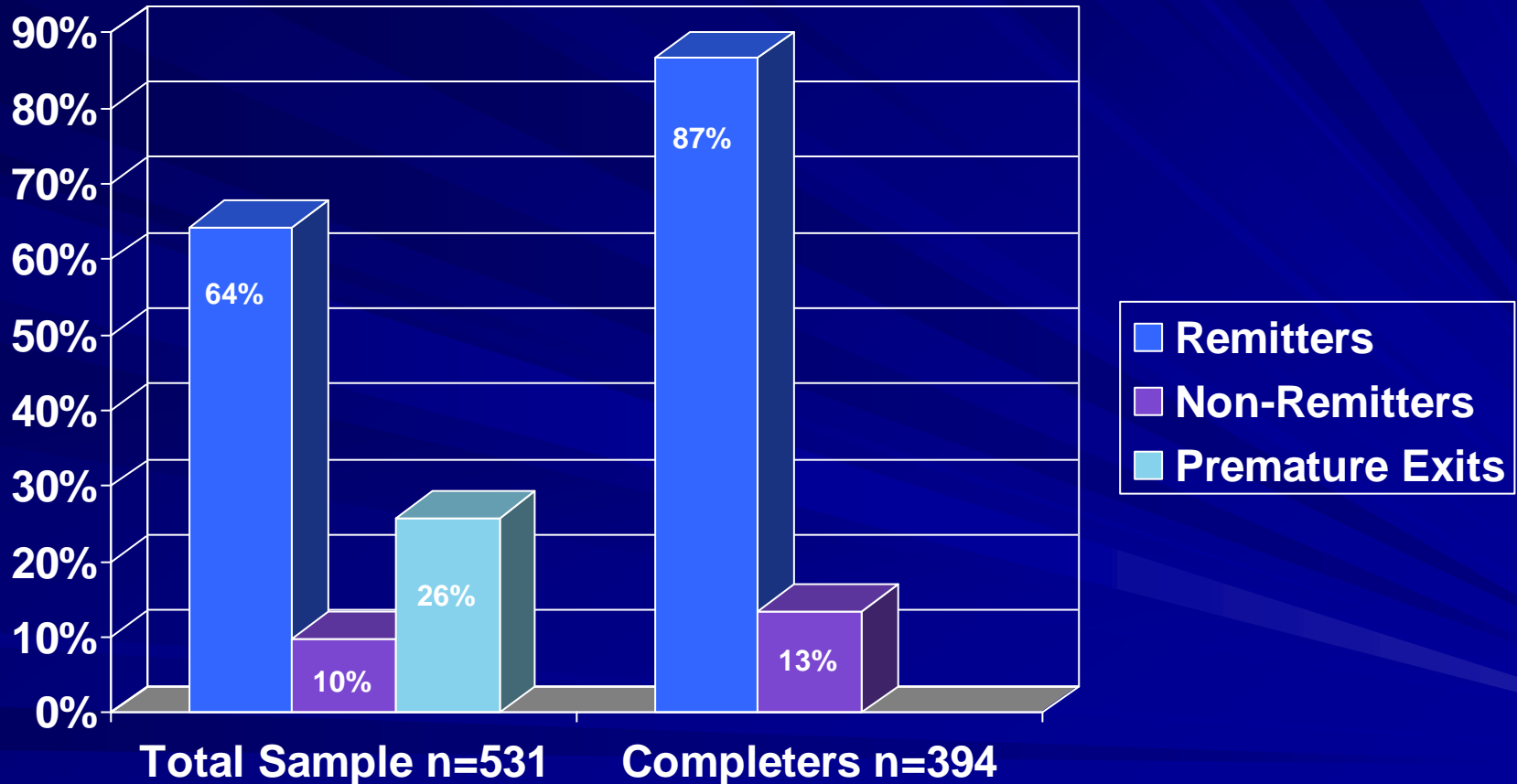
Continuation
ECT

Continuation Pharmacotherapy
(*lithium + nortriptyline*)

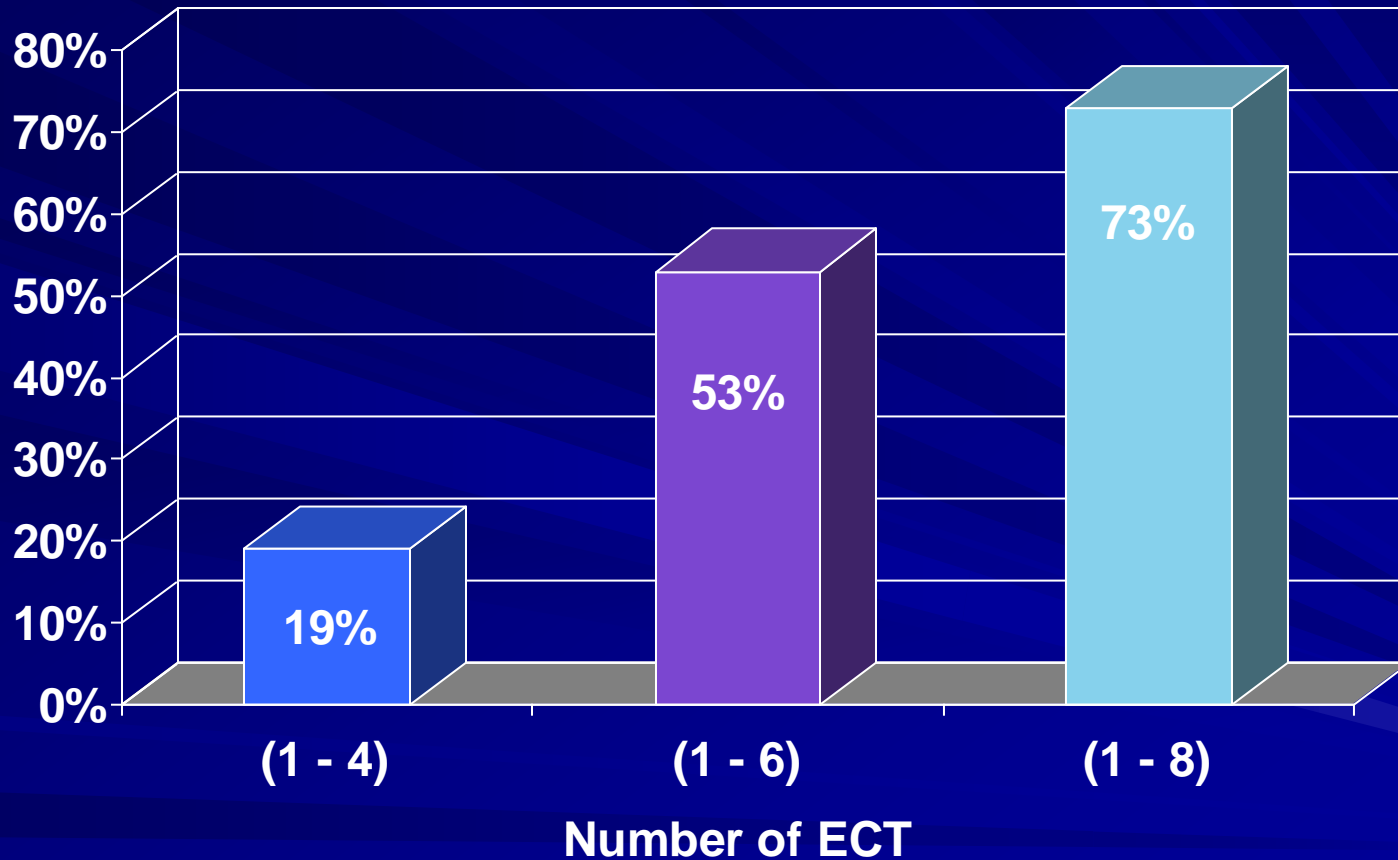
CORE C-ECT vs. C-Pharm Results



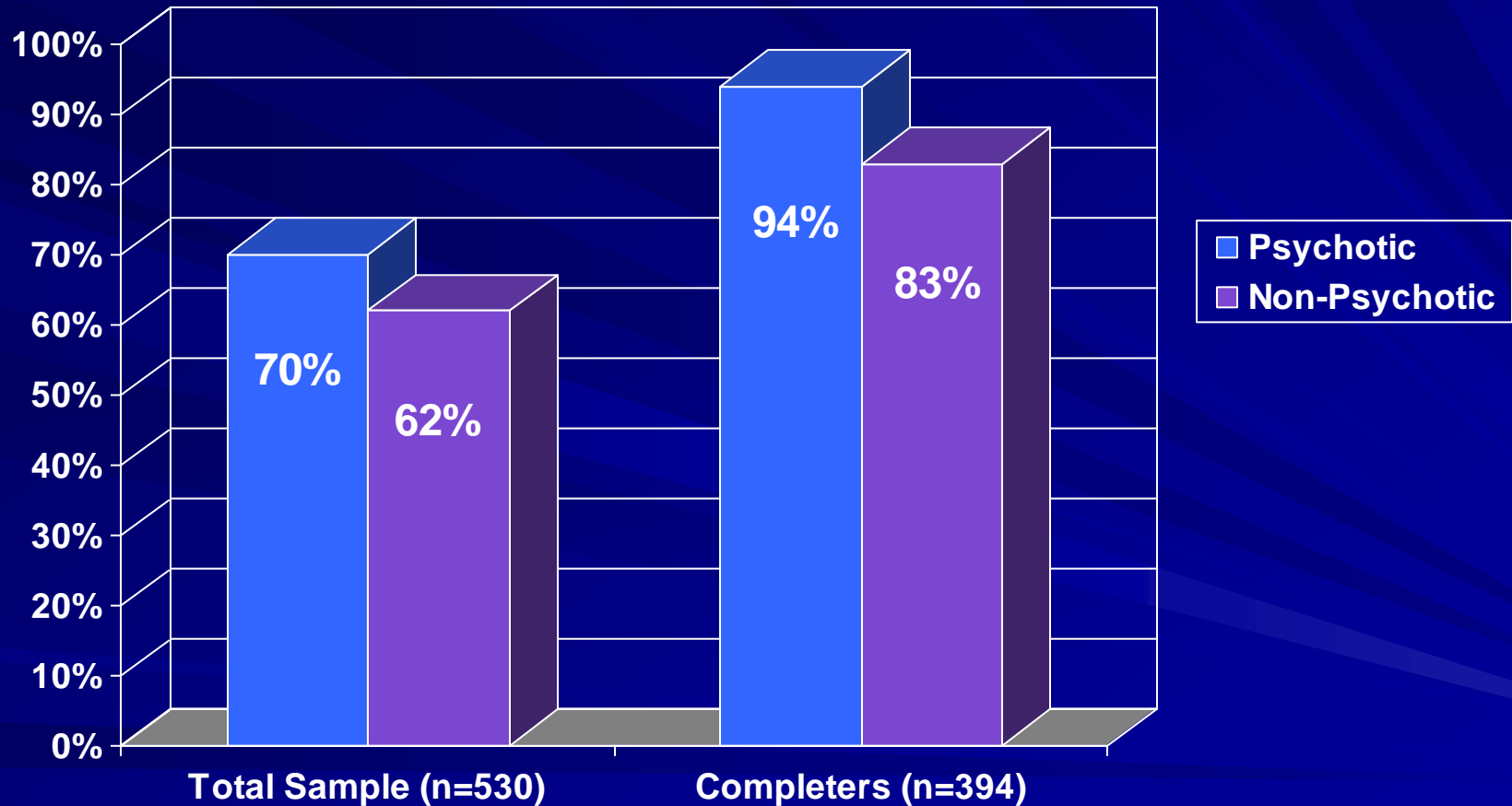
Response Status for Patients Entering and Completing Acute Phase



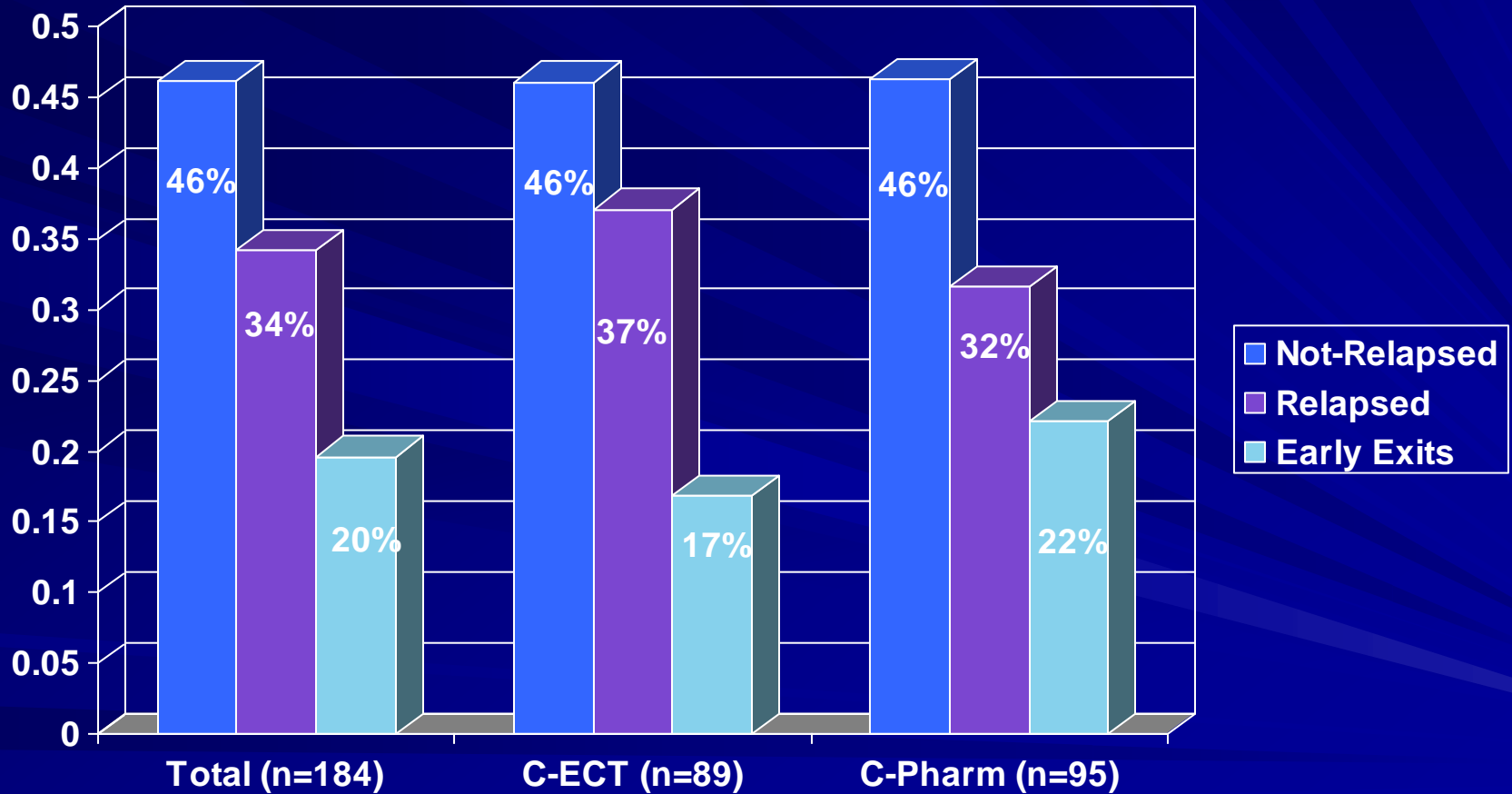
Proportion of Patients Remitting by ECT Number



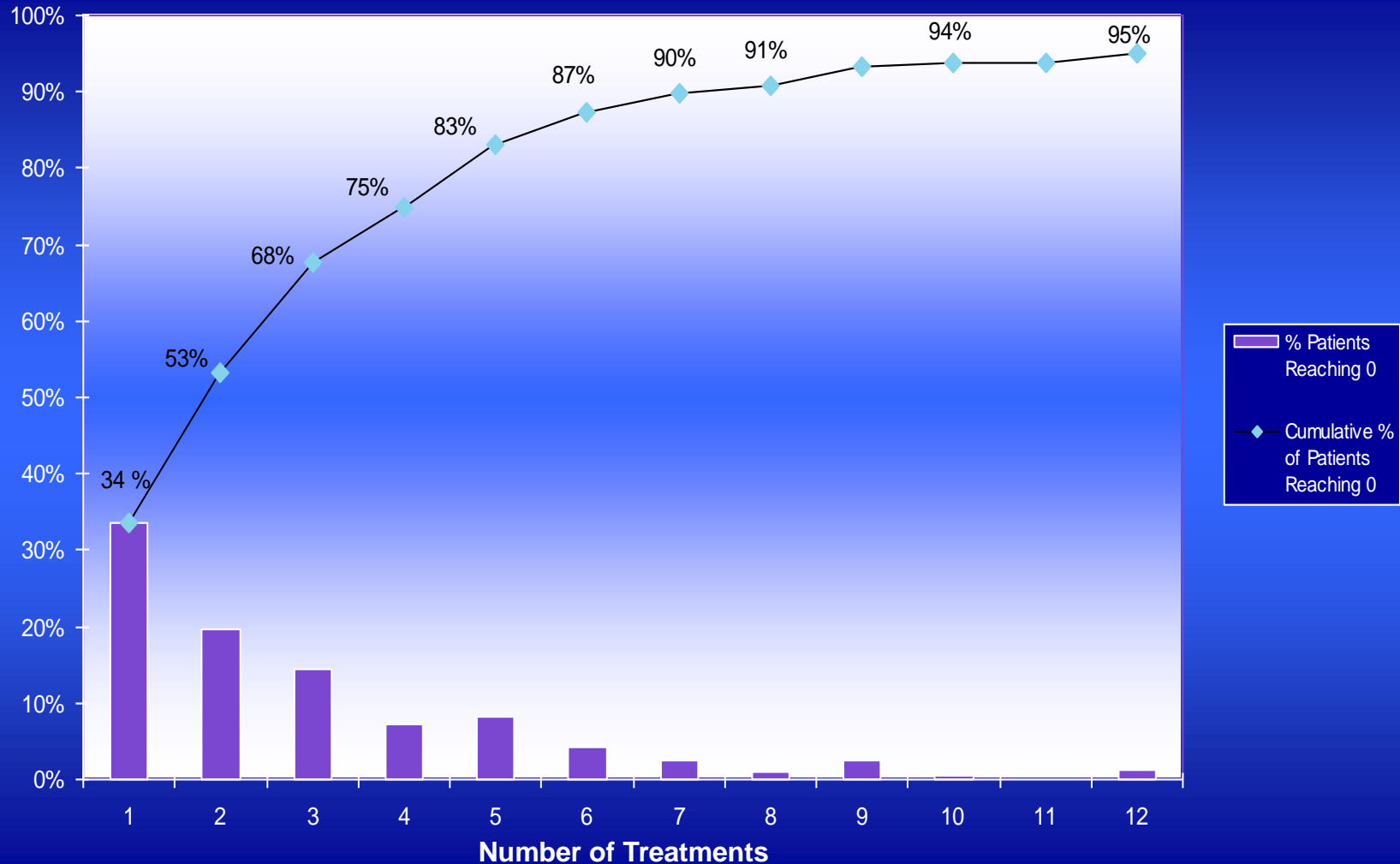
Remission Rates for Psychotic and Non-Psychotic Patients



Relapse Status at 6 Months



Number of ECT Needed to Resolve Suicide Risk Among All Patients with Baseline Self-Rating ≥ 2



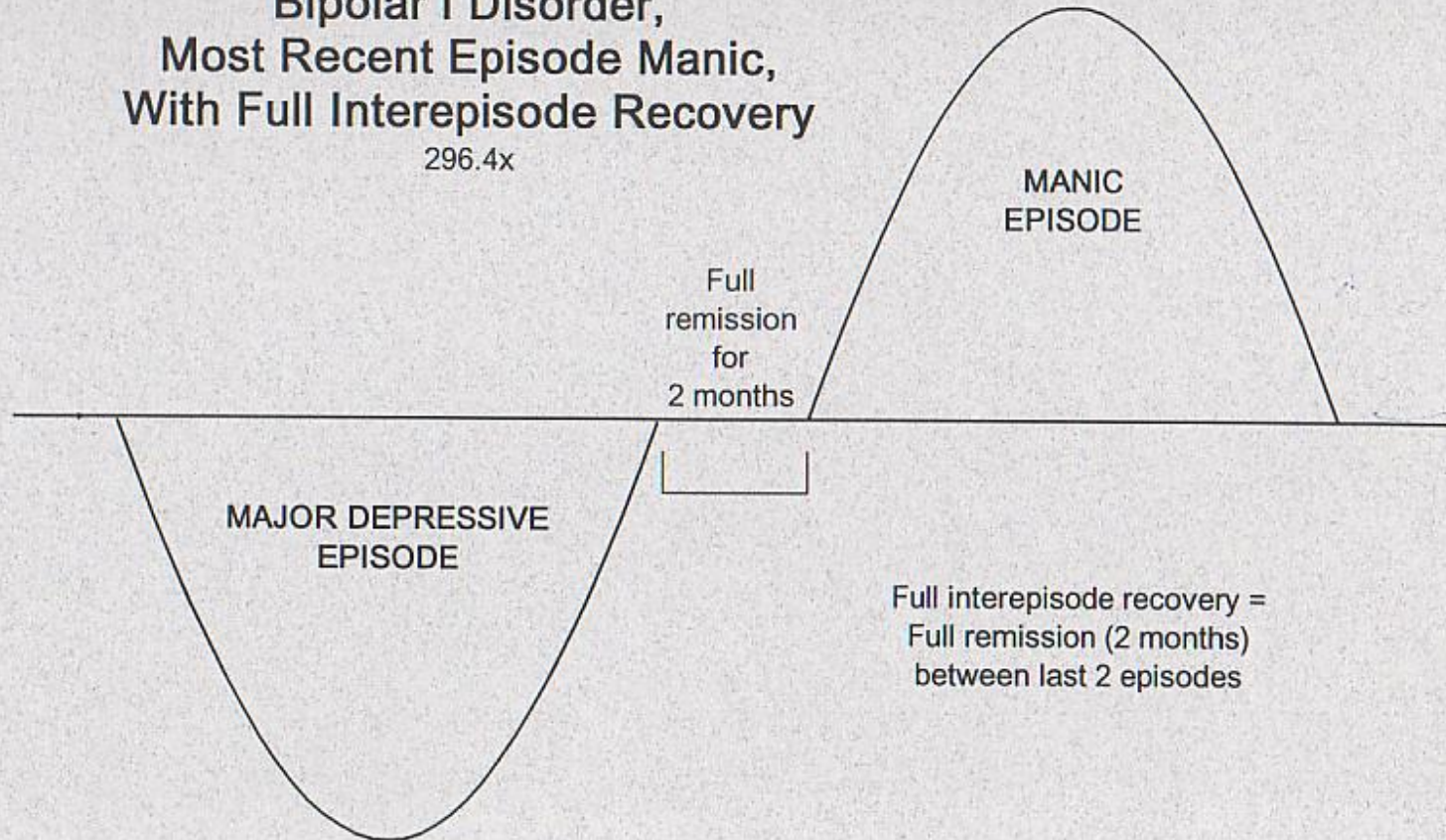
Conclusions

- Bilateral ECT results in high remission rates
- Psychotic depression responds particularly well to ECT
- Continuation ECT is an effective alternative to pharmacotherapy for relapse prevention

Mania

Bipolar I Disorder,
Most Recent Episode Manic,
With Full Interepisode Recovery

296.4x



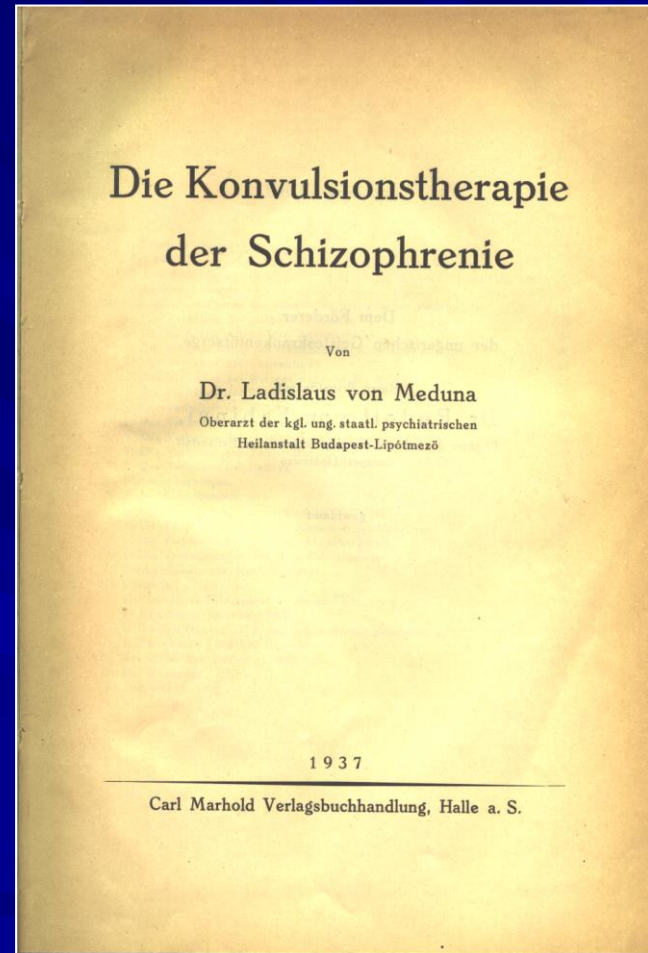
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Mania

- ECT effective in acute mania
 - 70-80% of patient achieve remission or marked improvement
 - Clinical trials with anti-manic agents report non-response rates over 30%
 - Substantial number of medication-resistant patients benefit from ECT
- ECT generally reserved for those who do not respond to medications
 - American and Canadian Psychiatric Associations consider ECT 2nd-line treatment
 - Except when rapid-onset of action is needed
 - There is still a paucity of evidence about the comparative efficacy of ECT and treatment options for mania

Schizophrenia

- Currently, usually reserved for patients with treatment-resistant schizophrenia
 - There is evidence that combination of ECT and antipsychotic medications is more efficacious than either alone
 - Main benefit seems to be an acceleration of treatment response



Schizophrenia

- Patients with psychotic exacerbations and short episode duration are more likely to benefit
- Features predictive of good outcomes
 - Prominent delusions and hallucinations
 - Fewer premorbid schizoid personality traits
 - Presence of catatonic symptoms

Catatonia



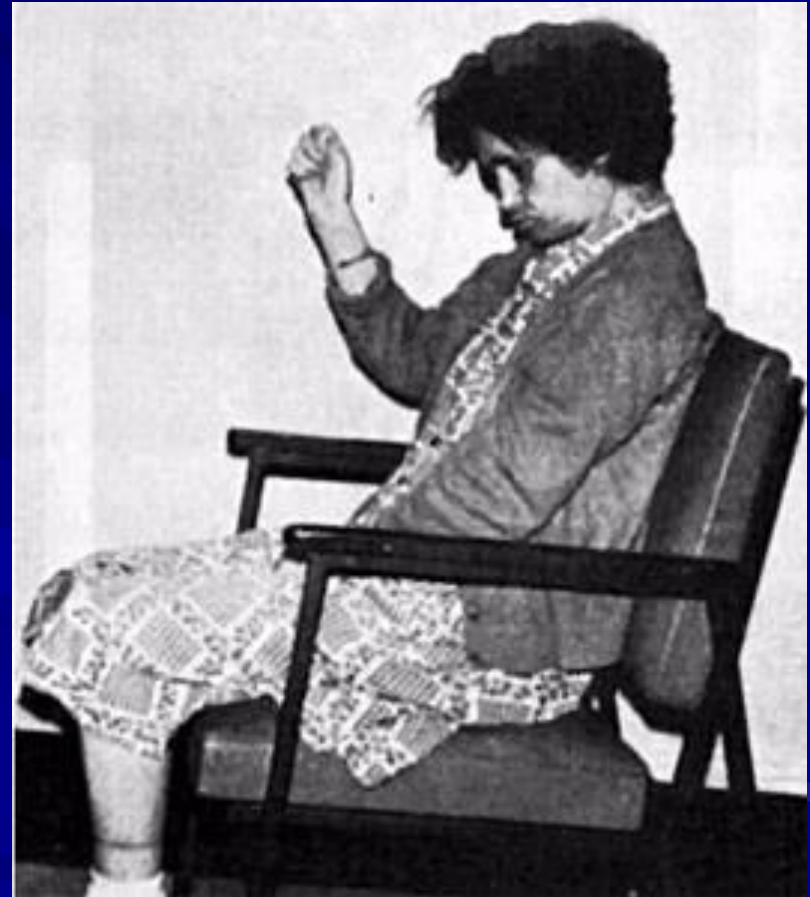
- A motor syndrome in psychiatric patients
- Found in:
 - Mania
 - Depression
 - Systemic diseases
 - Toxic syndromes
 - Schizophrenia
 - Neurologic disorders

“The patient remains entirely motionless, without speaking, and with a rigid, masklike facies, the eyes focused at a distance; he seems devoid of any will to move or react to any stimuli; there may be fully developed ‘waxen’ flexibility, as in cataleptic states. The general impression conveyed by such patients is one of profound mental anguish.”

Kahlbaum 1874

Catatonia

- Prevalence of catatonia among psychiatric patients ranges from 7.6% to 38%
- Most catatonic patients have a mood disorder
 - Particularly mania
- 20% of patients with mania exhibit catatonic features
- Syndrome has an excellent short-term prognosis



Catatonia

Primary Signs

- Mutism
- Immobility/ Stupor
- Staring
- Posturing
- Negativism
- Grimacing

Associated Signs

- Rigidity
- Mannerisms
- Stereotypy
- Echophenomena
- Waxy flexibility
- Perseveration

Treatment

- Benzodiazepines: Lorazepam
 - IV or PO
 - Give until relief of symptoms or sleep
- ECT is the definitive treatment
- Antipsychotics
 - May exacerbate syndrome
 - Even the atypical antipsychotics may induce neuroleptic malignant syndrome in catatonic patients

Adverse Effects

- ECT is the safest procedure performed under general anesthesia
 - Mortality rate $\leq 0.002\%$
- Medical morbidity results from the anesthetic administration or the physiological consequences of the induced seizure
 - Transient blood pressure and heart rate changes
 - Arrhythmias
- Common, non-serious side effects include headache, nausea, and muscle aches

Adverse Effects

- The cognitive effects of ECT remain an issue of concern and controversy in the field
 - For the vast majority of patients, these effects are mild and acceptable
 - For a small minority they may be considerably more extensive
- The extent of cognitive impairment (*primarily retrograde amnesia*) is proportional to the intensity of the ECT administered

ECT May Cause Three Types of Memory Disturbance

■ Acute Confusional State

- Lasting up to an hour after each treatment and varies with age
- Consequence of both the seizure and the anesthetic agents

■ Retrograde Amnesia

- Affects memories of events from the period of illness and treatment
- Greater for public events than for personal information
- A small subset of patients will complain of more severe symptoms not matched by objective cognitive testing

■ Anterograde Amnesia

- Anterograde amnesia refers to the impairment in retaining new memories after ECT
- This deficit typically resolves within 1 to 3 weeks after a course of ECT

*1,250 Electroconvulsive Treatments without
Evidence of Brain Injury*

Technique

- Bilateral ECT remains the “gold standard”
 - Associated with more short-term and long-term cognitive side effects than right-unilateral ECT
- Historical debate as to the relative effectiveness of unilateral vs. bilateral ECT
 - Literature confounded by less-than-optimal electrode placement or dosing strategies for unilateral ECT

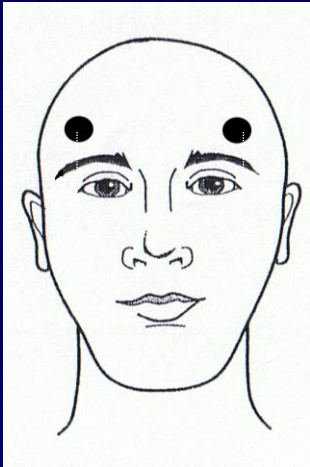


Thymatron

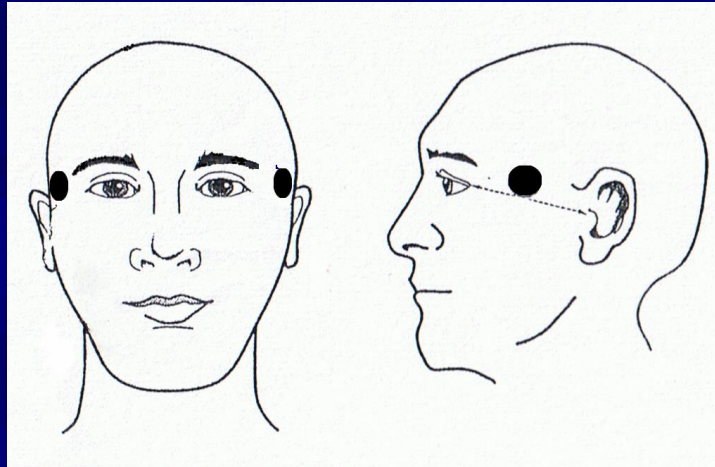


Mecta Spectra 5000

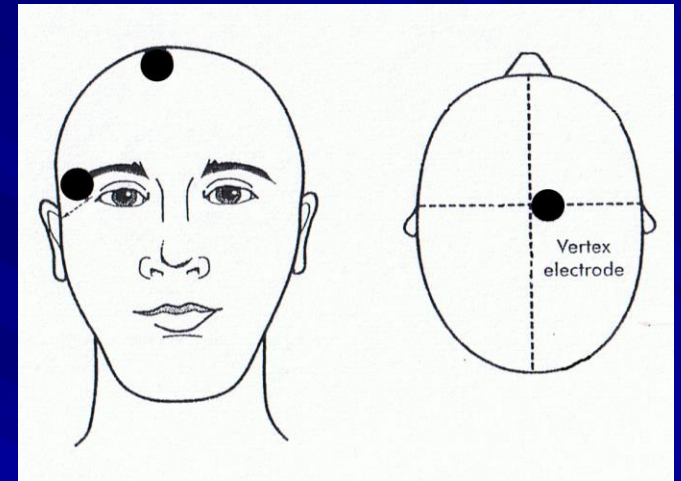
Electrode Placement



Bi-Frontal



Bi-Temporal



Right Unilateral

Drugs for Anesthesia

■ Anesthetic Agents

- Rapid onset of action and short duration preferable
- Methohexital (*0.75 – 1 mg/kg*)
 - Short-acting barbiturate
 - Most commonly used
 - Low anticonvulsant effect
 - Low cost
- Thiopental (*2 – 5 mg/kg*)
 - Greater risk of cardiac side effects
- Ketamine (*0.5 – 1 mg/kg*)
 - Proconvulsant
 - Tends to worsen ECT induced HR and BP changes
- Propofol (*2 – 3 mg/kg*)
 - Anticonvulsant effects
- Etomidate (*0.2 – 0.3 mg/kg*)
 - Few cardiac effects

■ Muscle Relaxants

- Succinylcholine (*0.5 – 1.5 mg/kg*)
 - Depolarizing agent - leads to visible fasciculations
 - Rapid onset (1- 2 minutes)
 - Duration of action less than 10 minutes
 - Easy to use and low cost
 - Agent of choice

■ Anticholinergics

- Used to blunt asystole associated with electrical shock and to control excessive salivation
- Atropine (*0.4 – 1 mg*)
 - Centrally acting leading to CNS effects
- Glycopyrrolate (*0.1 – 0.4 mg*)
 - Peripherally acting

Technique

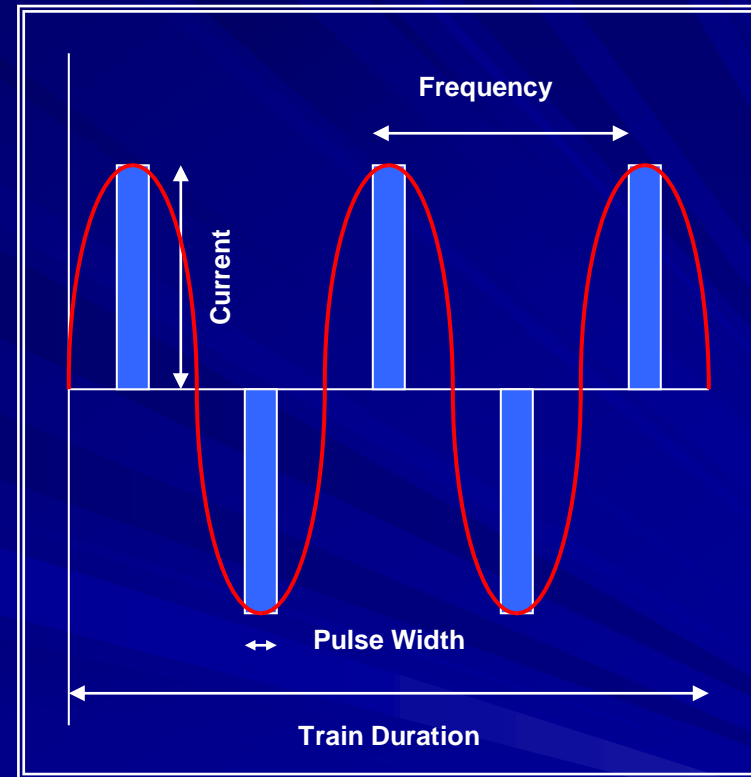
- For many years, it was assumed that all seizures were equally efficacious
- Stimulus dose affects efficacy
 - Especially in RUL ECT
 - The degree to which stimulus intensity exceeds seizure threshold, and not the absolute stimulus dose administered, is critical in determining outcome

Technique

- Changes in seizure threshold occur in less than 20% of patients during the treatment course
- Seizure should be monitored during every treatment
 - Motor and EEG
- Stimulus dosing must be adjusted when an inadequate seizure is induced

Stimulus and Dosing Recommendations

- Constant Current
- Waveform
 - Brief-pulse
 - Sine-wave considered obsolete
- Dose
 - Maximum Outputs in USA limited to 504-576 mC
 - Higher in rest of the world
 - Bitemporal/Bifrontal
 - Minimally Dose Sensitive
 - Unilateral
 - Strong dose-response relationship



*Parameters in a bidirectional brief pulse stimulation
(overlapping sine-wave)*

Treatment

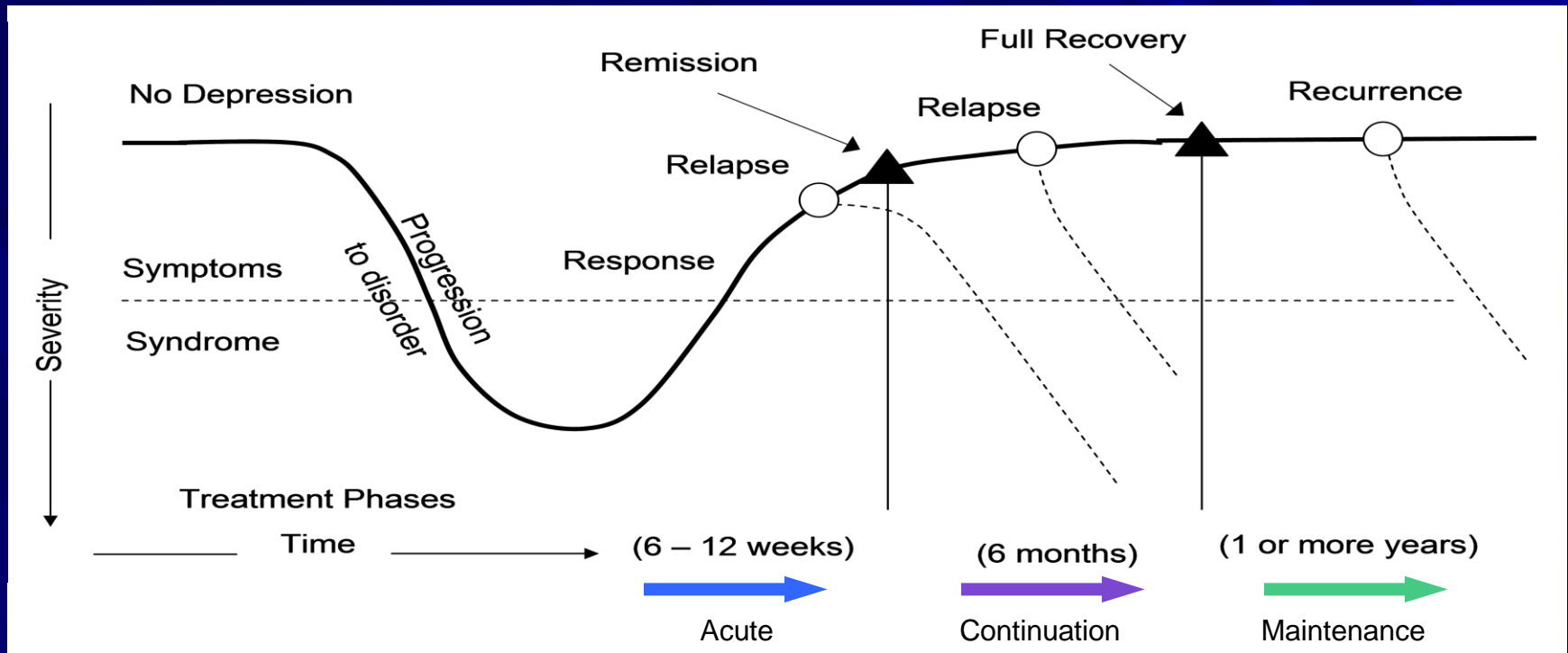
Number of Treatments

- No fixed number of treatments in a “Course”
- 6-12 treatments are *usually* needed for a response to occur
- Treat until the patient is well
 - Or no further improvement over two treatments
- Continuation treatment is necessary

Twice a week ECT

- An effective schedule
- Therapeutic outcome not different from three times a week ECT
- Slower onset of action
- Less cognitive effects
- ECT three times a week specifically indicated when early onset of clinical effect is of primary importance

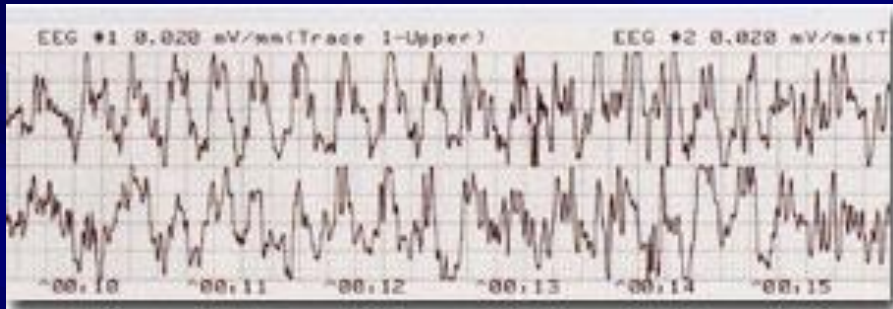
Three Phases of Treatment



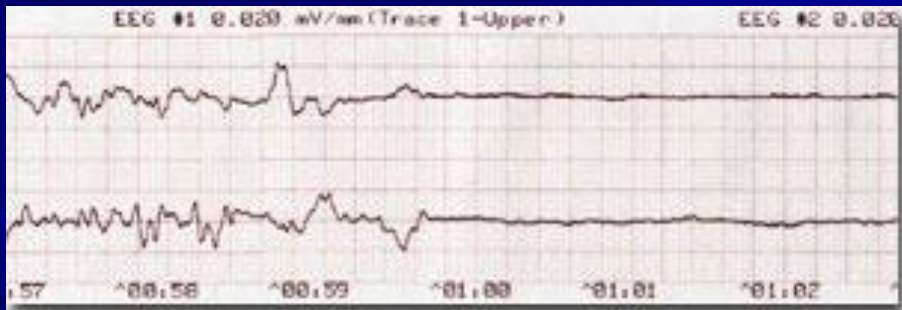
- Continuation treatment is necessary to sustain remission
- Relapse rates after ECT
 - Placebo: 84%
 - Nortriptyline: 60%; Nortriptyline and Lithium: 32 – 39%
 - Continuation ECT: 32%

EEG Monitoring

Beginning of Seizure



End of Seizure



- Post-ictal suppression
 - The fall in EEG amplitude at the end of the seizure
 - Has emerged as the only significant predictor of therapeutic outcome
- Seizure duration *per se* does not correlate with ECT outcome
 - Although seizures greater than 25 seconds are associated with better outcomes

Pre-ECT Evaluation

- No “routine” pre-ECT medical evaluation should be required for all patients
- Detailed physical exam and neurological exam
 - Assess for presence of medical conditions or medications that increase risk of procedure
 - A collaborative approach between the ECT psychiatrist, medical consultants, and anesthesia providers is more meaningful than simply asking for “clearance” before ECT
 - Recommendations should be sought to optimize the patient’s medical status and/or to modify the treatment procedure to minimize medical risk

Pre-ECT Evaluation

- Spine x-rays are not routinely required
- EEG or neuroimaging should be considered when other clinical information suggests that a relevant neurological disorder might be present
- The pre-ECT evaluation should document
 - Cognitive status
 - Evaluation of orientation and memory
 - More detailed neuropsychological assessment is useful in patients with pre-existing cognitive impairment or dementia
 - Capacity to engage in an informed consent process

Informed Consent

- Full explanation of procedure in layman's terms
- Presentation of risks and potential benefits of treatment offered and alternatives
- Statement that patient may withdraw consent at any time and for any reason
- Patient and family are fully informed
- Written valid informed consent is signed
 - By patient
 - “Significant family member”
- Consent should be obtained before the beginning of each phase of treatment and periodically afterwards

Informed Consent

- Ideally patient and family can see an ECT video
 - For education and unambiguous documentation of information presented

Informed ECT for Patients and Families

with



Dr. Max Fink

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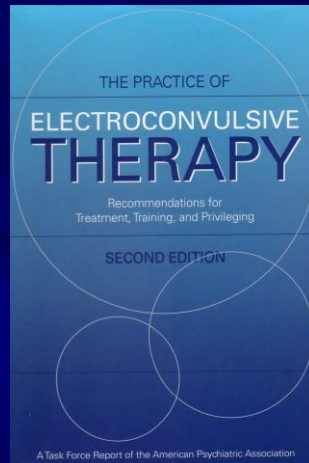
Mechanism of Action

- Still largely unknown
- Two demonstrated neurobiological effects are the basis for interest
 - Hypercortisolemia
 - Accompanies melancholia and catatonia
 - Melancholia responsive to ECT > 90%
 - Reverses with effective ECT
 - Demonstrated using the Dexamethasone Suppression Test (DST) or Dexamethasone-CRH Test
 - Normal DST follows remission
 - Abnormal DST predicts relapse
 - Anatomic changes in animal trials using ECS
 - Neuronal sprouting without cell loss
 - Enhanced neurogenesis in the dentate gyrus

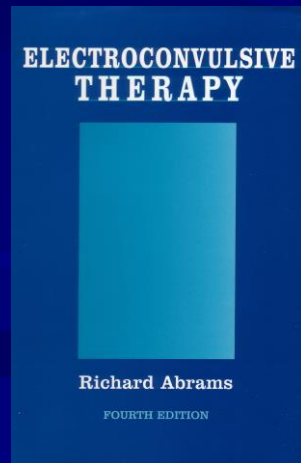
ECT in Britain: *A Shameful State of Affairs*

“If ECT is ever legislated against or falls into disuse it will not be because it is an ineffective or dangerous treatment; it will be because psychiatrists have failed to supervise and monitor its use adequately. It is not ECT which has brought psychiatry into disrepute. Psychiatry has done just that for ECT.”

Reference Texts

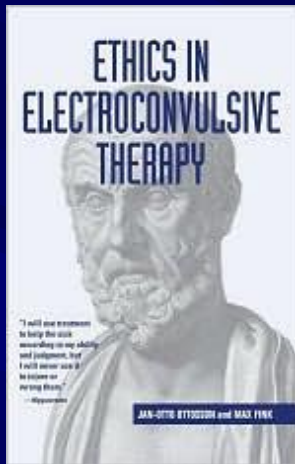


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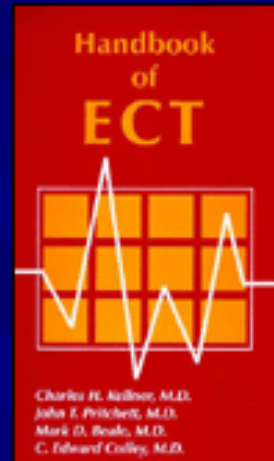


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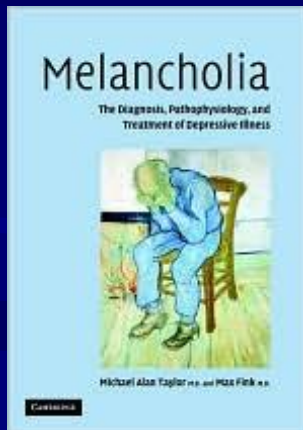
Reference Texts



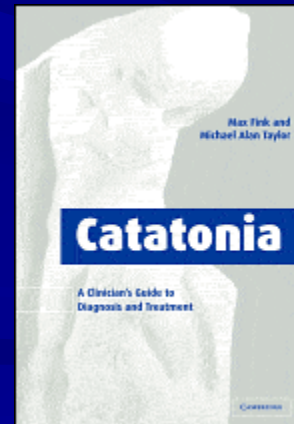
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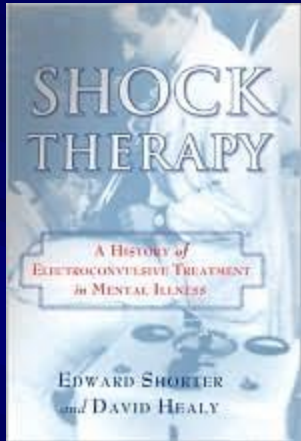


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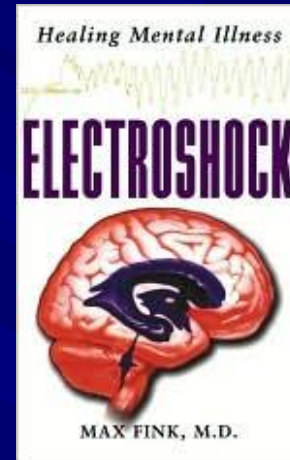


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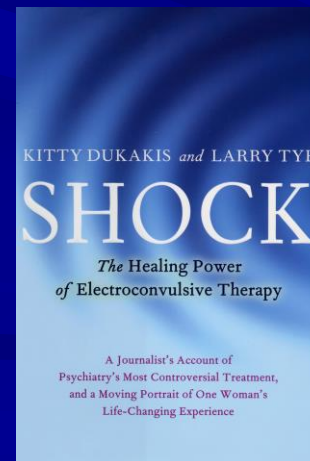
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Posttest Question 1

ECT has demonstrated efficacy in the treatment of:

- A. Depressive Episodes
- B. Manic Episodes
- C. Catatonia
- D. Acute Psychotic Episodes
- E. All of the above

Posttest Question 2

Methohexital is the preferred anesthetic agent for ECT because:

- A. It is relatively inexpensive
- B. It is only moderately anticonvulsant
- C. It has quick onset of action
- D. It has brief duration of action
- E. All of the above

Posttest Question 3

Which best describes the role of the medical consultant in the pre-ECT evaluation?

- A. To provide clearance to undergo ECT
- B. To help optimize the patient's medical condition prior to ECT
- C. To tell the psychiatrist if ECT is appropriate for the patient
- D. To identify contraindications to ECT

Posttest Question 4

Which is NOT true concerning the seizure during ECT?

- A. Should be monitored with EEG
- B. Should be monitored with EMG
- C. Cumulative seizure length during a course of ECT is closely correlated with clinical outcome
- D. Failure to elicit a seizure is associated with lack of efficacy
- E. Seizure threshold increases during the treatment course

Posttest Question 5

Discovery of which of the following medical conditions in a patient being evaluated for ECT is most concerning?

- A. Type II Diabetes
- B. Recent Myocardial Infarction
- C. HIV/AIDS
- D. Psoriasis
- E. Epilepsy

Posttest Answers

1. E
2. E
3. B
4. C
5. B