Chapter 14

PROGNOSIS FOR EMPLOYMENT

The fourth question that we had initially asked ourselves was, Will the patient be able to earn a living for himself or will he remain dependent upon others?

The second Michigan Epilepsy Center follow-up project provided preliminary information, in this regard, from forty-six patients. The other patients involved in the project were either still in some type of school situation or were housewives. Twenty patients were employed at time of follow-up, and twenty-six were unemployed. The statistically significant correlates, with findings obtained at the time of the initial examination in regard to employment state at follow-up, are shown in Table 110. The

TABLE 110

SIGNIFICANT CORRELATIONS OF FINDINGS ON INITIAL EXAMINATION WITH UNEMPLOYMENT AT TIME OF FOLLOW-UP

	r	*Significance Level* (%)
Attended special school	−.388	2
Full Scale IQ	−.366	2
Average marks in school	−.359	2
Amount of theta activity in EEG	.341	5
Performance IQ	−.339	5
Verbal IQ	−.332	5
"Organic" findings on Bender-Gestalt Test	.331	5
Prognosis for intellectual functions	.315	5
Seizure activity in EEG	.310	10
Generalized paroxysmal activity in EEG	.308	10
Focal grand mal seizures	.292	10
Prognosis for behavior	.281	10

significant correlates between findings obtained at follow-up examination and employment state are listed in Table 111. The coding system had been constructed in such a manner that "presently employed" was marked as 1 and "unemployed" as 2; the high end of the scale therefore represents unemployment. It is apparent that unemployment was mostly related to lower intellect and/or organic mental changes on the initial as well as follow-up examination. There is also a significant correlation

TABLE 111

SIGNIFICANT CORRELATIONS OF FINDINGS ON FOLLOW-UP EXAMINATION WITH UNEMPLOYMENT AT TIME OF FOLLOW-UP

	r	*Significance Level* (%)
Organic mental changes	.477	1
Response to anticonvulsant medication	−.441	5
Serial 7 subtractions impaired	.415	1
Proverb interpretations concrete	.393	5
Recent memory impaired	.385	2
History of difficulty concentrating	.384	2
Behavior problems	.383	2
Verbal IQ	−.355	5
Full Scale IQ	−.339	5
Age	−.335	5
"Organic" findings on Bender-Gestalt test	.330	5
Remote memory impaired	.313	5
Amount of theta activity in EEG	.289	10
Nonparoxysmal diffuse hyperventilation buildup in EEG	.253	10

with behavioral difficulties. While this may not be surprising, it is, of course, of considerable interest that variables related to seizure types or seizure frequency did not show significant relationships. The only hint that seizures may interfere with employment is contained in the correlate which shows poor response to anticonvulsant medication. Unemployed patients, therefore, are not likely to be in complete remission. Analysis of variance between the employed and unemployed groups, utilizing the previously mentioned 190 variables, confirmed—as the asterisks show—the findings of the correlations matrix and placed them

in somewhat sharper focus. Behavioral problems head the list, these were probably of long standing, as we noted in the previous chapter, and so were intellectual difficulties. They manifested themselves probably during school age in the form of poor grades and also necessitated special education in approximately half of the unemployed patients. The six-year difference in mean age between the groups is important because it suggests that some of the patients may be getting a slow start on the employ-

TABLE 112

SIGNIFICANT DIFFERENCES BETWEEN EMPLOYED AND UNEMPLOYED GROUP

	Employed	*Unemployed*	*F*	*Significance Level (%)*
Behavior problem at follow-up*	1.9	3.4	7.5	1
History of school grades*	4.6	3.2	6.1	5
Age	26.5 yrs.	20.6 yrs.	6.1	5
"Organic" findings on Bender-Gestalt test*	2.5	4.3	5.1	5
Performance IQ*	101.9	88.3	5.1	5
Prognosis for intellectual functions*	3.6	5.1	4.8	5
Amount of theta activity in EEG*	3.6	4.8	4.8	5
Full Scale IQ*	101.3	88.5	4.6	5
Digit Symbol—Wechsler IQ	8.6	6.8	4.4	5
Paroxysmal activity in EEG	1.1	2.3	4.4	5
Clusters of minor seizures for several days, freedom from seizures for several weeks	2.7	1.3	4.2	5

ment market; but as they get older and their seizure disorder improves somewhat, they begin finding jobs. The hard-core unemployed epileptic individual is, in all probability, the patient with lower IQ, and/or organic mental changes with or without associated personality difficulty. The fact that seizures do not necessarily preclude employment is demonstrated by the observation that the variable "clusters of minor seizures for several days with freedom from seizures for several weeks" occurred significantly more frequently in the employed than in the unemployed group in this particular sample of patients. As had been pointed out in the chapter on seizure prognosis, patients who

TABLE 113

SIGNIFICANT DIFFERENCES BETWEEN EMPLOYED AND UNEMPLOYED GROUP

		Employed	*Unemployed*	X^2	*Significance Level* (C_t)
Postictal headaches					
	Absent	3	12	6.2	5
	Present	16	8		
Attended special school*					
	Yes	3	14	5.2	5
	No	16	12		
Majority of tests were not applicable due to small numbers in sample.					
Rotation of Bender designs					
	Absent	16	13	3.6	10
	Present	3	12		
Academic difficulties in school					
	Absent	15	11	3.6	10
	Present	5	15		
Postictal confusion (major seizures)					
	Absent	17	12	3.0	10
	Present	2	8		
Postictal fatigue (major seizures)					
	Absent	7	14	3.0	10
	Present	12	6		
Focal major seizures					
	Absent	8	18	2.8	10
	Present	12	8		

present this phenomenon are not likely to achieve a permanent remission. It also deserves to be repeated that the variable "present seizure state" did not show significant differences between the two groups.

It has been mentioned previously that the Michigan Epilepsy Center had received a grant from the U.S. Public Health Service, Division of Vocational Rehabilitation, to study the aspects that relate to employment problems of epileptic patients. The material from that study will not be presented here because it merits extensive discussion which is beyond the scope of this publication. It did, however, provide an opportunity to check the main findings that were mentioned here. In the material from the VRA project there was likewise no significant differ-

ence in regard to seizure frequency between employed and unemployed patients. The detailed breakdown for the VRA patients is shown in Table 114. Two important aspects emerge: (1) The patient who has seizures less than once a year is, for practical purposes, in remission and is employed in the majority of cases. This is of course what one would expect on general grounds and (2) the more interesting point is that on the bottom of the scale there is no difference between the groups. A considerable number of epileptic patients, therefore, are able to maintain employment in spite of having, on the average, several

TABLE 114

FREQUENCY OF OCCURRENCE OF SEIZURES AT PRESENT IN RELATION TO EMPLOYMENT STATUS

Code Number and Description	*Employed*	*Unemployed*
1 Less than once a year	32	12
2 About once a year	6	5
3 Two to three seizures a year	5	13
4 Four to six seizures a year	7	7
5 Seven to 12 seizures a year	4	6
6 Once a month	9	6
7 Two to three a month	11	9
8 Once a week	1	7
9 Several a week	13	19
Totals	88	84

seizures per week. The VRA study confirmed that seizures by themselves do not have to lead to unemployment. The major handicapping factors for the VRA group were likewise intellectual difficulties, organic mental changes, personality problems, and factors related to motivation.

The physician quite commonly hears the patient's complaint that he was fired because he had a seizure on the job, or he cannot find employment because "nobody will hire an epileptic." Although this may be the case in some instances, it has been my experience in virtually all cases where this was complained of by the patient, that subsequent mental status examination showed deficits which rendered the patient, for practical purposes, unemployable in a competitive work situation. The patient

may not be aware of these deficits, and it is much easier for him to blame his seizures for rejection by society, rather than organic mental changes, intellectual difficulties, or personality problems.

When the material from the VRA project is completely worked up, we should be able to provide formulas which will predict with reasonable accuracy the patient who is, in fact, unemployable in spite of all rehabilitative measures. More importantly, it should give the characteristics of those patients who are potentially employable, but for some reason or another have not succeeded in getting or maintaining a job. This would be the group towards which maximal rehabilitative efforts should be devoted.

Another interesting aspect of the findings is that they take the employment problems of the epileptic patient out of the strict realm of epilepsy (i.e. recurrent seizures) and place them in a more general framework. The factors that were found to be operative in the unemployed epileptic may well play a significant role in other hard-core unemployed individuals who tend to blame external circumstances rather than their own insufficiencies for their failure. It has been stated in the introduction to this book that the statistical methods used in this study to clarify aspects related to epilepsy could be applied without difficulty to any other condition one may want to investigate. Chronic unemployment is, in all probability, not only a sociological but, perhaps even more importantly, a medical problem in respect to the dimensions outlined above.

Chapter 15

INSTITUTIONALIZATION

A further question raised initially was in regard to the characteristics of patients who are likely to become permanent inmates of an institution for epileptics. The first follow-up study contained only five patients who had been institutionalized and the second study, seven patients. These numbers were too small for statistical purposes. We had, therefore, over the years transferred patients from Caro State Hospital for Epileptics to the Lafayette Clinic in order to get a clearer view of the problem. As previously mentioned in the chapter on seizure prognosis, fifty-seven of the Caro patients were included in the Lafayette Clinic inpatient review. These fifty-seven patients were contrasted against the 162 patients who had been referred from the community. Fortunately it turned out that there were no age or sex differences between the groups. The mean age was 26.6 years for patients from the community and 28.8 years for the Caro patients. There were eighty-six males and seventy-six females in Group I (patients from the community), and twenty-nine males and twenty-eight females in Group II (Caro State Hospital patients). Tables 115 and 116 show the variables that differed significantly between the two groups. The variables which are marked by an asterisk also showed significant differences in Tables 68 and 69 dealing with response to treatment in the hospital. The table containing the F tests demonstrates two main findings: (1) The Caro patients had an earlier onset and more intense seizure disorders than the patients referred from the community. There was a longer duration of illness, more frequent injuries during seizures, more different seizure types in

TABLE 115

SIGNIFICANT DIFFERENCES BETWEEN INSTITUTIONALIZED GROUP AND PATIENTS REFERRED FROM THE COMMUNITY

	Patients from Community	*Patients from Caro State Hospital*	*F*	*Significance Level (%)*
Duration of illness in years	12.2	22.7	45.8	1
Duration of main seizure type*	7.1	8.6	41.7	1
Amount of schooling*	3.8	2.4	41.0	1
Full Scale IQ*	83.6	64.0	36.8	1
Findings of cerebral pathology on neurological examination*	1.5	2.3	31.6	1
Frequency of injuries during seizures*	1.4	2.2	30.0	1
Focal atrophy on pneumoencephalography on the right	1.0	1.7	23.2	1
Age at time of onset of recurrent seizures in months*	170.7	84.1	21.7	1
Amount of alpha rhythm in EEG	2.8	2.0	19.9	1
Age at onset of first seizure in months*	151.6	65.3	19.5	1
Organic pathology suspected from psychological tests	2.5	3.1	17.3	1
Combination of seizures*	2.5	3.4	13.8	1
Evidence of bilateral cerebral disease*	1.9	2.3	12.8	1
Prenatal or perinatal injury suspected	1.4	1.9	12.5	1
Frequency of aura	2.6	1.8	10.7	1
Length of hospitalization in weeks*	6.8	9.2	8.8	1
Amount of theta activity in EEG*	2.8	3.3	8.5	1
Amplitude of background activity in EEG*	3.9	3.3	7.0	1
Amount of delta activity in EEG	1.1	1.3	6.9	1
Cerebral infection as etiological component	1.2	1.5	6.0	5
Frequency of maximal occurrence of seizures*	7.7	8.4	6.0	5
Neurotic tendencies on psychological testing	2.3	1.8	5.5	5
Clusters of seizures for several days, freedom from seizures for several weeks*	1.5	1.2	5.3	5
Amount of EEG abnormality*	3.4	3.8	4.9	5
Megimide induced seizure patterns, difficult to classify	2.8	3.7	4.8	5
Amount of fast activity in EEG	2.4	2.8	4.2	5
Evidence of left-sided cerebral disturbance from neurological examination and seizure patterns	1.4	1.8	4.0	5
Number of major seizures in hospital	3.1	6.6	6.4	5

TABLE 116

SIGNIFICANT DIFFERENCES BETWEEN INSTITUTIONALIZED GROUP AND PATIENTS REFERRED FROM THE COMMUNITY

		Patients from Community	*Patients from Caro State Hospital*	X^2	*Significance Level (%)*
Minor nonfocal motor seizures*					
	Absent	155	44	15.2	1
	Present	7	13		
Received regular schooling					
	Absent	9	14	14.7	1
	Present	144	39		
Focal grand mal seizures					
	Absent	92	19	9.2	1
	Present	70	38		
Theta rhythm present when patient has eyes opened*					
	Absent	151	46	5.9	1
	Present	11	11		
Focal grand mal variant seizure induced with Megimide*					
	Absent	121	37	5.4	5
	Present	8	9		
Received special schooling*					
	Absent	105	27	5.3	5
	Present	48	26		

the same individual, greater maximal frequency of seizures and more major seizures at the Lafayette Clinic. They also had more evidence of focal as well as diffuse cerebral pathology on clinical examination, pneumoencephalography, and psychological testing. The EEG mostly reflected cerebral damage with little alpha rhythm, more theta, delta and fast activity, and a greater amount of overall EEG abnormality. Amount of seizure patterns in the EEG, however, was not different between the groups, and (2) there were differences in regard to etiological factors. Prenatal and perinatal injuries, as well as cerebral infections, were significantly more common in the Caro group than in the group living in the community. A significant proportion of patients had been committed to the institution because of severe brain injury, making them unfit for life in the community, with epilepsy being superimposed.

We have repeatedly made the point before, that etiological factors did not seem to be of importance in regard to seizure control. The Caro State Hospital sample, however, showed that institutionalized patients had severe seizure disorders, and also more severe injuries to the central nervous system. The question arose, therefore, whether or not a greater intensity of the seizure disorder was a direct result of the more severe cerebral insults. To answer this question it was decided to divide the Caro State Hospital group into those patients in whom etiological factors had been present and into a group where no etiology could be demonstrated, and to compare the two groups on all variables. It should be mentioned at this time that the histories from Caro State Hospital were of excellent quality, containing very detailed information. In addition, we had in nearly all cases the opportunity to interview the parents after the patients had been transferred to the Lafayette Clinic. It was found that there were only twelve patients in whom absolutely no etiological factors could be implicated. When patients were included in whom one of the etiologies (prenatal or perinatal injury, postnatal head injury, cerebral infection, other significant external cause—e.g. cerebral malformation—, or family history of epilepsy) had been rated as questionably present, two groups could be formed. The first consisted of twenty-eight patients with no or questionable etiology; the other of twenty-seven patients with etiological factors. F tests and Chi Square tests were performed on the previously mentioned 190 variables. It was found that *no* statistically significant differences could be demonstrated between these two groups—apart from the variables dealing with etiology which had, of course, formed the basis of the separation into groups—except for the finding that a left-sided cerebral disturbance was found more commonly in the group in whom etiological factors were present (F 13.0, 1%). No significant differences were observed in regard to age at onset of illness, duration of illness, or to frequency, intensity or type of seizures. The IQ also was not significantly different (Full Scale 64 versus 61). This completely negative result was somewhat surprising and raised the question of whether we had contaminated our groups by including the cases of questionable etiology into those

with no discernible etiology, and by including family history of epilepsy as an etiological factor. It was therefore decided to take the twelve patients in whom no etiology had been present and contrast them with twelve patients who had had either definite cerebral infection or definite prenatal and/or perinatal injury. The major findings are shown in Table 117. Although we are dealing with a small sample, the trends are obvious. The patients with cerebral infection or perinatal injury were younger at the time of onset of their illness and younger in age at time of transfer to the Lafayette Clinic. This kept the duration of the illness essentially constant between the two groups. The group with known etiology also had an eleven-point lower mean IQ, but the intensity of the seizure disorder as expressed by remissions, frequency of maximal occurrence of seizures, frequency of seizures just prior to transfer to the Lafayette Clinic, frequency of seizures at the Lafayette Clinic, clusters of seizures in a given day, and occurrence of status epilepticus showed no differences between the groups. If there is a trend towards a difference at all, it would be that the group who had a definite etiology was actually slightly better off in respect to their seizure disorder. It is recognized that we are dealing with a very small sample of patients; nevertheless, there is no evidence that the intensity of the seizure disorder is related to the severity of cerebral injury.

Reviewing the patient material from Caro State Hospital, we noted that one is dealing essentially with three types of patients: (1) those who have an exceedingly intense seizure disorder, usually starting early in life, which does not yield to anticonvulsant treatment; (2) patients who have cerebral injuries, also usually acquired at an early age, leading to marked intellectual difficulties making them unfit for life in the community, and (3) a few patients with epilepsy whose main difficulty is not the intensity of the seizure disorder, or the severity of cerebral injury, but who show severe behavioral problems which cannot be tolerated by the environment.

The first group is the most interesting from the point of view of the epileptologist because it points to the existence of what one might call "malignant epilepsy." Fortunately this group is relatively small in size.

TABLE 117

COMPARISONS OF INSTITUTIONALIZED PATIENTS REGARDING THE INFLUENCE OF ETIOLOGICAL FACTORS

	No Etiology (N = 12)	*Definite Etiology* (N = 12)
Mean age at time of first seizure	7.8 years	3.1 years
Mean age at onset of recurrent seizures	10.4 years	5.9 years
Duration of illness	26.7 years	26.0 years
Number of patients who were in remission at time of transfer to Lafayette Clinic	0	2
Number of patients who had experienced remission in the past	2	2
Number of different seizure types in a given patient:		
One seizure type only	3	4
Two seizure types	5	4
Three or more seizure types	4	4
Main seizure types most difficult to treat:		
Grand mal focal	5	9
Grand mal nonfocal	3	1
Psychomotor seizures	4	1
Grand mal variant nonfocal	0	1
Grand mal variant focal	0	1
Number of patients whose seizures started during first year of life	2	5
Duration of seizure type most difficult to treat	more than ten years	more than ten years
Maximal frequency of occurrence of seizures	several per week	several per week
Frequency of seizures prior to transfer to Lafayette Clinic	2 to 3 a month	7 to 12 per year
Number of patients who had clusters of seizures in one day	9	10
Number of patients who had clusters of seizures over several days, with freedom from seizures for several weeks	3	1
Number of patients with status epilepticus	3	2
IQ	69.2	58.7
Number of major seizures during hospitalization at Lafayette Clinic	64	52
Number of minor seizures during hospitalization at Lafayette Clinic	66	30

Chapter 16

LIFE EXPECTANCY

In the second MEC follow-up study we had noted that out of 136 patients whose fate could be ascertained, thirteen (9.6%) had died. This is a rather high proportion if one considers the age group that one is dealing with. As had been stated in the chapter on seizure prognosis, the mean age of patients at the time of death was 18.5 years if one excluded the three patients who had suffered from brain tumors, and 24.5 years if they were included. These are, of course, unusually low ages and are probably, at least in part, due to the small sample. Nevertheless, the figures did agree with the literature that the average life span of patients with epilepsy is lower than that of the general population.

In order to get some more information on this topic, we had asked the Michigan Department of Health, Section of Vital Records, to send us a listing of all the patients whose death certificates had shown epilepsy, for the years 1960 through 1966. We also inquired about the total number of deaths, the mean age at time of death for all individuals, and the mean age at time of death of patients who had seizures. Table 118 lists the findings. Age at time of death was expressed by the median rather than the mean because of infant mortality and the open-end age beyond ninety years. The table indicates that the diagnosis of epilepsy had appeared on the death certificate in approximately 0.1 per cent of all cases. It also shows that the median age at time of death of the patients in whom epilepsy was noted on the death certificates was approximately two and one-half decades below that of the average resident of the State of Michigan.

TABLE 118

NUMBER AND MEDIAN AGE AT TIME OF DEATH DUE TO ALL CAUSES IN THE STATE OF MICHIGAN COMPARED WITH PATIENTS WHERE EPILEPSY WAS LISTED AS DIRECT OR CONTRIBUTING CAUSE OF DEATH*

Year	*Total Deaths*	*Median Age at Death*	*Epilepsy*	*Median Age at Death*
1960	67,912	68.3 years	81	35.2 years
1961	67,375	68.7 years	74	40.8 years
1962	70,049	69.1 years	95	41.8 years
1963	72,438	69.3 years	91	34.7 years
1964	72,129	69.2 years	97	36.5 years
1965	73,665	69.5 years	109	41.8 years
1966	74,596	69.5 years	119	43.5 years

* Courtesy Michigan Department of Public Health, Vital Records Section

It has been pointed out in the discussion of the literature that studies based on death certificates alone will give only general trends rather than completely accurate data. The problem is that the presence of epilepsy frequently is not reported on the death certificates. The total number of patients who have epilepsy undoubtedly exceeds that which is reported on the certificates. This is not merely an assumption, as I failed to find the name of one of my former epileptic patients on the list supplied by the Michigan Department of Health. When the specific death certificate was requested it was noted that the cause of death had been listed as drowning and the diagnosis of epilepsy had not appeared on the death certificate. The wording on the death certificates in regard to significant chronic illnesses is actually so ambiguous that there is no particular reason to include the diagnosis for the majority of cases. The most relevant section of the Michigan death certificate is represented in Figure 24. The emphasis is obviously on conditions that are regarded as having directly contributed to the death of the person. Unless the patient's death is actually witnessed, it is impossible to say whether a convulsive seizure had led to the patient's death or not. There is no space provided on the death certificates to list the chronic illnesses the patient may have suffered, regardless of whether or not they were considered by the physician as a contributory cause of death. These points are made here to demonstrate that

19. CAUSE OF DEATH	MEDICAL CERTIFICATION	Interval Between Onset and Death
Enter only one cause per line for (a), (b), and (c) * This does not mean the *mode of dying*, such as heart failure, asthenia, etc. It means the disease, injury or *complication* which caused death.	I. DISEASE OR CONDITION DIRECTLY LEADING TO DEATH*(a) ANTECEDENT CAUSES Morbid conditions, if any, giving DUE TO (b) rise to the above cause (a) stating the underlying cause last. DUE TO (c) II. OTHER SIGNIFICANT CONDITIONS Conditions contributing to the death but not related to the disease or condition causing death.	
19d. DATE OF OPERATION	19e. MAJOR FINDINGS OF OPERATION	20. AUTOPSY? Yes ☐ No ☐
21a. ACCIDENT SUICIDE HOMICIDE (Specify)	21b. PLACE OF INJURY (e.g., in or about home, farm, factory, street, office bldg., etc.)	21c. (CITY, VILLAGE, OR TOWNSHIP) (COUNTY) (STATE)
21d. TIME OF INJURY (Month) (Day) (Year) (Hour) m.	21e. INJURY OCCURRED While at Work ☐ Not While at Work ☐	21f. HOW DID INJURY OCCUR?
22. I hereby certify that I attended the deceased from _____, 19____, to _____, 19____, that I last saw the deceased alive on _____, 19____, and that death occurred at _____ m., from the causes and on the date stated above.		
23a. SIGNATURE (Degree or title)	23b. ADDRESS	23c. DATE SIGNED

FIGURE 24. Copy of medical section of death certificate.

the Vital Statistics Section of the Michigan Department of Health has, at present, no way of knowing what the median age at time of death is for all patients who have suffered from epilepsy. When data based on death certificates are published in the future, it would be advisable to describe the relevant sections of the death certificates so that the reviewer can form an opinion about the completeness of the sample.

The most reliable way of gathering information on this topic is, of course, through follow-up of large numbers of patients for a long period of time, as is currently being done in Denmark. Our results from the review of death certificates are given here to demonstrate methodological problems, and so that they can be compared with other data that are being collected through follow-up studies. In spite of the difficulties which one encounters in the interpretation of data from death certificates, it is interesting that the findings do agree with the current study by Henriksen *et al.*, who had noted that the majority of their patients had died between the ages of thirty and forty-five years.

Chapter 17

SUMMARY

SEIZURE PROGNOSIS

Review of the literature showed that there has been no substantial improvement in *long-term* remission rates of epileptic patients over the past sixty years. Statements that approximately 80 per cent of patients are controlled by anticonvulsant medications are usually due to short follow-up periods and the inclusion of "improved" patients in the "controlled" group. A direct relationship has been shown to exist between length of follow-up and the percentage of patients who are seizure free at any given time. In regard to characteristics of patients which are likely to influence prognosis, the literature showed consensus on the following features: Patients who are normal in all other respects, except for the seizure disorder, tend to have a good prognosis especially if they have only grand mal seizures. Patients whose EEG is normal or normalizes with treatment can likewise expect a good outcome. The prognosis becomes poor with long duration of illness, a combination of different seizure types, large total number of seizures, and early age of onset.

Opinions are somewhat divided in regard to the importance of frequency of occurrence of seizures, whether seizures occur in the waking or sleeping state, heredity or other etiological factors, and abnormal findings on neurological examination.

It is repeatedly pointed out in the literature that patients with psychomotor seizures have a poorer prognosis than patients who have grand mal seizures. It should be borne in mind, however, that psychomotor seizure patients usually also have additional grand mal seizures and, therefore, one tends to compare patients

who have more than one seizure type with those who have only one seizure type. This fact should be considered in future research dealing with psychomotor epilepsy. It is apparent that major seizures have always responded better to anticonvulsant treatment than minor attacks, and modern drugs have not changed this pattern appreciably. The electroencephalogram has been shown to relate only in part to seizure prognosis. The relationship tends to improve if one looks at specific features of the tracings rather than relying on a global rating of normal versus abnormal. It is important to recognize that focal seizure discharges in a child's electroencephalogram do not necessarily represent the fixed atrophic type of lesion that one is accustomed to find in the adult.

In regard to febrile convulsions, the literature review indicates that they can be roughly divided into two groups: (1) simple or "benign" febrile convulsions and (2) epilepsy triggered by fever. It is interesting to note that essentially all the criteria that are given for differentiating between these two conditions also have been listed as being of importance in distinguishing between cases of epilepsy with good or poor prognosis.

Pyknolepsy was extensively discussed and it was demonstrated that the condition originally described under this name does not represent a clinical entity, and it seems to serve no purpose to perpetuate the term.

The prognosis of petit mal is still somewhat controversial, but the majority of authors feel that the seizures gradually decrease in number and intensity during adolescence and adulthood so that they do not form a major handicap for the patient later on. Precise figures for actual complete remissions are not readily available because the follow-up examination would have to include EEG evaluations in all instances. Historical reports about cessation of petit mal are unreliable. Approximately one-third to one-half of all patients starting with petit mal develop grand mal seizures later on. There is suggestive evidence that subsequent development of grand mal can be prevented by combined prophylactic treatment. This aspect deserves more intensive investigation using matched groups.

Infantile spasms—hypsarhythmia represent the most severe

form of childhood epilepsy. The success and failure of steroid treatment was discussed and the point was made that immediate treatment seems to be imperative if one wants to avoid the profound mental decay accompanying the condition. It was suggested that infantile spasms—hypsarhythmia be regarded by the pediatrician and general practitioner as a medical emergency requiring immediate intensive treatment by specialists in the hope that permanent and severe loss of intellectual functions can be prevented.

In regard to posttraumatic epilepsy, there is still some controversy whether the patient's prognosis for long-term seizure remission differs from that of seizures due to other etiologies. Part of the difficulty resides in a problem of definition, namely, Does a single seizure after trauma constitute "epilepsy" or is the presence of several recurring seizures required for such a diagnosis? There tends to be agreement that the incidence of posttraumatic seizures stands in direct relationship to the severity of the cerebral injury. Penetrating wounds in the central-parietal regions appear to be most epileptogenic. The maximum incidence of posttraumatic epilepsy after wounds of this type was given in the literature as 65 per cent. This still leaves approximately one-third of patients who do not develop seizures after such injury. It seems therefore that cerebral damage, although a potent epileptogenic factor, cannot be sufficient cause for the development of a chronic seizure disorder. It is important to point out also that the probability for terminal remissions was shown, in two separate studies, to bear no relationship to the intensity of the injury. In general, the course of true posttraumatic epilepsy appears to be relatively mild with seizures spaced by fairly long intervals.

In contrast to medical treatment there has been definite progress in regard to surgical results. This is mostly attributable to the introduction of electroencephalography which demonstrated that patients with psychomotor seizures may have a single focal lesion in one temporal lobe. The surgical results do not seem to deteriorate in relation to length of follow-up as is the case with medical treatment. Operative intervention discloses, in a number of instances, previously unsuspected small but gross le-

sions which can be removed *in toto* with subsequent arrest of seizures. Unfortunately most patients with psychomotor seizures have multiple areas of pathological electrical activity, and only a relatively small number of patients become eligible for operation. Patients with focal discharges in areas other than the temporal regions tend to have a poorer surgical result. In severely disabled patients with infantile hemiplegias, uncontrolled seizures, and socially intolerable behavior, hemispherectomy appears to be of value. It was pointed out that neurosurgical follow-up criteria of patients have frequently been quite loose, and specific suggestions for improvements were made.

In order to determine long-term prognosis of seizure patients and the factors that are responsible for a good or poor outcome, two follow-up studies were conducted at the Michigan Epilepsy Center. The first was in the nature of a pilot study testing the data collection and data analysis procedures. Thirty-two children were involved who had been followed for at least five years after initial evaluation. A two-year terminal remission had occurred in 33.3 per cent, and a five-year terminal remission in 29.6 per cent. The second study dealt with ninety patients of all ages who had been followed for at least five years after initial evaluation. The two-year terminal remission rate was 32.2 per cent, and the five-year terminal remission rate was 16.7 per cent. These findings agree with the majority of studies published in the literature.

In order to arrive at prognostic indices for good versus poor outcome, the clinical and electroencephalographic findings were coded, punched on IBM cards, and subjected to the following statistical procedures: intercorrelation of findings, factor analysis, analysis of variance, and discriminant function analysis. Factor analysis produced four factors that were relevant for prognosis:

1. Epilepsy associated with cerebral damage.
2. EEG seizure activity.
3. Mixed psychomotor epilepsy.
4. Specific seizure propensity.

The following variables showed loadings on the various factors:

Ad 1. Patients with lowered IQ, "organic" features on psychological tests, abnormal findings on neurological examination, and slow landmarks of development showed

persistent seizures on follow-up and were unemployed.

Ad 2. The EEG was found to behave for the most part as an independent variable but was not likely to become normal if it showed seizure patterns at time of initial evaluation while the patient was already on some anticonvulsant medication. The factor loading in regard to seizure outcome was quite low.

Ad 3. Patients with psychomotor seizures in combination with other seizure types, in the presence of associated psychiatric difficulties, were found to have done poorly in regard to seizure outcome, behavior, and employment.

Ad 4. This factor dealt only with frequency of occurrence of seizures. This was shown to be unrelated to all other variables that were sampled, and this factor constitutes the core of the epilepsy problem.

Analysis of variance confirmed the findings obtained from the intercorrelation matrix. The most important variables that distinguished patients who had shown a two-year terminal remission from those who continued to have seizures were frequency of injuries during major seizures, number of different seizure types in the same patient, duration of seizure disorder, presence or absence of psychomotor seizures, presence or absence of clusters of seizures over several days followed by freedom from seizures for several weeks, degree of presence of seizure patterns in the initial EEG, and amount of overall EEG abnormalities.

Inasmuch as the patients in these samples had for the most part been treated by their family physicians rather than specialists in neurology, an attempt was made to compare these treatment results against findings obtained by the Neurology Outpatient Service of the Lafayette Clinic. One hundred twenty-three patients had been followed regularly for periods ranging between two and seven years. Seventy-four per cent of these patients had had a seizure within six months prior to their last clinic visit. In a subgroup of fifty-six patients who had been followed regularly for at least five years, a terminal remission of at least two years prior to last clinic visit had occurred in only 14.3 per cent of cases. It should be borne in mind, however, that the Lafayette Clinic Outpatient Service tends to see the more

difficult treatment problems, and patients who continue to attend outpatient clinics are likely to represent a negative selection. Findings from seizure clinics merely point to the existence of a group of hard-core, difficult to treat patients, but give no definite indication about the relative size of this group in comparison to the total epilepsy population.

Inasmuch as outpatients may or may not adhere to their prescribed drug regime, they do not readily lend themselves to a description of the characteristics of the patient whose seizure disorder is indeed resistant to anticonvulsant drugs. For these reasons, the results of treatment of 245 epileptic inpatients who had been hospitalized for at least three weeks on the Neurology Inpatient Service of the Lafayette Clinic were evaluated. One hundred thirty-two of these patients had been referred from the community because of uncontrolled seizures; eighty-two had been referred from the state hospital system of the State of Michigan for research and/or teaching purposes, and thirty-one had been admitted from the community because of marked behavioral difficulties. Of the 132 patients who had been referred from the community because of inadequate seizure control, 45.5 per cent did not have any seizures during hospitalization, 25.7 per cent had between one and three seizures, while 28.8 per cent had more than four seizures in spite of maximum treatment efforts. The subgroup of 132 patients, as well as the total group, were subjected to analysis of variance in order to delineate the characteristics of the patient who is unresponsive to maximum treatment efforts in the hospital. It was found that intensity of seizure disorder was the most important aspect in regard to treatment response. Presence or absence of presumed etiological factors was not of importance. The seven criteria that had differentiated between the remitted and the unremitted group in the long-term follow-up study of the Michigan Epilepsy Center also were found to have been important in the success or failure of short-term inpatient treatment. In addition, frequency of seizures immediately prior to hospitalization was important in regard to seizure control while hospitalized.

Discriminant function analysis based on these eight variables was performed. It classified correctly 76 per cent of the patients

who did not have seizures in the hospital and 81 per cent of those who had at least one seizure while on adequate medication. Cross-validation utilizing the sample of patients from the second follow-up study of the Michigan Epilepsy Center confirmed the results. The formulas for classifying the patients in regard to their likelihood of achieving seizure control, either in the hospital situation or as outpatients, were presented.

It was observed that the "seizure propensity" of the epileptic patient (i.e. tendency towards spontaneously recurring seizures) was not related to his "seizure threshold" as measured by the amount of Megimide needed to induce a clinical seizure. The implications of this finding were discussed from a theoretical as well as practical point of view.

Suggestions for the use of the discriminant function weights were made, especially in regard to selection of patients for inpatient treatment, and whether or not a patient's report about his current seizure frequency can be trusted. The weights were developed on predominantly adolescent and adult patients who already had been on some drug regime prior to their evaluation by a neurologist. Therefore, they will not necessarily be applicable to children or patients who have just experienced their first seizure.

The finding reported in the literature, that duration of seizure disorder prior to initial evaluation is important for prognosis, was confirmed. Eighty-five per cent of the patients seen in the first year had achieved a terminal remission of at least two years. If the patients were seen within the second year after the onset of their illness, the percentage of two-year terminal remissions had already dropped to 50 per cent, and if the illness had persisted for ten years or longer, the remission rate had dropped to 13 per cent. The possible implications for the pathophysiology of epilepsy were discussed and suggestions to study the phenomenon more intensively were made.

BEHAVIOR PROGNOSIS

As far as behavior is concerned, it was found in both follow-up studies that the tendency was towards improvement of ab-

normalities with the passage of time. Behavioral disturbances did not appear for the first time, in these samples, years after the seizure disorder had manifested itself; they either preceded the seizures or occurred at about the same time as seizures made their first appearance. Behavioral difficulties were most common and most persistent in the group of patients who had evidence of some form of cerebral damage. A discriminant function analysis was performed: 77.3 per cent of patients who did not have behavioral difficulties and 85.0 per cent of those who did were correctly identified. The variables related to the classification were Performance IQ, "organic" features on psychological tests, presence of seizures during the first year of life, history of behavioral difficulties in school, feeding problems in infancy, talking age, special schooling, average school grades, adverse social environmental factors, and objective findings of cerebral pathology on neurological examination. This aspect of the study represents preliminary data because it has not yet been cross-validated on another sample.

PROGNOSIS FOR INTELLECTUAL FUNCTIONS

The literature shows considerable controversy in this respect. There are only two points of definite agreement:

1. Epileptic patients can be subdivided into two groups. One might be called "epilepsy only," and the other, "epilepsy associated with brain damage of varying degrees." This latter group has definitely lowered intelligence as one might expect.

2. Epileptic patients show more fluctuation in upward or downward direction on test-retest measures than the normal population.

A further point upon which most authors are agreed is that patients whose seizures start in childhood have lower intelligence than those in whom the disorder manifests itself first in adolescence or adulthood. On the other points listed below there tends to be agreement between authors, but opinions to the contrary exist.

1. In cases of "epilepsy only," the intelligence level is

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1. In cases of "epilepsy only," the intelligence level is

within normal limits but shifted towards the lower end of the normal range.

2. Frequency of major seizures tends to be directly related to intellectual level.

3. A small but statistically significant decrease in intellectual functions can be seen on test-retest measures as far as group mean values are concerned.

4. The Performance areas of the Wechsler IQ scale appear to be more affected in epileptic patients than the Verbal areas.

The concept of "epileptic personality" was purposely omitted from consideration of the literature review because there exist only opinions and no reliably measured data.

The Michigan Epilepsy Center's second follow-up study contained fifty-six patients who had been tested twice on the Wechsler IQ scales with intervals ranging between five and nine years. On the initial tests, the mean Full Scale IQ was 94.5 with a Performance IQ of 95.7, and a Verbal IQ of 94.9. At the time of follow-up, the values were 93.6, 91.8, and 92.4. The decrease in Performance IQ was significant at the 1 per cent level of confidence, and that of the Verbal IQ at the 5 per cent level. A comparison of patients whose Full Scale IQ had decreased by seven or more points against those in whom the IQ had decreased less, remained stable or had increased, demonstrated that the patients with initially higher IQ levels tended to show decrease more commonly than patients in the lower intellectual range. This phenomenon could explain, in part, why there are proportionally fewer epileptic patients in the bright normal or superior range of intelligence than in the average population. The loss is usually not marked enough to place the patient into the dull-normal or borderline defective group. The point was made that a "normal" IQ score in the epileptic patient does not necessarily reflect his pre-illness intellectual level. The possible relations to emotional functions were discussed.

The Performance IQ was more affected by the seizure disorder than the Verbal IQ. It was demonstrated that seizures per se can lead to decrease in Performance IQ. The IQ tended to rise if the patient achieved a terminal remission of at least

two years. This was not the case if the seizure disorder was merely improved.

Discriminant function analysis was performed and criteria developed that would allow prediction as to whether a patient's IQ is likely to deteriorate. The formula classified correctly 95 per cent of patients whose IQ had dropped by seven or more points and 83 per cent of the others. The variables involved in the prediction were as follows: initial Full Scale IQ, number of different seizure types in the same patient, frequency of major seizures, clusters of seizures for several days—freedom from seizures for several weeks, "organic" features on psychological tests, presence of adverse social environmental factors, and EEG background amplitude. The formula has not been cross-validated as yet on another sample and will apply mostly to adolescents and adults rather than children.

Age at time of onset of the seizure disorder was not related to seizure outcome in this sample of patients. Definite relationships existed, however, between age of onset and intellectual functions. The mean Full Scale IQ of patients whose seizures started between birth and three years of age was 84.8, for the patients whose seizures started between four and twelve years it was 90.4, and for those who developed seizures between thirteen and twenty-seven years of age it was 101.3. A seizure disorder starting early in life, therefore, does not necessarily have a poor prognosis as far as seizure control is concerned but is likely to be associated with lowered intelligence, regardless of presumed etiology.

It is of considerable interest that modern statistical studies corroborated four of the points that were made by Turner in 1907 as being unfavorable in regard to intellectual functions:

1. Young age at time of onset of the illness.
2. Presence of major as well as minor seizures.
3. Frequent seizures.
4. Occurrence of the seizures in series.

EMPLOYMENT

Intercorrelation of findings on the patient sample from the second MEC follow-up study showed that employment problems

in the epileptic patients were related mainly to lower IQ, organic mental changes, and behavioral difficulties. It was surprising to note that seizure frequency was not related to the patient's employment state. This finding could be checked on another sample of 172 patients and was found to hold true, if patients whose seizure frequency was less than once a year were excluded.

INSTITUTIONALIZATION

The findings of fifty-seven patients from Caro State Hospital for Epileptics were contrasted against those of 162 patients referred to the Neurology Inpatient Service of the Lafayette Clinic from the community, in order to define the characteristics of patients who have to be institutionalized. It was found that the institutionalized patients tended to consist essentially of three groups: (1) patients with severe cerebral injuries, usually acquired early in childhood, (2) exceedingly intense seizure disorders, also usually starting early in life, and (3) some patients with epilepsy whose main difficulty is not the intensity of the seizure disorder or the severity of cerebral injury, but who show severe behavioral problems which cannot be tolerated by the community.

A comparison of institutionalized patients with known etiological factors against those in whom no recognizable etiology was present did not show appreciable differences between the groups. There was no evidence that the intensity of the seizure disorder was related to the intensity of cerebral injury.

LIFE EXPECTANCY

The literature review pointed out that the life expectancy of epileptic patients tends to be lower than that of the general population. Status epilepticus is still a significant cause of death, especially in patients who are institutionalized. There exists a group of patients with severe and uncontrollable seizures who die in early adulthood from generalized physical and mental deterioration. Death as a direct result from a seizure is quite

infrequent but does occur on occasion and is not preventable at all times. Inasmuch as patients with nocturnal seizures may roll over in bed and suffocate, the importance of supervised sleeping arrangements was stressed.

In order to check on the reports in the literature regarding life expectancy of epileptic patients, a survey of death certificates was carried out. The Michigan Department of Public Health calculated for us the annual median age at time of death for all persons who had died in the State of Michigan during the years 1960 through 1966, as well as that of persons where epilepsy was listed as primary or contributory cause of death on the death certificates. It was found that the median age at time of death from all causes ranged between 68.3 and 69.5 years. The median age at time of death for patients where epilepsy was mentioned on the death certificate ranged between 35.2 and 43.5 years. Surveys of this type have inherent methodological difficulties which were discussed and can only provide evidence for trends rather than leading to firm conclusions. Suggestions about improvements in the format of death certificates were made.

CONCLUSIONS

It has been mentioned in the Foreword that one of the main reasons for writing the book lay in the hope that some clues may be uncovered in regard to the pathophysiology of epilepsy. Reviewing the literature and my own investigations, it would seem clear that in the majority of instances epilepsy is *not merely* a symptom of a variety of other etiological conditions. By this I do not mean to deny the importance of the symptom of convulsive seizures in a patient who is developing a brain tumor, or in conditions such as tuberous sclerosis, Sturge-Weber syndrome, Unverricht's myoclonus epilepsy and the like. What is meant is that after a careful neurological evaluation has been performed, the majority of patients with chronic recurring seizures will not be found to have any other significant disease. Lest there be some misunderstanding on this point, I would like to reemphasize that a patient who starts with convulsive seizures at any age deserves the most careful neurological workup in order to eliminate the possibility of other neurological or metabolic illnesses; but the fact that convulsive seizures can be a symptom of a great variety of different illnesses affecting the central nervous system should not necessarily argue against the additional existence of a condition which I have called here "specific seizure propensity" of the individual. It is this aspect that deserves intensive study in the future. Although some type of injury to the central nervous system frequently can be demonstrated in patients with chronic seizure disorders, this is not a necessary nor sufficient cause for the disorder.

The difference between seizure threshold and propensity

towards spontaneously recurring seizures is likely to be of fundamental importance in the understanding of epilepsy. While a convulsive seizure is a symptom of a temporarily lowered threshold, it will remain isolated or infrequent unless the individual also has the necessary mechanisms for propensity towards spontaneously recurring attacks. The intensity of that latter factor is likely to make the difference between patients who have occasional seizures only and patients who are not controllable by current anticonvulsant treatment. It also may well make the difference between children who have what is now called "benign" febrile convulsions and "epilepsy triggered by fever."

Hughlings Jackson once pointed out that when confronted with an epileptic patient ". . . the first question in my mind is not 'Is it a case of epilepsy?' but 'Where is the lesion permitting occasional excessive discharge?'" This was indeed a giant step forward nearly one hundred years ago, but we should not continue merely to echo Jackson's thoughts. The great majority of neurophysiological and neurochemical investigations still deal with the "epileptogenic focus" or the properties of the "epileptogenic neuron." These are important studies, but they are likely to be insufficient in providing the final answer to the problem. In addition to Jackson's question, one should also ask one's self, What are the factors that are responsible for the spread of abnormal electrical activity in this particular patient? Even more important would be the question, How does the patient's condition differ on the five days of the week when he is seizure-free from that of the sixth day when he has an attack? The neurophysiological and neurochemical events that lead up to this sixth day of the overt seizure would deserve at least equal attention as that which is being paid to the epileptogenic focus. The focus, after all, tends to be a more constant event rather than an intermittent one. Studies which deal with the cerebral environment in which the epileptogenic focus finds itself on different days would certainly be most valuable and would deserve a high priority. It bears repeating that the main problem in chronic epilepsy is not only the epileptogenic focus or the paroxysmal discharge, but the abnormal spread of electrical activity to other parts of the brain and/or the periphery. The presence of a focus

or diffuse bursts tends to lower the seizure threshold, but those factors which allow for spread are the ones that are in all probability related to the seizure propensity of the individual. As a crude analogy, one might point to the development of a forest fire. A lighted cigarette carelessly thrown away in the woods during a hot and dry summer will result in a fire, the extent of which will depend on the preceding length of absence of rain. The same lighted cigarette thrown away in the same location during the rainy season will extinguish itself harmlessly. Let us therefore not remain obsessed only with the cigarette or focus, but consider in much greater detail the state of the rest of the cerebral forest. The investigations of focal epilepsy have brought about great improvements in our concepts about the disorder, but they remain incomplete. One has to see the entire spectrum of the condition, ranging from the mildest cases to severely demented individuals who still occupy state hospital beds, in order to fully appreciate the complexity of the issue.

The differentiation of epilepsy into *idiopathic* and *symptomatic* has not been very fruitful in the past and has not been shown to be of prognostic significance. One of the reasons for this is probably the fact that the terms do not designate homogeneous groups. The word "idiopathic" is frequently used synonymously with genetic and at other times it refers to patients in whom no etiology can be found by careful history. The fact that no etiology is discernible by history does not necessarily mean that the patient could not have a "small but gross" lesion in one temporal lobe, which is discovered only incidentally, as a result of temporal lobectomy for seizure control. The word "symptomatic" implies that the etiology lies in some form of injury to the central nervous system, yet in a number of instances this "injury" is only a relatively minor accident which may have nothing whatsoever to do with the appearance of the seizure disorder. In other instances a definite family history of epilepsy is available in clearly symptomatic cases where there also has been undeniable brain injury. It is an open question to what extent the two elements conspired to produce a seizure disorder which may or may not respond to treatment. While brain injury lowers seizure threshold, it has not been shown that it affects seizure

propensity. This would explain why the same amount of injury will produce only isolated seizures in one individual and a severe intractable disorder in another.

The "constitutional" factor in epilepsy has of course long been recognized but has recently been rather neglected. Although we have at present no way of knowing what this constitutional factor is, it serves no purpose to deny its existence because research efforts will then be thwarted. Part of the reason for omitting the constitutional element from consideration seems to have been that the word has been equated by some authors with "hereditary." This is unfortunate because it narrows the term and suggests a mechanism which so far has not been proven to be operative in the great majority of patients. There is definite evidence that certain EEG abnormalities are inherited in a dominant mode. There is also definite evidence that patients who have these EEG abnormalities are likely to have a lowered threshold for seizure induction, but—and this is the important point—there is no evidence that these patients also have a propensity towards spontaneously recurring seizures. Siblings of epileptic patients—especially of those who have spike wave activity in their EEGs—have a high incidence of EEG abnormalities but only a very low incidence of overt recurrent convulsive seizures. It is clear that some additional factor must be operative in the epileptic patient on which he differs from his siblings. If we accept the concept that the resting EEG is related to seizure threshold rather than seizure propensity, we could explain also the occasional paradox where under treatment the EEG actually may become worse but the patient better.

Classifications of epilepsy based on presumed pathophysiological mechanisms are not likely to be useful in the immediate future because of our ignorance in regard to the really important basic factors. Until the time comes that we do have the necessary understanding, we shall probably be well advised to stay on a purely descriptive level of the clinical condition. Although the term "epilepsy" has nothing to commend itself—except usage through the ages—it seems to serve little purpose to coin new words at this time which suggest knowledge that is not available.

A distinction between patients with "epilepsy only" and "epi-

lepsy associated with cerebral damage" of varying degrees may sound on the surface like a resurrection of the idiopathic versus symptomatic classification. This is, however, not the case. The term "epilepsy only" means that the patient is healthy in all other respects to the best of our knowledge. It does not imply the presence or absence of presumed etiological factors or any pathophysiological mechanism. The patient who is classified as having epilepsy associated with mild, moderate, or severe cerebral damage has obviously more than one handicap. The term does not indicate that cerebral damage caused the seizures; it could be a result of them, or it may actually be independent of the seizure disorder. Although a distinction of this type would not necessarily yield a prognosis for seizure cessation, it could be useful in forecasting the patient's overall life achievements.

It has been pointed out that the chances for a patient to achieve complete seizure freedom rest mainly on the intensity of his seizure disorder and its duration. There is possibly some relationship between these aspects. A severe seizure disorder tends to be refractory to treatment by the time the neurologist sees the patient. The question arises, however, whether the severity could have been influenced by more intensive treatment at the very onset of the illness. The finding that 85 per cent of patients who are seen by a specialist within the first year of their illness achieve a terminal remission of at least two years is most impressive. Even more important is the observation that the results drop to 50 per cent after the first year. Combining these findings with Lund's observations that treatment results of the first three months herald the future course of the disorder, a strong case could be made that a maximum effort should be exerted to control seizures at the very onset. The medication regime should be adequate for the age and weight of the patient and rearranged with each successive seizure. There would seem to be no room for complacency in this regard. Follow-up appointments should initially be closely spaced, and comparison EEGs should be obtained at each visit.

The problem is, however, that at the present time we have no way of knowing whether a seizure in a child or adult will remain isolated or whether it represents the beginning of a chronic sei-

zure disorder. A differentiation of these two conditions would certainly be most important and specific matched control studies dealing with the total evaluation of patients immediately after their first seizures are indicated. All of the currently used anticonvulsants tend to have some side effects in a significant number of patients when given in adequate dosages. Their indiscriminate use therefore is not to be advocated, but hesitation to use them is equally dangerous if they are indeed capable of preventing an individual from becoming a chronic epileptic patient. This is a dilemma the physician faces today, and it is regrettable that there are so far no rigorous studies available that could provide us with guidelines in this respect.

We must not be satisfied with treatment results that lead to "improvement" but not to cessation of seizures. The fact that intelligence tends to decrease if the illness persists unchecked has to be taken into account. This is even more important when we recognize that the patients with an initially bright normal or superior intelligence quotient are more likely to suffer loss of intellectual functions. A basically bright person confronted with the fact of decreasing intellectual functions cannot help becoming a problem to himself or to society. These aspects of the epilepsy issue tend to be glossed over at the present time when we hear of improvement in seizure control that is being achieved by modern drugs. We have to continue to search for better treatment, by drugs or other methods, that will lead to complete cessation of attacks. While intellectual decrease is a most serious event at any stage of life, it becomes a virtual catastrophe if it occurs in childhood. The physician has been trained to regard conditions as emergencies where the life of the patient hangs in the balance. We can now save lives but we are woefully inadequate in saving that which makes us specifically human—namely, the intellect. The saving of intellectual functions will have to assume greater urgency than it has been given in the past. While this applies to all patients, it could perhaps be most clearly seen in the cases of infantile spasms-hypsarhythmia. A delay of treatment of a few *days* might make the difference between a child who will become either an inmate of a state institution or a self-sustaining citizen. This condition would surely

qualify for emergency measures in spite of the fact that life itself is not at stake. Inasmuch as the specialist does not tend to see these children until later in the course of their illness, by which time irrevocable damage is likely to have occurred, it becomes imperative that general practitioners and pediatricians who represent the first line of medical defense become thoroughly familiar with the diagnosis and its potential implications. Treatment, complex as it is, may well be left in the hands of the specialist provided he is called to the scene immediately and can see the child within a matter of a few hours.

While these comments dealt with the duration of the illness and its relationship to treatment response, there also appears to be a relationship between age at time of onset and the severity of the disorder. We have not been able to demonstrate in our own studies that patients whose seizures start before the age of three years develop necessarily a chronic intractable disorder. This does not rule out, however, that a more indirect relationship might exist. It could be postulated that a severe seizure disorder is likely to manifest itself early in life, but not every instance of epilepsy starting in childhood has to be of this severity. The child, as a result of maturational factors, has *a priori* a lower seizure threshold than the adult. He may therefore respond with a seizure to less provocation than the older individual. A milder seizure tendency may bring on clinical seizures in the child which may promptly respond to anticonvulsant medication. The seizure tendency apparently decreases with increasing age, and this may well be the reason why patients with "late onset epilepsy" and posttraumatic epilepsy of adult life seem to have relatively infrequent seizures. This concept could explain why different authors come to different opinions about the prognostic importance of age at time of onset of the illness. It could also explain the observation of our own investigations that children are somewhat more likely to show either complete seizure cessation or chronic disorders rather than occupying a middle position of some improvement as time goes on.

With epilepsy being a condition of such diverse clinical manifestations and markedly varying intensity, it is apparent that any general rule about what epileptic patients can or cannot do is

bound to be unjust. Each patient deserves careful individual attention in regard to his assets as well as his liabilities. Restrictions that have to be applied should not hold across the board for all patients, but should deal only with a particular individual at a particular time. They should be reevaluated periodically in regard to their continued need, with the goal being maximal opportunity in the presence of minimal risk. In actual practice this means that some epileptic patients can be leading essentially normal lives, while others may not be able to operate motor vehicles and work around dangerous machinery, while still others may need more or less constant supervision by members of the family or in a hospital environment.

This book has emphasized, as mentioned in the Foreword, the areas where progress has been slower than one might have been led to believe. This was done in order to point out our deficiencies and pave the way for a more rapid pace of accomplishments, but it does present a potential danger. There has been over the past several decades a progressive liberalization of rules and laws in regard to epilepsy. Many dedicated persons have spent a great deal of effort to remove the stigma that is still attached to this diagnosis. These efforts are most important and are just beginning to bear fruit in a variety of ways. The findings reported in this book should not be used to undermine them. Baseless pessimism in regard to the condition is at least equally as dangerous as false optimism. As long as we are unable to cure the majority of our epileptic patients, we should at least try to make their lot as easy as humanly possible, while persisting in our efforts directed toward the permanent eradication of the disorder. At the present time, epilepsy still represents just as great a challenge as it has throughout the ages. By fully recognizing this challenge and bringing to bear on it, in addition to the most modern equipment, our best scientific minds, we should be able to find the way that will lead not only to the permanent cure of those patients who already suffer from the illness, but also to its prevention.

APPENDIX

VARIABLES USED IN FIRST MEC FOLLOW-UP PROJECT CORRELATION MATRIX

INITIAL FINDINGS

Age
Sex
Physical Health
*Duration of Labor
*Forceps Delivery
*Birth Difficulty
Feeding Problems in Infancy
Colic in Infancy
Crying During First Year of Life
Patient's Weight Gain Progress in Infancy
*Activity During First Year of Life
Sitting Up Age
Walking Age
Talking Age
*Delayed Maturation
*Seizures Present During First Year of Life
*Highest Degree of Fever Attained
*Febrile Convulsions
Nonfebrile Convulsions in Infancy
*Bedwetting
Usual Childhood Diseases without Delirium
*Behavior Difficulties in School
*Academic Difficulties in School
Personality Disorder
Family History
Infantile convulsions without fever
*Epilepsy
*Diabetes

*Temporary psychiatric hospitalization
*Chronic alcoholism
Seizure Type
*Nonfocal major
*Focal major
*Minor focal motor
*Psychomotor
***Combination of Seizures**
***Prognosis for Seizure Control**
***Prognosis for Behavior Control**
***Prognosis for Academic Achievement**
Major Seizures
Duration since onset
Present since first year of life
*Frequency of occurrence
*Remission in the past
Clusters of seizures in one day
*Status epilepticus
Relationship of time of day to seizures
Occurring within two hours after awakening
Frequency of occurrence of aura
Loss of bladder control
*Duration of one attack
State of Consciousness During Seizure
Dazed
Completely unconscious
Not altered
Posture During Seizure
Falls suddenly
No movements observed
Patient stiff
Twitching or shaking
Facial Color During Seizure
Pale
Cyanotic
Prominent Symptoms of Seizure
Blank stare

Head turns to right
Swallowing motions
Vocalization
Right arm or hand twitching
Left face twitching
Left arm or hand twitching
Left leg twitching
Postictal State
Confusion
Sleep
Unilateral muscle weakness
Nausea
Minor Seizure
Duration since onset
Frequency of occurrence
Remission in the past
Clusters of seizures in one day
Status epilepticus
Clusters of seizures over several days, freedom from seizures for several weeks
Relationship of time of day to seizures
Frequency of occurence of aura
Loss of bladder control
Duration of one attack
Dazed
No aftereffects
***Social Factors Contributing to Illness**
Etiological Factors in Neurological History
***Objective Findings of Cerebral Pathology on Neurological Examination**
***Psychological Test Results**
Intellectual level
Immaturity
Neurotic tendencies
Psychotic tendencies
Personality disturbances
*Organic pathology suspected

***Age at Onset of Convulsive Disorder**
Duration of Illness
***Highest Rise of GTT From Fasting**
EEG
*Amount of abnormality
*Amount of seizure patterns
*Amount of focal abnormalities
*Amount of alpha activity
*Amount of theta activity
*Amount of fast activity
Generalized paroxysmal activity
Intervals between paroxysms
Amplitude of background rhythms, Left
Amplitude of background rhythms, Right
Main background frequency
Adequate Effort but No EEG Change with Hyperventilation
Final Diagnosis
Convulsive disorder
Psychiatric disorder in addition to diagnosis of epilepsy
Mental retardation in addition to diagnosis of epilepsy

FOLLOW-UP FINDINGS

EEG
*Amount of abnormality
*Amount of seizure patterns
*Amount of focal abnormalities
*Amount of alpha activity
*Amount of theta activity
*Amount of fast activity
Generalized paroxysmal activity
Intervals between paroxysms
Amplitude of background rhythms, Left
Amplitude of background rhythms, Right
Main background frequency
Adequate Effort but No EEG Change with Hyperventilation
Patient On or Off Anticonvulsant Medication

*Present Seizure State
*Behavior Problem
*Academic School Problem
Attending or Attended Regular School
Attending or Attended Special School
No Formal Education
*Average Marks
Grade Failure
*Institutionalized

*The variables marked by asterisk were used in the factor analysis.

VARIABLES USED IN SECOND MEC FOLLOW-UP PROJECT CORRELATION MATRIX

INITIAL FINDINGS

*Sex
Physical Health
Difficulty During Pregnancy of the Mother
Duration of Pregnancy
Duration of Labor
*Birth Weight
*Condition of Child at Birth
Birth Cry
Condition of Patient's Head at Birth
*Birth Difficulty
Feeding Problems in Infancy
Colic in Infancy
Activity During First Year of Life
*Seizures Present During First Year of Life
*Sitting Up Age
Walking Age
*Talking Age
Toilet Training
Dry at Night
Highest Degree of Fever Attained
*Febrile Convulsions
Nonfebrile Convulsions in Infancy
*Bedwetting
*Behavior Difficulties in School
Amount of Schooling
*Attending or Attended Special School
Average Grades

***History of Personal Relations During Adolescence**
Family History
*Stillbirth
*Early infantile deaths
*Infantile convulsions with fever
*Infantile convulsions without fever
*Epilepsy
*Diabetes
*Chronic alcoholism
Seizure Type
*Nonfocal major
*Focal major
*Minor focal motor
*Psychomotor
*Absence
***Combination of Seizures**
Etiology of Seizures
*Unknown
*Birth injury
Postnatal head injury
*Cerebral infection
*Mixed hereditary and external cause
*Hereditary cause only
Prognosis for Seizure Control
Prognosis for Behavior Control
Prognosis for Academic Achievement
Adequacy of Medication Regime in the Past
Never Treated Before
***Patient's Initial Response to Adequate Amount of Anticonvulsants**
***Duration of Seizure Disorder**
Major Seizure
*Frequency of occurrence, Maximal
*Frequency of occurrence at present
*Remission in the past
*Clusters of seizures in one day
*Status epilepticus

Relation of menses to seizure
EEG
*Amount of abnormality
*Amount of seizure patterns
*Amount of focal abnormalities
Amount of alpha activity
Amount of theta activity
Amount of fast activity
Right temporal focus
Left temporal focus
Focus consists of theta discharge
Focus consists of complex discharge
*Focus consists of sharp wave or spike
*Generalized paroxysmal activity
*Amount of spike wave activity
*Amplitude of background rhythms, Left
Main background frequency
***Social Factors Contributing to Illness**
***Objective Findings of Cerebral Pathology in Neurological Examination**
Psychological Test Results
*Immaturity
*Neurotic tendencies
*Psychotic tendencies
*Personality disturbances
***Final Diagnosis Psychiatric Disorder in Addition to Diagnosis of Epilepsy**
***Organic Brain Pathology Suspected on Bender-Gestalt Test**
Rotation of 45 Degrees or More on Bender-Gestalt Test
***Verbal IQ Score**
***Performance IQ Score**
***Full Scale IQ Score**
***Difference Between Verbal and Performance Score**

FOLLOW-UP FINDINGS

***Age**
Seizure Type

Nonfocal Major
Focal Major
Minor Focal Motor
Psychomotor
Absence
Combination of Seizures
°**Adequacy of Medication Regime in the Past**
Response to Adequate Amount of Anticonvulsant Medications
Change in Number of Seizure Types
Remission at Present for Major Seizures
°**Remission in the Past for Major Seizures**
Remission at Present for Minor Seizures
Remission in the Past for Minor Seizures
°**Remote Memory**
°**Recent Memory**
°**Serial 7 Subtractions**
°**Proverb Interpretation**
Egocentric or Bizarre Interpretation
°**Organic Mental Changes**
Difficulty Concentrating
°**Personality Problem**
Sociopathic Behavior and/or Antisocial Behavior in P.I.
Depression
Destructive or Assaultive Behavior
EEG
°Amount of abnormality
°Amount of seizure patterns
°Amount of focal abnormalities
°Amount of alpha activity
°Amount of theta activity
°Amount of fast activity
°Right temporal focus
°Left temporal focus
Focus consists of theta discharge
°Focus consists of complex discharge
°Focus consists of sharp wave or spike
°Generalized paroxysmal activity

*Amount of spike wave activity
*Amplitude of background rhythms, Left
Amount of nonparoxysmal buildup, HV
Amount of paroxysmal buildup, HV
*Amount of photic driving at low flash rates
*Amount of photic driving at medium flash rates
*Amount of photic driving at high flash rates
Main background frequency
Abnormalities improved or deteriorated
*Organic Brain Pathology Suspected on Bender-Gestalt Test
Rotation of 45 Degrees or More on Bender-Gestalt Test
*Verbal IQ Score
*Performance IQ Score
*Full Scale IQ Score
*Difference Between Verbal and Performance Score
Verbal Scale Score Difference Between Evaluation I and II: Worse
Verbal Scale Score Difference Between Evaluation I and II: Better
Performance Scale Score Difference Between Evaluation I and II: Worse
Performance Scale Score Difference Between Evaluation I and II: Better
Interval Between Two Visits
Handedness
*Present Seizure State
Patient On or Off Anticonvulsant Medication
*Behavior Problem
Academic School Problem
Attending or Attended Special School
Average Marks in Regular School
*Gainfully Employed
Housewife Performing Duties Adequately
*Overall Condition of Patient

*Variables carrying asterisk were used for factor analysis.

VARIABLES USED IN SECOND MEC FOLLOW-UP PROJECT

F-TESTS

Age
Physical Health
Duration of Labor
Birth Weight
Condition of Child at Birth
Length of Time Till Mother Saw Child after Delivery
Feeding Problems in Infancy
Crying During First Year of Life
Activity During First Year of Life
Sitting Up Age
Walking Age
Talking Age
Toilet Training
Age at Which Dry at Night
Highest Degree of Fever Attained
Duration of Fever over 104 Degrees
Amount of Schooling
Average Grades
School Truancy
Personal Relationships During Adolescence
Etiology
Birth injury
Cerebral infection
Mixed hereditary and external cause
Hereditary cause only
Major Seizures
Duration since onset

Frequency of maximal occurrence
Frequency of occurrence at present
Remission in the past
Clusters of seizures in one day
Status epilepticus
Clusters of seizures over several days, freedom for several weeks
Relationship of time of day to seizures
Relation of menses to seizures
Frequency of occurrence of aura
Loss of bladder control
Tongue biting
Injuries sustained during attack
Duration of one attack

Minor Seizures

Duration since onset
Frequency of maximal occurrence
Frequency of occurrence at present
Remission in the past
Clusters of seizures in one day
Clusters of seizures over several days, freedom for several weeks
Relationship of time of day to seizures
Frequency of occurrence of aura
Duration of one attack

Combination of Seizures

Initial Response to Anticonvulsant Medications— 1-3 Months

Subsequent Response to Anticonvulsant Medications— 3 Months-1 Year

Subsequent Response to Anticonvulsant Medications— 1 Year and after

Seizure Pattern Change after Anticonvulsant Treatment

EEG

Amount of abnormality, waking record
Amount of abnormality, waking and sleep record
Amount of seizure patterns

Amount of focal abnormalities
Amount of alpha activity
Amount of theta activity
Amount of fast activity
Amount of diffuse delta activity
Amount of paroxysmal activity
Left background rhythms amplitude
Right background rhythms amplitude
Main background frequency
Wechsler IQ
Verbal Scale
Performance Scale
Full Scale
Information
Comprehension
Arithmetic
Similarities
Digit Span
Vocabulary
Digit Symbol
Picture Completion
Picture Arrangement
Block Design
Object Assembly
Organic Brain Pathology Suspected from Bender-Gestalt Test
Forty-five Degree or More Rotation of Bender-Gestalt Figures
Psychological Tests
Immaturity
Neurotic tendencies
Psychotic tendencies
Personality disturbances
Organic pathology suspected
Social Factors Contributing to Illness
Laboratory Findings Summary
Objective Findings of Cerebral Pathology on Neurological Examination
Etiological Factors Summary

Prognosis for Seizure Control
Prognosis for Behavior Control
Prognosis for Academic Functions
Follow-Up Results
Present seizure state
Behavior problem
Academic school problem
Average marks
Overall condition of patient

VARIABLES FROM SECOND MEC FOLLOW-UP PROJECT

CHI SQUARE TESTS

Sex
Pregnancy Complications
Marked nausea and vomiting
Labor Complications
Forceps delivery
Birth cry, induced versus spontaneous
Colic in Infancy
Attended Special School
Seizures Present During First Year of Life
Birth Difficulty
Febrile Convulsions
Bedwetting
Behavior Difficulties in School
Academic Difficulties in School
Severe Infectious Disease
Severe Head Injury with Unconsciousness
Neurotic Symptoms
Personality Disorder
Family History
Stillbirths
Breech deliveries
Multiple births
Early infantile deaths
Congenital defects
Mental retardation
Temper tantrums
Behavior problems

Academic school problems
Meningitis
Bedwetting
Breathholding spells
Infantile convulsions with fever
Infantile convulsions without fever
Epilepsy
Fainting spells
Severe chronic headache
Chorea
Diabetes
Excessive nervousness
Nervous breakdown
Temporary psychiatric hospitalization
State hospitalization
Chronic alcoholism
Abortions or miscarriages
Etiology Unknown
Seizure Type
Nonfocal major
Focal major
Minor focal motor
Psychomotor
Absence
Major Seizures
Present since first year of life
Occurring at night during sleep
Precipitating event—Nonspecific excitement
Precipitating event—Emotional stress
Precipitating event—Omission of anticonvulsant medications
Posture during attack—Slides gradually to ground
Posture during attack—Falls suddenly
Muscular action during attack—Classic tonic and clonic phase
Muscular action during attack—Patient stiff
Muscular action during attack—Twitching or shaking
Facial color during attack—Pale
Facial color during attack—Cyanotic

Eyes rolled up during attack
Postictal state—Fatigue
Postictal state—Headache
Postictal state—Confusion
Postictal state—Sleep
Postictal state—Nausea
Prominent feature of attack—Salivation
Prominent feature of attack—Vocalization
Prominent feature of attack—Right side twitching
Prominent feature of attack—Left side twitching
Minor Seizures
Occurring within 2 hours of awakening
Emotional stress as precipitating event
Consciousness during attack—Not altered
Consciousness during attack—Hears, but cannot respond
Consciousness during attack—Dazed
Consciousness during attack—Completely unconscious
Posture during attack—Not altered
Postictal state—No aftereffects
Postictal state—Sleep
Feature of attack—Random wandering around
Adequacy of Medication Regime in the Past
Reason for Referral—Emotional or behavior problems
Diagnosis of Psychiatric Disorder in Addition to Diagnosis of Epilepsy
Psychiatric Treatment Recommended
EEG
Right temporal focus
Left temporal focus
Type of discharge—Sharp wave or spike
Forty-five Degree Rotation in Any Figure on Bender-Gestalt Test
Follow-Up Results
Takes anticonvulsant medication
Attending regular school
Attending special school
Grade failure
Gainfully employed

ESTIMATED PROBABILITY OF CORRECT CLASSIFICATION (2 GROUPS)

DIFFERENCES BETWEEN DISCRIMINANT FUNCTIONS	PROBABILITY
.00	.50
.04	.51
.08	.52
.12	.53
.16	.54
.20	.55
.24	.56
.28	.57
.32	.58
.36	.59
.40	.60
.45	.61
.49	.62
.53	.63
.57	.64
.62	.65
.66	.66
.71	.67
.75	.68
.80	.69
.85	.70
.89	.71
.94	.72
.99	.73
1.04	.74
1.10	.75
1.15	.76
1.21	.77
1.26	.78
1.32	.79
1.39	.80
1.45	.81
1.52	.82
1.58	.83

1.66	.84
1.73	.85
1.81	.86
1.90	.87
1.99	.88
2.09	.89
2.20	.90
2.31	.91
2.44	.92
2.59	.93
2.75	.94
2.94	.95
3.18	.96
3.48	.97
3.89	.98
4.59	.99

CONSTANTS AND WEIGHTS FOR PREDICTING INPATIENT TREATMENT RESULTS

	Discriminate Function I								
	1	2	3	4	5	6	7	8	9
Constant	−17.48								
Injuries during seizures	−0.41	−0.82	−1.23	−1.64	−2.05	NA	NA	NA	NA
Combination of seizures	−0.39	−0.78	−1.17	−1.56	1.95	−2.34	−2.73	−3.12	−3.51
Psychomotor seizures	6.08	12.16	NA	NA	NA	NA	NA	NA	NA
Duration of seizure disorder	2.85	5.70	8.55	11.40	14.25	17.10	19.95	22.80	25.65
Frequency of occurrence of seizures at present	0.56	1.12	1.68	2.24	2.80	3.36	3.92	4.48	5.04
Cluster of seizures for several days, freedom from seizures for several weeks	0.77	1.54	2.31	3.08	3.85	NA	NA	NA	NA
Amount of EEG abnormality	1.57	3.14	4.71	6.28	7.85	NA	NA	NA	NA
Seizure patterns in EEG	0.09	0.18	0.27	0.36	0.45	NA	NA	NA	NA

	Discriminate Function II								
	1	2	3	4	5	6	7	8	9
Constant	−24.01								
Injuries during seizures	−0.02	−0.04	−0.06	−0.08	−0.10	NA	NA	NA	NA
Combination of seizures	0.06	0.12	0.18	0.24	0.30	0.36	0.42	0.48	0.54
Psychomotor seizures	6.25	12.50	NA	NA	NA	NA	NA	NA	NA
Duration of seizure disorder	2.92	5.84	8.76	11.68	14.60	17.52	20.44	23.36	26.28
Frequency of occurrence of seizures at present	1.02	2.04	3.06	4.08	5.10	6.12	7.14	8.16	9.18
Cluster of seizures for several days, freedom from seizures for several weeks	0.90	1.80	2.70	3.60	4.50	NA	NA	NA	NA
Amount of EEG abnormality	1.78	3.56	5.34	7.12	8.90	NA	NA	NA	NA
Seizure patterns in EEG	0.21	0.42	0.63	0.84	1.05	NA	NA	NA	NA

NA = Not Applicable

CONSTANTS AND WEIGHTS FOR PREDICTING OUTPATIENT TREATMENT RESULTS

	Discriminate Function I								
	1	2	3	4	5	6	7	8	9
Constant	−17.81								
Combination of seizures	−0.84	−1.68	−2.52	−3.36	−4.20	−5.04	−5.88	−6.72	−7.56
Clusters of seizures for several days, freedom from seizures for several weeks	−1.25	−2.50	−3.75	−5.00	−6.25	NA	NA	NA	NA
Injuries during seizures	1.25	2.50	3.75	5.00	6.25	NA	NA	NA	NA
Psychomotor seizures	9.48	18.96	NA	NA	NA	NA	NA	NA	NA
Duration of seizure disorder	1.92	3.84	5.76	7.68	9.60	11.52	13.44	15.36	17.28
Frequency of occurrence of seizures at present	1.35	2.70	4.05	5.40	6.75	8.10	9.45	10.80	12.15
Amount of EEG abnormality	2.46	4.92	7.38	9.84	12.30	NA	NA	NA	NA
Seizure patterns in EEG	0.40	0.80	1.20	1.60	2.00	NA	NA	NA	NA

	Discriminate Function II								
	1	2	3	4	5	6	7	8	9
Constant	−30.28								
Combination of seizures	−0.27	−0.54	−0.81	−1.08	−1.35	−1.62	−1.89	−2.16	−2.43
Clusters of seizures for several days, freedom from seizures for several weeks	−1.57	−3.14	−4.71	−6.28	−7.85	NA	NA	NA	NA
Injuries during seizures	1.92	3.84	5.76	7.68	9.60	NA	NA	NA	NA
Psychomotor seizures	11.37	22.74	NA	NA	NA	NA	NA	NA	NA
Duration of seizure disorder	2.60	5.20	7.80	10.40	13.00	15.60	18.20	20.80	23.40
Frequency of occurrence of seizures at present	1.66	3.32	4.98	6.64	8.30	9.96	11.62	13.28	14.94
Amount of EEG abnormality	2.20	4.40	6.60	8.80	11.00	NA	NA	NA	NA
Seizure patterns in EEG	1.36	2.72	4.08	5.44	6.80	NA	NA	NA	NA

NA = Not Applicable

DISTRIBUTION OF AGE AT DEATH FOR ALL INDIVIDUALS AND FOR THOSE WITH EPILEPSY MENTIONED ON DEATH CERTIFICATES*

	Total	*Infants*	*1–4*	*5–9*	*10–14*	*15–19*	*20–24*	*25–29*	*30–34*	*35–39*
1960 Total Deaths	67,912	4,702	716	389	302	475	524	529	760	1,110
Epilepsy Deaths	81	1	7	7	2	3	6	3	11	10
1961 Total Deaths	67,375	4,604	677	403	273	478	527	454	718	1,143
Epilepsy Deaths	74	—	4	3	4	3	5	6	5	5
1962 Total Deaths	70,049	4,367	609	372	319	450	521	483	700	1,084
Epilepsy Deaths	95	2	2	1	4	8	5	5	9	9
1963 Total Deaths	72,438	4,150	628	398	309	580	596	542	733	1,204
Epilepsy Deaths	91	—	5	2	5	7	5	14	8	9
1964 Total Deaths	72,129	4,043	615	408	340	652	691	544	790	1,161
Epilepsy Deaths	97	1	3	4	8	5	9	4	10	15
1965 Total Deaths	73,665	3,936	596	375	338	672	705	574	753	1,186
Epilepsy Deaths	109	1	1	4	7	3	6	10	6	14
1966 Total Deaths	74,596	3,751	629	418	403	760	766	681	710	1,142
Epilepsy Deaths	119	1	3	2	2	5	7	9	5	11

* Courtesy Michigan Department of Public Health, Vital Records Section

40–44	*45–49*	*50–54*	*55–59*	*60–64*	*65–69*	*70–74*	*75–79*	*80–84*	*85–89*	*90 and Over*	*Median Age At Death*
1,742	2,604	3,650	4,855	6,184	8,130	9,049	8,595	6,934	4,386	2,276	68.3
5	6	3	5	—	5	1	1	2	3	—	35.2
1,670	2,570	3,501	4,703	6,142	7,976	9,070	8,629	6,980	4,481	2,376	68.7
12	3	3	7	4	3	3	1	2	—	1	40.8
1,742	2,623	3,698	4,891	6,396	8,331	9,484	9,189	7,390	4,809	2,591	69.1
7	9	8	8	5	4	3	3	2	—	1	41.8
1,822	2,679	3,858	5,090	6,422	8,437	9,792	9,550	7,873	5,041	2,734	69.3
7	6	2	6	2	4	5	3	1	—	—	34.7
1,875	2,751	3,874	5,086	6,451	8,038	9,760	9,620	7,881	4,943	2,606	69.2
6	3	4	5	3	4	7	3	2	1	—	36.5
1,948	2,824	3,936	5,126	6,576	8,163	9,721	10,010	8,234	5,180	2,812	69.5
7	11	7	8	8	6	4	2	4	—	—	41.8
1,983	2,851	4,108	5,253	6,736	7,986	9,905	10,061	8,502	5,160	2,896	69.5
21	8	9	10	8	5	4	3	2	4	—	43.5

CONSTANTS AND WEIGHTS FOR PREDICTING INTELLECTUAL LOSS

	Discriminate Function I								
	1	2	3	4	5	6	7	8	9
Constant	−79.22								
Frequency of occurrence of seizures at present	−1.60	−3.20	−4.80	−6.40	−8.00	−9.60	−11.20	−12.80	−14.40
Combination of seizures	5.85	11.70	17.55	23.40	29.25	35.10	40.95	46.80	52.65
Clusters of seizures for several days, freedom from seizures for several weeks	3.01	6.02	9.03	12.04	15.05	NA	NA	NA	NA
EEG background amplitude	2.92	5.84	8.76	11.68	14.60	17.52	20.44	23.36	26.28
Organic pathology suspected from *psychological* tests	9.22	18.44	27.66	36.88	46.10	NA	NA	NA	NA
Social factors contributing to illness	4.01	8.02	12.03	16.04	20.05	NA	NA	NA	NA
Full Scale IQ	0.99	(Always Multiply by Actual Full Scale Figure)							

	Discriminate Function II								
	1	2	3	4	5	6	7	8	9
Constant	−71.88								
Frequency of occurrence of seizures at present	−1.53	−3.06	−4.59	−6.12	−7.65	−9.18	−10.71	−12.24	−13.77
Combination of seizures	4.99	9.98	14.97	19.96	24.95	29.94	34.93	39.92	44.91
Clusters of seizures for several days, freedom from seizures for several weeks	2.19	4.38	6.57	8.76	10.95	NA	NA	NA	NA
EEG background amplitude	3.20	6.40	9.60	12.80	16.00	19.20	22.40	25.60	28.80
Organic pathology suspected from psychological tests	9.79	19.58	29.37	39.16	48.95	NA	NA	NA	NA
Social factors contributing to illness	3.42	6.84	10.26	13.68	17.10	NA	NA	NA	NA
Full Scale IQ	0.93	(Always Multiply by Actual Full Scale Figure)							

NA = Not Applicable

NAME:_____

LAFAYETTE CLINIC INPATIENT EPILEPSY REVIEW—DR. RODIN

PROJECT 116
Coding Sheets

CARD 6

DATE OF EXAMINATION

1–2 ☐☐ Month
4–5 ☐☐ Day
7–8 ☐☐ Year

10 REFERRING SOURCE

0 Not recorded
1 Private M.D.
2 Agency other than State Hospital
3 Court or Police
4 Caro State Hospital
5 Northville State Hospital
6 Pontiac State Hospital
7 Ypsilanti State Hospital
8 Traverse City/Kalamazoo State Hospital
9 Lapeer/Plymouth State Hospital

12 RACE

0 Not recorded
1 White
2 Negro
3 American Indian
4 Mexican
5 Oriental
6
7
8
9

*14 BIRTH ORDER (*For 9 or more, Code as 9*)

☐

16 MAIN REASON FOR ADMISSION

0 Not recorded
1 Seizure control
2 Behavior control
3 Teaching or research purposes

* Asterisks indicate variables that were used in data analysis.

PATIENT'S GENERAL PAST MEDICAL AND PSYCHIATRIC HISTORY
(Check the boxes which are applicable. Code "0" for items on which no information.)

18 ☐ First born twin or other multiple birth
20 ☐ Second, third, or fourth multiple birth
*22 ☐ Delayed maturation
24 ☐ Breathholding spells
*26 ☐ Febrile convulsions (isolated episodes not directly related to current seizure disorder)
*28 ☐ Nonfebrile convulsions (isolated episodes not directly related to current seizure disorder)
30 ☐ Atypical spells: _____
*32 ☐ Bedwetting
*34 ☐ Neurotic symptoms: _____
*36 ☐ Psychotic symptoms: _____
*38 ☐ Personality disorder: _____
*40 ☐ Police record: _____

FAMILY HISTORY
(Check the boxes which are applicable. If no family history available, cross out entire section. Omit questionable data.)

STILLBIRTHS

*42 ☐ Male
*44 ☐ Female
46 ☐ Paternal side of family
*48 ☐ Maternal side of family
*50 ☐ More than one in family
*52 ☐ Sex unknown

State relationship to patient:

_____

EARLY INFANTILE DEATHS

*54 ☐ Male
*56 ☐ Female
*58 ☐ Paternal side of family
*60 ☐ Maternal side of family
*62 ☐ More than one in family
*64 ☐ Sex unknown

State relationship to patient:

_____

66–70 ☐☐☐☐☐ Lafayette Clinic inpatient number
71–78 Leave blank
79–80 [0][6] Card number

CARD 7 FAMILY HISTORY (*cont'd*)

TWINS

*2 ☐ Male
*4 ☐ Female
*6 ☐ Paternal side of family
*8 ☐ Maternal side of family
*10 ☐ More than one in family

State relationship to patient:

_____

CONGENITAL MALFORMATIONS

12 ☐ Male
14 ☐ Female
16 ☐ Paternal side of family
18 ☐ Maternal side of family
20 ☐ More than one in family

State relationship to patient:

_____

Type: _____

MENTAL RETARDATION

*22 ☐ Male
*24 ☐ Female
*26 ☐ Paternal side of family
*28 ☐ Maternal side of family
30 ☐ More than one in family

State relationship to patient:

_____

BREATHHOLDING SPELLS

32 ☐ Male
34 ☐ Female
36 ☐ Paternal side of family
38 ☐ Maternal side of family
40 ☐ More than one in family

State relationship to patient:

_____

INFANTILE FEBRILE CONVULSIONS

*42 ☐ Male
*44 ☐ Female
*46 ☐ Paternal side of family
*48 ☐ Maternal side of family
50 ☐ More than one in family

State relationship to patient:

_____

EPILEPSY

*52 ☐ Male
*54 ☐ Female
*56 ☐ Paternal side of family
*58 ☐ Maternal side of family
*60 ☐ More than one in family

State relationship to patient:

_____

61–65 Leave blank
66–78 Duplicate these columns from original data on Card 6.
79–80 [0][7] Card number

CARD 8

OTHER NEUROLOGICAL DISEASES

*2 ☐ Male
*4 ☐ Female
*6 ☐ Paternal side of family
*8 ☐ Maternal side of family
*10 ☐ More than one in family

State relationship to patient:

_____

Specify type

_____

DIABETES

*12 ☐ Male
*14 ☐ Female
*16 ☐ Paternal side of family
*18 ☐ Maternal side of family
*20 ☐ More than one in family

State relationship to patient:

_____

PSYCHIATRIC DISORDERS

*22 ☐ Male
*24 ☐ Female
*26 ☐ Paternal side of family
*28 ☐ Maternal side of family
*30 ☐ More than one in family

State relationship to patient:

_____

Specify type

_____

SCHOOL HISTORY

*32 AMOUNT OF SCHOOLING

(Code only when education completed)

[0] Not recorded
[1] No formal schooling
[2] Attended grade school; did not complete 8th grade
[3] Attended grade school; graduated 8th grade
[4] Attended high school; not graduated
[5] Graduated from high school
[6] Attended college; not graduated
[7] Graduated from college; include in "college" any recognized formal post-high school
[8] Graduate school
[9] Doctoral degree

*34 ATTENDING OR ATTENDED SPECIAL SCHOOL

[0] Not recorded
[1] No
[2] Yes

*36 ATTENDING OR ATTENDED REGULAR SCHOOL

[0] Not recorded
[1] No
[2] Yes

*38 AVERAGE GRADES

[0] Not recorded
[1] Unsatisfactory and grade failure
[2] Unsatisfactory but no grade failure
[3] Average
[4] Somewhat above average
[5] Superior or honor student

*40 USE OF ALCOHOL BY PATIENT

[0] Not recorded
[1] Abstinent
[2] Social drinker
[3] One or more drinks per day
[4] Chronic alcoholism without DTs or Korsakoff's syndrome
[5] Chronic alcoholism with DTs or Korsakoff's syndrome

TYPE (S) OF CLINICAL SEIZURES PRESENT

*42 ☐ *Grand Mal Seizure, nonfocal:* No aura, loss of consciousness, falling, tonic phase, clonic phase, followed by sleep, some disorientation and memory loss.

*44 ☐ *Grand Mal Seizure, focal onset:* Either subjective aura, or head and neck turning to one side, or twitching of one side of the face or part of an extremity, loss of consciousness, tonic phase, clonic phase, sleep; on recovery possible weakness of one extremity or pronounced disorientation and memory loss.

*46 ☐ *Grand Mal Seizure* but history inadequate to differentiate between focal or nonfocal onset.

*48 ☐ *Grand Mal Variant Seizure—Nonfocal:* Loss of consciousness, falling, some twitching or shaking, no well-defined tonic and clonic phase like in classical grand mal, there may or may not be sleep afterward.

*50 ☐ *Grand Mal Variant—Focal onset:* Subjective aura, or head and neck turning to one side or twitching of one side of the face or twitching of one part of an extremity, loss of consciousness, falling, no tonic and clonic phase as in classical grand mal; some twitching or shaking, or merely generalized rigidity, there may or may not be sleep afterward.

*51 ☐ *Minor Motor Focal Seizure:* Consciousness may be retained or lost, no falling, patient feels weak and sits down or remains standing, twitching of one or more extremities, or twitching of the face, no Jacksonian march, may or may not sleep afterward.

*52 ☐ *Minor Motor Nonfocal Seizure:* Consciousness clouded, bilaterally symmetrical tonic extension or flexion of arms. There may be twitching but no definite jerking. May be confused afterwards, usually does not sleep. Retains posture or staggers.

53 ☐ *Minor Motor or Sensory Seizure with Jacksonian March:* Twitching and/or numbness starting in one discreet area (face, hand, leg) spreading in typical Jacksonian type of march.

*54 ☐ *Automatism (Psychomotor):* There may or may not be subjective aura, consciousness lost, posture retained, purposeless coordinated behavior which is inappropriate at that moment; when coming out of the seizure, patient is disoriented and may be belligerent, may or may not sleep, but sleep unlikely.

55 ☐ *Psychic or Sensory Seizure:* Subjective sensation on part of patient with no overt motor manifestations which occur suddenly and are not related to the situation the patient finds himself in; no loss of consciousness, no falling, no longer than about 15 minutes—usually only 1 to 2 minutes—usually no sleep afterward.

56 ☐ *Confusional State:* Confused and/or disoriented behavior lasting from several minutes to several hours, which is not preceded nor followed by a seizure.

*57 ☐ *Absence:* Consciousness lost, staring expression, posture unchanged, continues with activities as soon as seizure is over at precisely the point at which he had been interrupted as a result of the seizure, and no sleep after seizure.

*58 ☐ *Absence with features of slight automatism:* Some chewing or other slight repetitive activity.

*59 ☐ *Absence with features of mild myoclonic activity:* Blinking of eyelids, slight jerking of head or hands.

60 ☐ *Myoclonic Seizure:* Clouding of consciousness, posture may be retained, twitching of eyelids, back and fro movements of the head (nodding type), and bilaterally symmetrical jerking of arms and/or legs, no aftereffects.

*61 ☐ *Myoclonic Jerks:* Isolated irregular jerks of one extremity with no change in consciousness and no loss of posture.

*62 ☐ *Akinetic Seizure:* Loss of consciousness and postural tone, patient gets up immediately after falling and has no other symptoms.

*63 ☐ *Temporal Lobe Components to Seizure Pattern:* (Check this box regardless how many other boxes have been checked if it is applicable—it serves as a summary column).

64 ☐ *Difficult to Classify*

65 Leave blank

66–78 Duplicate these columns from original data on Card 6.

79–80 [0][8] Card number

CARD 9 ONSET OF SEIZURES

AGE AT TIME OF FIRST SEIZURE

*1–3 ☐☐☐ Months

AGE AT ONSET OF RECURRENT SEIZURES

*5–7 ☐☐☐ Months

TOTAL DURATION OF ILLNESS PRIOR TO HOSPITALIZATION

*9–10 ☐☐ Years

REMISSION IN SEIZURE DISORDER

*12–13 ☐☐ Years

*15 COMBINATION OF SEIZURES

(The even numbers are to be checked if the patient has focal grand mal seizures and sometimes in addition auras only. The aura would then not represent a second seizure type. The scale would be marked on number 2. If there are focal grand mal seizures and psychomotor automatisms and auras only, the scale would be marked at 4, etc.)

[0] Not recorded
[1] 1 seizure type only
[2]
[3] 2 seizure types
[4]
[5] 3 seizure types
[6]
[7] 4 seizure types
[8]
[9] More than four seizure types

ETIOLOGY OF SEIZURES

*17 ☐ UNKNOWN (Check only if none of the other columns apply and adequate history available—place "0" in box if history inadequate.)

*19 PRENATAL OR PERINATAL INJURY

[0] Not recorded
[1] Absent
[2] Questionable
[3] Probable
[4] Very likely
[5] Definite

*21 POSTNATAL HEAD INJURY

[0] Not recorded
[1] Absent
[2] *Mild:* marked bruise or laceration, but no aftereffects.
[3] *Moderate:* marked bruise or laceration with or without skull fracture, no unconsciousness, but may have been momentarily dazed. Some aftereffects like vomiting or dizziness for a few days.
[4] *Marked:* injury associated with unconsciousness for a period of less than 5 minutes.
[5] *Severe:* injury associated with unconsciousness for more than 5 minutes.

*23 CEREBRAL INFECTION

[0] Not recorded
[1] Absent
[2] Questionable
[3] Probable
[4] Very likely
[5] Definite

*25 OTHER SIGNIFICANT EXTERNAL CAUSES

[0] Not recorded
[1] Absent
[2] Questionable
[3] Probable
[4] Very likely
[5] Definite. Specify: _____

*27 MIXED HEREDITARY AND EXTERNAL CAUSE

[0] Not recorded
[1] Absent
[2] Questionable
[3] Probable
[4] Very likely
[5] Definite

*29 HEREDITARY CAUSE ONLY

(A family includes 2nd cousins, great-aunts, and great-uncles, but not great-grandparents. If column 27 is checked this column becomes "0"—not recorded.)

- [5] Not recorded
- [1] *Absent:* no family history of infantile convulsions or epilepsy.
- [2] *Questionable:* one other family member had isolated infantile convulsions.
- [3] *Probable:* several other family members had infantile convulsions or one close relative had epilepsy.
- [1] *Very likely:* several family members had infantile convulsions and one other had epilepsy.
- [5] *Definite:* two or more family members had epilepsy.

SPECIFIC SEIZURE HISTORY

31 MOST DIFFICULT PROBLEM

- [0] Not recorded
- [1] Major seizures
- [2] Minor seizures

TYPE OF SEIZURE

33-34 [ ][ ] (Indicate the type of seizure by noting the IBM column numbers which appear on Card 8, columns 42-62.)

CURRENT SEIZURE PRESENT SINCE FIRST YEAR OF LIFE

*36-38 [ ][ ][ ] Months

*40 DURATION OF THIS PARTICULAR SEIZURE TYPE

- [0] Not recorded
- [1] Less than 1 month
- [2] 1–2 months
- [3] 3–6 months
- [4] 7–11 months
- [5] 1–3 years
- [6] 4–6 years
- [7] 7–9 years
- [8] 10–15 years
- [9] More than 15 years

*42 FREQUENCY OF MAXIMAL OCCURRENCE OF SEIZURES

- [0] Not recorded
- [1] Less than once a year
- [2] About once a year
- [3] 2-3 seizures a year
- [4] 4–6 seizures a year
- [5] 7–12 seizures a year
- [6] Once a month
- [7] 2–3 a month
- [8] Once a week
- [9] Several a week

*44 FREQUENCY OF OCCURRENCE AT PRESENT

[0] Not recorded
[1] Less than once a year
[3] About once a year
[3] 2–3 seizures a year
[4] 4–6 seizures a year
[3] 7–12 seizures a year
[3] Once a month
[7] 2–3 a month
[8] Once a week
[3] Several a week

*46 IN REMISSION AT PRESENT

[0] Not recorded
[1] Absent
[2] Remission lasted 1 year
[3] Remission lasted 1–2 years
[4] Remission 2–3 years
[5] Remission 3–5 years
[6] Remission 5–7 years
[7] Remission 7–10 years
[0] Remission 10–15 years
[0] More than 15 years

*48 REMISSION IN THE PAST

[0] Not recorded
[1] Never
[0] Up to 1 year
[3] 1–2 years
[4] 3–5 years
[5] 6–8 years
[6] 9–11 years
[7] 12–14 years
[8] 15–20 years
[9] More than 20 years

*50 CLUSTERS OF SEIZURES IN ONE DAY

[0] Not recorded
[1] Never
[2] Rarely
[3] Occasionally
[4] Frequently
[5] Usually

*52 STATUS EPILEPTICUS

[0] Not recorded
[1] Never
[2] Rarely
[3] Occasionally
[4] Frequently
[5] Usually

*54 CLUSTERS OF SEIZURES OVER SEVERAL DAYS THEN FREEDOM FOR WEEKS

- [0] Not recorded
- [1] Never
- [2] Rarely
- [3] Occasionally
- [4] Frequently
- [5] Usually

*56 FREQUENCY OF OCCURRENCE OF AURA

- [0] Not recorded
- [1] Never
- [2] Rarely
- [3] Occasionally
- [4] Frequently
- [5] Usually

57–65 Leave blank

66–78 Duplicate these columns from original data on Card 6.

79–80 [0][9] Card number

CARD 10 TYPE OF AURA

- 2 [ ] Diffuse myoclonic jerks
- 4 [ ] Motor manifestations—right
- 6 [ ] Motor manifestations—left
- 8 [ ] Somatic sensory manifestations—right
- 10 [ ] Somatic sensory manifestations—left
- 12 [ ] Abdominal sensations
- 14 [ ] Vertigo
- 16 [ ] "Dizziness" other than vertigo
- 18 [ ] Déjà vue
- 20 [ ] Visual, auditory, or olfactory hallucinations
- 22 [ ] Fear
- 24 [ ] Difficulty speaking

*26 INJURIES SUSTAINED DURING ATTACK

- [0] Not recorded
- [1] Never
- [2] Rarely
- [3] Occasionally
- [4] Frequently
- [5] Usually

*28–29 LENGTH OF HOSPITALIZATION

[ ][ ] Weeks

*31 NUMBER OF ADMISSIONS

[ ]

*33–35 NUMBER OF MAJOR SEIZURES IN HOSPITAL WHILE ON MEDICATION

☐☐☐

*37–39 NUMBER OF MINOR SEIZURES WHILE ON MEDICATION

☐☐☐

41 SEIZURES RELATED TO MENSES WHILE IN HOSPITAL

[0] Not recorded
[1] No
[2] Suggestive
[3] Definitely

*43 SEIZURES RELATED TO LEAVE OF ABSENCE

[0] Not recorded
[1] No
[2] Suggestive
[3] Definitely

*45 SEIZURES RELATED TO TIME OF DAY

[0] Not recorded
[1] No
[2] Suggestive
[3] Definitely

47–48 IF RELATED TO TIME OF DAY, MOST COMMON TIME OF OCCURRENCE (Based on 24 hours)

☐☐

*50 SEIZURES OCCURRED IN WAKING HOURS ONLY

[0] Not recorded
[1] No
[2] Yes

*52 SEIZURES OCCURRED DURING SLEEP ONLY

[0] Not recorded
[1] No
[2] Yes

*54 SEIZURES OCCURRED DURING WAKING AND SLEEPING

[0] Not recorded
[1] No
[2] Yes

LATERALITY OF CEREBRAL DISTURBANCE

*56 RIGHT:

[0] Not recorded
[1] EEG only
[2] EEG and seizure pattern or neurological examination
[3] EEG, seizure pattern and neurological examination

*58 LEFT:

[0] Not recorded
[1] EEG only
[2] EEG and seizure pattern or neurological examination
[3] EEG, seizure patterns and neurological examination

*60 BILATERAL CEREBRAL INVOLVEMENT
(based on EEG, seizure patterns or neurological examination)

[0] Not recorded
[1] Absent
[2] Suggestively present
[3] Definitely present

*62 NO CEREBRAL DISTURBANCE (e.g. normal or Dys. 1 EEG, normal neurological, no focal seizure pattern)

[0] Not recorded
[1] Cerebral disturbance definitely present
[2] Cerebral disturbance suggestively present
[3] Cerebral disturbance definitely absent

*64 PNEUMOENCEPHALOGRAM DIFFUSE ATROPHY

[0] Not recorded
[1] Absent
[2] Suggestive dilatation of ventricles
[3] Definite ventricular dilatation

66-78 Duplicate these columns from original data on Card 6.
79-80 [1][0] Card number

CARD 11

PNEUMOENCEPHALOGRAM FOCAL ATROPHY

*2 RIGHT:

[0] Not recorded
[1] Absent
[2] Suggestively present
[3] Definitely present

*4 LEFT:

[0] Not recorded
[1] Absent
[2] Suggestively present
[3] Definitely present

*6 PNEUMOENCEPHALOGRAM CORTICAL ATROPHY

[0] Not recorded
[1] Absent
[2] Suggestively present
[3] Definitely present

8 ARTERIOGRAM FOCAL ABNORMALITY OF POSSIBLE ETIOLOGICAL SIGNIFICANCE

[0] Not recorded
[1] Absent
[2] Suggestively present
[3] Definitely present

10 LATERALIZATION ON ARTERIOGRAM

[0] Not recorded
[1] No lateralization
[2] Right side
[3] Left side

*12 OBJECTIVE FINDINGS OF CEREBRAL PATHOLOGY IN NEUROLOGICAL EXAMINATION (apart from organic mental syndrome)

[0] Not recorded
[1] None
[2] Mild
[3] Moderate
[4] Marked

PSYCHOLOGICAL TEST RESULTS

*14–16 VERBAL IQ

☐☐☐

*18–20 PERFORMANCE IQ

☐☐☐

*21–23 FULL SCALE IQ

☐☐☐

*25 IMMATURITY

[0] Not recorded
[1] None
[2] Mild
[3] Moderate
[4] Marked

*27 NEUROTIC TENDENCIES

[0] Not recorded
[1] None
[2] Mild
[3] Moderate
[4] Marked

*29 PSYCHOTIC TENDENCIES

[0] Not recorded
[1] None
[2] Mild
[3] Moderate
[4] Marked

*31 PERSONALITY DISTURBANCES

[0] Not recorded
[1] None
[2] Mild
[3] Moderate
[4] Marked

*33 ORGANIC PATHOLOGY SUSPECTED

[0] Not recorded
[1] None
[2] Mild
[3] Moderate
[4] Marked

SEIZURE PHOTOGRAPH ANALYSIS
INITIAL SYMPTOMS CONSIST OF:

35 [ ] Marked motor restlessness
37 [ ] Requests to stop test
39 [ ] Complains of dizziness
*41 [ ] Sits up
43 [ ] Isolated body or head jerks
45 [ ] Twitching of eyelids
47 [ ] Facial twitching unlocalized
49 [ ] Facial twitching, right
51 [ ] Facial twitching, left
53 [ ] Rhythmic blinking of eyelids
55 [ ] Rhythmic head nodding
57 [ ] Right arm twitching
59 [ ] Right leg twitching
61 [ ] Left arm twitching
63 [ ] Left leg twitching
64–65 Leave blank
66–78 Duplicate these columns from original data on Card 6.
79–80 [1][1] Card number

CARD 12 INITIAL SYMPTOMS CONSIST OF:

2 [ ] Verbalization
4 [ ] Vocalization
6 [ ] Looking around confused
8 [ ] Facial expression, bewildered
10 [ ] Facial expression, frightened
12 [ ] Facial expression, empty
14 [ ] Facial expression, angry

16 ☐ Salivation
*18 ☐ Chewing or swallowing or smacking
*20 ☐ Head turns to right
*22 ☐ Head turns to left
24 ☐ Head swings to opposite side after initial turning
*26 ☐ Head is retracted backwards
28 ☐ Head is flexed towards chest
*30 ☐ Eyes deviated to right
*32 ☐ Eyes deviated to left
34 ☐ Eyes swing to opposite side after initial turning
*36 ☐ Eyes deviated upwards
38 ☐ Eyes converge
40 ☐ Extended right arm raised laterally
42 ☐ Extended right arm raised anteriorly
44 ☐ Extended right arm raised posteriorly
46 ☐ Extended left arm raised laterally
48 ☐ Extended left arm raised anteriorly
50 ☐ Extended left arm raised posteriorly
*52 ☐ Right arm flexed in elbow raised laterally
*54 ☐ Right arm flexed in elbow raised anteriorly
56 ☐ Right arm flexed in elbow raised posteriorly
*58 ☐ Left arm flexed in elbow raised laterally
*60 ☐ Left arm flexed in elbow raised anteriorly
62 ☐ Left arm flexed in elbow raised posteriorly
*64 ☐ Right arm held before face as if looking at head
66–78 Duplicate these columns from original data on Card 6.
79–80 [1][2] Card number

CARD 13 INITIAL SYMPTOMS CONSIST OF: (*cont'd*)

*2 ☐ Left arm held before face as if looking at hand
4 ☐ Right arm held above head as if touching back of head
6 ☐ Left arm held above head as if touching back of head
8 ☐ Right leg raised in extension
10 ☐ Left leg raised in extension
*12 ☐ Right leg raised while flexed in knee
*14 ☐ Left leg raised while flexed in knee
16 ☐ Right leg raised higher than left
18 ☐ Left leg raised higher than right
*20 ☐ Jackknifing
22 ☐ Hyperextension of entire body
24 ☐ Entire body rolls to the right
26 ☐ Entire body rolls to the left
*28 ☐ Legs diverge

TONIC PHASE

30	☐	Tonic facial contraction, right
32	☐	Tonic facial contraction, left
*34	☐	Right arm extended in elbow and wrist
*36	☐	Left arm extended in elbow and wrist
*38	☐	Right arm extended in elbow, flexed in wrist
*40	☐	Left arm extended in elbow, flexed in wrist
42	☐	Right arm crosses over left
44	☐	Left arm crosses over right
46	☐	Arms diverge
*48	☐	Fingers partially flexed, right hand
*50	☐	Fingers partially flexed, left hand
*52	☐	Fist, right
*54	☐	Fist, left
*56	☐	Right arm flexed in elbow
*58	☐	Left arm flexed in elbow
59–65		Leave blank
66–78		Duplicate these columns from original data on Card 6.
79–80	1 3	Card number

CARD 14—TONIC PHASE (*cont'd*)

*2	☐	Right leg extended
*4	☐	Left leg extended
6	☐	Right leg flexed at knee
8	☐	Left leg flexed at knee
10	☐	Right leg crossed over left
12	☐	Left leg crossed over right
14	☐	Legs diverge
*16	☐	Spontaneous Babinski's sign, right
*18	☐	Spontaneous Babinski's sign, left

POSTICTAL STATE

20	☐	Aphasia
22	☐	Confused as to person
24	☐	Confused as to place
26	☐	Confused as to time
28	☐	Random uncontrolled movements
30	☐	Yelling
32	☐	Aggressive behavior
34	☐	Chewing, swallowing or smacking of lips
*36	☐	Automatism
38	☐	Sleep

ICTAL AUTOMATISM

40 DURATION

- [0] Not recorded
- [1] Less than 1 minute
- [2] Less than 1 to 2 minutes
- [3] Less than 2 to 3 minutes
- [4] Less than 3 to 5 minutes
- [5] Over 5 minutes

*42 [ ] Slight automatic acts, patient remains seated or lying.

*44 [ ] Marked rhythmic repetitive movements, patient remains seated or lying.

*46 [ ] Leaves chair, wanders about.

47–65 Leave blank

66–78 Duplicate these columns from original data on Card 6.

79–80 [1][4] Card number

MICHIGAN EPILEPSY CENTER AND LAFAYETTE CLINIC
ELECTROENCEPHALOGRAPHY

Coding Sheets
Department 3

☐☐☐☐☐ Patient number Name_____
☐☐☐☐☐ EEG number

PROJECT NAME_____
PHYSICIAN'S NAME_____

CARD 1

2–3 ☐☐ Physician number

RECORDING DATE
4–5 ☐☐ Month
6–7 ☐☐ Day
8–9 ☐☐ Year

AGE
10–11 ☐☐ Months
*12–13 ☐☐ Years

*14 SEX
[1] Male
[2] Female

15 HANDEDNESS
[0] Not recorded
[1] Right
[2] Left

16 PATIENT STATUS
[0] Not recorded
[1] Outpatient
[2] Inpatient
[3] Other—Describe:
_____

17 PLACE OF RESIDENCE
[0] Not recorded
[1] Greater Detroit
[2] Outside of Detroit

18 REFERRING PERSON OR AGENCY

- [3] Not recorded
- [1] Self
- [2] Spouse
- [3] Patient, sibling, or child
- [4] More distant relative or friend
- [5] Social agency
- [6] Physician or other hospital (except State Hospital transfer)
- [7] State Hospital transfer
- [8] Court or police
- [9] Other—Describe:

_____

*19 LAST SEIZURE

- [0] Not recorded
- [1] Within one day
- [2] 1–3 days
- [3] 4–7 days
- [4] 8–14 days
- [5] More than 14 days

*20 ON ANTICONVULSANT MEDICATION

- [0] Not recorded
- [1] No
- [3] Yes

21-23 FAMILY NUMBER

☐☐☐

24-28 NUMBER OF PROBAND

☐☐☐☐☐

29 ANCESTRY

- [0] Not recorded
- [1] Father
- [2] Mother
- [3] Paternal grandfather
- [4] Paternal grandmother
- [5] Maternal grandfather
- [6] Maternal grandmother
- [7] Paternal aunt or uncle
- [8] Maternal aunt or uncle
- [9] Cousin

30 SIBLING ORDER

[0]
[1]
[2]
[3]
[4]
[5]
[6]
[7]
[8]
[9]

31 SIBLING TOTAL

[0]
[1]
[2]
[3]
[4]
[5]
[6]
[7]
[8]
[9]

32 CHILD

[0]
[1]
[2]
[3]
[4]
[5]
[6]
[7]
[9]

33 DRUG TREATMENT OF PATIENT OR RECENT ELECTRIC CONVULSIVE TREATMENT

[0] Not recorded
[1] None
[2] Drugs which do not affect EEG
[3] Drugs which could affect EEG, but patient received inadequate doses
[4] Tranquilizers in adequate amounts
[5] Barbiturates in adequate amounts
[6] Energizers or stimulants in adequate amounts
[7] Combination of drugs in adequate amounts
[8] Drugs which could affect EEG, adequate dose, but stopped for 48 hours
[9] Electric convulsive treatment within the last two months

*34 EEG DIAGNOSIS

[0] Not recorded
[1] Normal
[2] Borderline
[3] Mild abnormality
[4] Moderate abnormality
[5] Marked abnormality

*35 CONVULSIVE DISORDER SUSPECTED

[0] Not recorded
[1] Absent
[2] Questionable
[3] Probable
[4] Very likely, but not diagnostic
[5] Diagnostic

*36 FOCAL LESION SUSPECTED

[0] Not recorded
[1] Absent
[2] Questionable
[3] Probable
[4] Very likely but not diagnostic
[5] Diagnostic

ALPHA ACTIVITY

37 [ ] Present with eyes open (Score when not due to drowsiness)

*38 [0] Not recorded
[1] Absent
[2] Slight (less than 25% of recording time with eyes closed)
[3] Moderate (25–50% of recording time with eyes closed)
[4] Marked (50–75% of recording time with eyes closed)
[5] Excellent (75–100% of recording time with eyes closed)

THETA ACTIVITY

*39 [ ] Present with eyes open (Score when not due to drowsiness)

*40 [0] Not recorded
[1] Absent
[2] Slight (less than 25% of recording time)
[3] Moderate (25–50% of recording time)
[4] Marked (50–75% of recording time)
[5] Massive (75–100% of recording time)

FAST ACTIVITY

*41 [0] Not recorded
[1] Absent
[2] Slight (less than 25% of recording time)
[3] Moderate (25–50% of recording time)
[4] Marked (50–75% of recording time)
[5] Massive (75–100% of recording time)

42 [0] Not recorded
[1] Anterior head regions only
[2] Diffuse

*43 DIFFUSE DELTA ACTIVITY

[0] Not recorded
[1] Absent
[2] Slight (less than 25% of recording time)
[3] Moderate (25–50% of recording time)
[4] Marked (50–75% of recording time)
[5] Massive (75–100% of recording time)

DISCRETE RHYTHMIC SLOW WAVE FOCUS

44 [ ] Right frontal
45 [ ] Left frontal
46 [ ] Right motor
47 [ ] Left motor
48 [ ] Right parietal
49 [ ] Left parietal
50 [ ] Right occipital
51 [ ] Left occipital
*52 [ ] Right anterior temporal
*53 [ ] Left anterior temporal
*54 [ ] Right midtemporal
*55 [ ] Left midtemporal
56 [ ] Right posterior temporal
57 [ ] Left posterior temporal

58 ENTIRE RIGHT HEMISPHERE

[0] Not recorded
[1] Absent
[2] Present

*59 ENTIRE LEFT HEMISPHERE

[0] Not recorded
[1] Absent
[2] Present

TYPE OF FOCUS

*60 [ ] Theta
*61 [ ] Complex discharge
62 [ ] Sharp wave
63 [ ] Spike

64–65 Leave blank
66–70 [ ][ ][ ][ ][ ] Patient number
71–72 [ ][ ] Project number
73–74 [ ][ ] Deck number
75–76 [ ][ ] Evaluation number
77–78 [0][3] Department number
79–80 [0][1] Card number

CARD 2

MORE THAN ONE RHYTHMIC FOCUS

2 ☐ Shifting focus
3 ☐ Mirror focus
4 ☐ Independent foci

DISCRETE RANDOM SLOW WAVE FOCUS

5 ☐ Right frontal
6 ☐ Left frontal
7 ☐ Right motor
8 ☐ Left motor
9 ☐ Right parietal
10 ☐ Left parietal
11 ☐ Right occipital
12 ☐ Left occipital
13 ☐ Right anterior temporal
14 ☐ Left anterior temporal
15 ☐ Right midtemporal
16 ☐ Left midtemporal
17 ☐ Right posterior temporal
18 ☐ Left posterior temporal

19 ENTIRE RIGHT HEMISPHERE

[0] Not recorded
[1] Absent
[2] Present

20 ENTIRE LEFT HEMISPHERE

[0] Not recorded
[1] Absent
[2] Present

21 INDEPENDENT FOCI

[0] Not recorded
[1] Absent
[2] Present

GENERALIZED PAROXYSMAL ACTIVITY
(Express severity in frequency occurrence of bursts)

*22 ABORTIVE PAROXYSMS

[0] Not recorded
[1] Absent
[2] Slight
[3] Moderate
[4] Marked

*23 DEFINITE PAROXYSMS BUT NOT SPIKE WAVE

[0] Not recorded
[1] Absent
[2] Slight
[3] Moderate
[4] Marked

*24 ABORTIVE ATYPICAL SPIKE WAVES

[0] Not recorded
[1] Absent
[2] Slight
[3] Moderate
[4] Marked

*25 ATYPICAL SPIKE WAVES

[0] Not recorded
[1] Absent
[2] Slight
[3] Moderate
[4] Marked

*26 ATYPICAL SPIKE WAVES WITH MULTIPLE SPIKES

[0] Not recorded
[1] Absent
[2] Slight
[3] Moderate
[4] Marked

27 CLASSICAL SPIKE WAVES (3 c/s)

[0] Not recorded
[1] Absent
[2] Present

28 ATYPICAL SEIZURE PATTERNS

[0] Not recorded
[1] Absent
[2] Present

29 HYPSARHYTHMIA

[0] Not recorded
[1] Absent
[2] Present

BACKGROUND RHYTHMS VOLTAGE

*30 LEFT

[0] Not recorded
[1] 0–10 μv
[2] 10–20
[3] 20–30
[4] 30–40
[5] 40–50
[6] 50–60
[7] 60–70
[8] 70–80
[9] Above 80

*31 RIGHT

[0] Not recorded
[1] 0–10 μv
[2] 10–20
[3] 20–30
[4] 30–40
[5] 40–50
[6] 50–60
[7] 60–70
[8] 70–80
[9] Above 80

32 SYMMETRY

[0] Not recorded
[1] More than 60 μv lower on right
[2] 30–60 μv lower on right
[3] 10–30 μv lower on right
[4] Up to 10 μv lower on right
[5] Background symmetrical
[6] Up to 10 μv higher on right
[7] 10–30 μv higher on right
[8] 30–60 μv higher on right
[9] More than 60 μv higher on right

MAIN BACKGROUND FREQUENCY

*33–34 [ ][ ]

HYPERVENTILATION

*35 DIFFUSE NONPAROXYSMAL BUILDUP

[0] Not recorded
[1] Absent
[2] Slight
[3] Moderate
[4] Marked

36 [ ] Buildup persists for more than 1 minute

*37 DIFFUSE PAROXYSMAL BUILDUP

- [0] Not recorded
- [1] Absent
- [2] Slight
- [3] Moderate
- [4] Marked

38 [ ] Buildup persists for more than 1 minute

*39 FOCAL BUILDUP

- [0] Not recorded
- [1] Absent
- [2] Present in resting record but increased with hyperventilation
- [3] Not present, brought out by hyperventilation

AREA OF FOCUS

40 [ ] Right frontal
41 [ ] Left frontal
42 [ ] Right motor
43 [ ] Left motor
44 [ ] Right parietal
45 [ ] Left parietal
46 [ ] Right occipital
47 [ ] Left occipital
48 [ ] Right anterior temporal
49 [ ] Left anterior temporal
50 [ ] Right midtemporal
51 [ ] Left midtemporal
52 [ ] Right posterior temporal
53 [ ] Left posterior temporal

54 SPECIFIC EPILEPTIC CHANGES

- [0] Not recorded
- [1] Absent
- [2] Present in resting record but increased with hyperventilation
- [3] Not present, brought out by hyperventilation

PHOTIC DRIVING RESPONSE

LOW FLASH RATES 1–7 f/s

*55
- [0] Not recorded
- [1] None
- [2] Slight
- [3] Moderate
- [4] Marked

56
- [0] Not recorded
- [1] Mostly subharmonic
- [2] Mostly fundamental
- [3] Mostly harmonic

57 [0] Not recorded
[1] Occipital only
[2] Parieto-occipital
[3] Parieto-occipital-temporal
[4] Motor-parieto-occipital-temporal
[5] Diffuse

ALPHA RANGE 8–12 f/s

*58 [0] Not recorded
[1] None
[2] Slight
[3] Moderate
[4] Marked

59 [0] Not recorded
[1] Mostly subharmonic
[2] Mostly fundamental
[3] Mostly harmonic

60 [0] Not recorded
[1] Occipital only
[2] Parieto-occipital
[3] Parieto-occipital-temporal
[4] Motor-parieto-occipital-temporal
[5] Diffuse

HIGH FREQUENCIES 13 f/s AND ABOVE

*61 [0] Not recorded
[1] None
[2] Slight
[3] Moderate
[4] Marked

62 [0] Not recorded
[1] Mostly subharmonic
[2] Mostly fundamental
[3] Mostly harmonic

63 [0] Not recorded
[1] Occipital only
[2] Parieto-occipital
[3] Parieto-occipital-temporal
[4] Motor-parieto-occipital-temporal
[5] Diffuse

64–65 Leave blank

66–78 Duplicate these columns from original data on Card 1, Department 3.

79–80 [3][2] Card number

CARD 8

OTHER PHOTIC RESPONSES

2 ☐ Photomyoclonic response
3 ☐ Excessive, spikey appearing driving response
4 ☐ Abortive paroxysms
5 ☐ Spike wave paroxysms without clinical accompaniments
6 ☐ Spike wave paroxysms with clinical accompaniments
7 ☐ Grand mal type buildup

MISCELLANEOUS PHENOMENA

8 ☐ Anterior displacement of alpha
9 ☐ Posterior head regions slowing
10 ☐ Alpha notching
11 ☐ Lambda waves
12 ☐ Spikey appearing record
13 ☐ Other—Describe _____

SLEEP

*14
[0] Not recorded
[1] Normal
[2] Borderline
[3] Mildly abnormal
[4] Moderately abnormal
[5] Markedly abnormal

15
[0] Not recorded
[1] Induced
[2] Spontaneous

*16 SLEEP RECORD SHOWS MORE ABNORMALITY THAN WAKING RECORD
[0] Not recorded
[1] No
[2] Yes

*17 SLEEP RECORD SHOWS LESS ABNORMALITY THAN WAKING RECORD
[0] Not recorded
[1] No
[2] Yes

18 STAGES RECORDED
[0] Not recorded
[1] Drowsiness only
[2] V wave
[3] Spindles
[4] K complex spindles
[5] Delta

MAIN TYPE OF ABNORMALITY

19 ☐ Spikey V wave or K complex
20 ☐ *Spindle asymmetry*
21 ☐ 14 and 6 c/s positive spikes
*22 ☐ Focal sharp waves or spikes
23 ☐ Focal slow waves
24 ☐ Focal flattening
*25 ☐ Paroxysmal abnormalities
26 ☐ Atypical spike waves
27 ☐ Classical spike waves
28 ☐ Other—Describe: _____

AREA OF FOCAL ABNORMALITY

29 ☐ Right frontal
30 ☐ Left frontal
31 ☐ Right motor
32 ☐ Left motor
33 ☐ Right parietal
34 ☐ Left parietal
35 ☐ Right occipital
36 ☐ Left occipital
37 ☐ Right anterior temporal
38 ☐ Left anterior temporal
39 ☐ Right midtemporal
40 ☐ Left midtemporal
41 ☐ Right posterior temporal
42 ☐ Left posterior temporal

MEGIMIDE STUDY

QUANTITY GIVEN (cc)

*43–44 ☐☐

*45 GENERALIZED SLOWING

[0] Not recorded
[1] Absent
[2] Slight
[3] Moderate
[4] Marked

*46 PAROXYSMAL RESPONSE

[0] Not recorded
[1] Absent
[2] Slight
[3] Moderate
[4] Marked

*47 FOCAL RESPONSE

- [0] Not recorded
- [1] Absent
- [2] Present in resting record but increased with drug
- [3] Not present, brought out by drug

AREA OF FOCAL RESPONSE

48 [ ] Right frontal
49 [ ] Left frontal
50 [ ] Right motor
51 [ ] Left motor
52 [ ] Right parietal
53 [ ] Left parietal
54 [ ] Right occipital
55 [ ] Left occipital
*56 [ ] Right anterior temporal
*57 [ ] Left anterior temporal
*58 [ ] Right midtemporal
*59 [ ] Left midtemporal
60 [ ] Right posterior temporal
61 [ ] Left posterior temporal

62 SEIZURE INDUCED

- [0] Not recorded
- [1] Absent
- [2] EEG seizure only
- [3] EEG and clinical seizure

63 ATTACK INDUCED WITHOUT EEG CHANGE

- [0] Not recorded
- [1] Absent
- [2] Present

64–65 Leave blank
66–78 Duplicate these columns from original data on Card 1, Department 3.
79–80 [0][3] Card number

MICHIGAN EPILEPSY CENTER AND LAFAYETTE CLINIC
EEG SEIZURE PATTERNS

Department 3
Coding Sheets

☐☐☐☐☐ Patient number NAME_____
PROJECT NAME _____
PHYSICIAN NAME_____

CARD 4

CLASSICAL 3 c/s SPIKE WAVE

2 NUMBER OCCURRING IN RESTING RECORD

- [0] Not applicable
- [1] One
- [2] Two
- [3] Three
- [4] Four
- [5] Five
- [6] Six
- [7] Seven
- [8] Eight
- [9] Nine or more

3 AVERAGE DURATION

- [9] Not applicable
- [1] Less than 5 seconds
- [2] 5–10 seconds
- [3] 10–15 seconds
- [4] 15–20 seconds
- [5] 20–25 seconds
- [6] 25–30 seconds
- [7] 30–35 seconds
- [8] 35–40 seconds
- [9] More than 40 seconds

CLASSICAL 3 c/s SPIKE WAVE WITH MULTIPLE SPIKES

4 NUMBER OCCURRING IN RESTING RECORD

- [0] Not applicable
- [1] One
- [2] Two
- [3] Three
- [4] Four
- [5] Five
- [6] Six
- [7] Seven
- [8] Eight
- [9] Nine or more

5 AVERAGE DURATION

- [0] Not applicable
- [1] Less than 5 seconds
- [2] 5–10 seconds
- [3] 10–15 seconds
- [4] 15–20 seconds
- [5] 20–25 seconds
- [6] 25–30 seconds
- [7] 30–35 seconds
- [8] 35–40 seconds
- [9] More than 40 seconds

CLASSICAL 3 c/s SPIKE WAVE WITH FOCAL ONSET

6 NUMBER OCCURRING IN RESTING RECORD

- [0] Not applicable
- [1] One
- [2] Two
- [3] Three
- [4] Four
- [5] Five
- [6] Six
- [7] Seven
- [8] Eight
- [9] Nine or more

7 AVERAGE DURATION

- [0] Not applicable
- [1] Less than 5 seconds
- [2] 5–10 seconds
- [3] 10–15 seconds
- [4] 15–20 seconds
- [5] 20–25 seconds
- [6] 25–30 seconds
- [7] 30–35 seconds
- [8] 35–40 seconds
- [9] More than 40 seconds

AREAS INVOLVED

- 8 [ ] Left fronto-motor
- 9 [ ] Right fronto-motor
- 10 [ ] Left motor-parietal
- 11 [ ] Right motor-parietal
- 12 [ ] Left parieto-occipital
- 13 [ ] Right parieto-occipital
- 14 [ ] Left anterior-midtemporal
- 15 [ ] Right anterior-midtemporal
- 16 [ ] Left mid-posterior temporal
- 17 [ ] Right mid-posterior temporal

4 c/s SPIKE WAVE

18 NUMBER OCCURRING IN RESTING RECORD

- [0] Not applicable
- [1] One
- [2] Two
- [3] Three
- [4] Four
- [5] Five
- [6] Six
- [7] Seven
- [8] Eight
- [9] Nine or more

19 AVERAGE DURATION

- [0] Not applicable
- [1] Less than 5 seconds
- [2] 5–10 seconds
- [3] 10–15 seconds
- [4] 15–20 seconds
- [5] 20–25 seconds
- [6] 25–30 seconds
- [7] 30–35 seconds
- [8] 35–40 seconds
- [9] More than 40 seconds

4 c/s SPIKE WAVE WITH MULTIPLE SPIKES

20 NUMBER OCCURRING IN RESTING RECORD

- [0] Not applicable
- [1] One
- [2] Two
- [3] Three
- [4] Four
- [5] Five
- [6] Six
- [7] Seven
- [8] Eight
- [9] Nine or more

21 AVERAGE DURATION

- [0] Not applicable
- [1] Less than 5 seconds
- [2] 5–10 seconds
- [3] 10–15 seconds
- [4] 15–20 seconds
- [5] 20–25 seconds
- [6] 25–30 seconds
- [7] 30–35 seconds
- [8] 35–40 seconds
- [9] More than 40 seconds

4 c/s SPIKE WAVE WITH FOCAL ONSET

22 NUMBER OCCURRING IN RESTING RECORD

- [0] Not applicable
- [1] One
- [2] Two
- [3] Three
- [4] Four
- [5] Five
- [6] Six
- [7] Seven
- [8] Eight
- [9] Nine or more

23 AVERAGE DURATION

- [0] Not applicable
- [1] Less than 5 seconds
- [2] 5–10 seconds
- [3] 10–15 seconds
- [4] 15–20 seconds
- [5] 20–25 seconds
- [6] 25–30 seconds
- [7] 30–35 seconds
- [8] 35–40 seconds
- [9] More than 40 seconds

AREAS INVOLVED

- 24 [ ] Left fronto-motor
- 25 [ ] Right fronto-motor
- 26 [ ] Left motor-parietal
- 27 [ ] Right motor-parietal
- 28 [ ] Left parieto-occipital
- 29 [ ] Right parieto-occipital
- 30 [ ] Left anterior-midtemporal
- 31 [ ] Right anterior-midtemporal
- 32 [ ] Left mid-posterior temporal
- 33 [ ] Right mid-posterior temporal

1–2 1/2 c/s SPIKE WAVE

34 NUMBER OCCURRING IN RESTING RECORD

- [0] Not applicable
- [1] One
- [2] Two
- [3] Three
- [4] Four
- [5] Five
- [6] Six
- [7] Seven
- [8] Eight
- [9] Nine or more

35 AVERAGE DURATION

- [0] Not applicable
- [1] Less than 5 seconds
- [2] 5–10 seconds
- [3] 10–15 seconds
- [4] 15–20 seconds
- [5] 20–25 seconds
- [6] 25–30 seconds
- [7] 30–35 seconds
- [8] 35–40 seconds
- [9] More than 40 seconds

1–2 1/2 c/s SPIKE WAVE WITH MULTIPLE SPIKES

36 NUMBER OCCURRING IN RESTING RECORD

- [0] Not applicable
- [1] One
- [2] Two
- [3] Three
- [4] Four
- [5] Five
- [6] Six
- [7] Seven
- [8] Eight
- [9] Nine or more

37 AVERAGE DURATION

- [0] Not applicable
- [1] Less than 5 seconds
- [2] 5–10 seconds
- [3] 10–15 seconds
- [4] 15–20 seconds
- [5] 20–25 seconds
- [6] 25–30 seconds
- [7] 30–35 seconds
- [8] 35–40 seconds
- [9] More than 40 seconds

1–2 1/2 c/s SPIKE WAVE WITH FOCAL ONSET

38 NUMBER OCCURRING IN RESTING RECORD

- [0] Not applicable
- [1] One
- [2] Two
- [3] Three
- [4] Four
- [5] Five
- [6] Six
- [7] Seven
- [8] Eight
- [9] Nine or more

39 AVERAGE DURATION

- [0] Not applicable
- [1] Less than 5 seconds
- [2] 5–10 seconds
- [3] 10–15 seconds
- [4] 15–20 seconds
- [5] 20–25 seconds
- [6] 25–30 seconds
- [7] 30–35 seconds
- [8] 35–40 seconds
- [9] More than 40 seconds

AREAS INVOLVED

- 40 ☐ Left fronto-motor
- 41 ☐ Right fronto-motor
- 42 ☐ Left motor-parietal
- 43 ☐ Right motor-parietal
- 44 ☐ Left parieto-occipital
- 45 ☐ Right parieto-occipital
- 46 ☐ Left anterior-midtemporal
- 47 ☐ Right anterior-midtemporal
- 48 ☐ Left midposterior temporal
- 49 ☐ Right midposterior temporal

FOCAL TEMPORAL SEIZURE (a) STARTS WITH GRADUAL BUILDUP OF DISCHARGES

AREA OF ONSET

- 50 ☐ Left anterior temporal
- 51 ☐ Left midtemporal
- 52 ☐ Left posterior temporal
- 53 ☐ Right anterior temporal
- 54 ☐ Right midtemporal
- 55 ☐ Right posterior temporal
- 56 ☐ Unclear

57 DURATION

- [0] Not applicable
- [1] Less than 30 seconds
- [2] 31–60 seconds
- [3] 1–3 minutes
- [4] 3–6 minutes
- [5] More than 6 minutes

FOCAL TEMPORAL SEIZURE (b) STARTS WITH DIFFUSE BURST

AREA MOST INVOLVED SUBSEQUENTLY

58 ☐ Left anterior temporal
59 ☐ Left midtemporal
60 ☐ Left posterior temporal
61 ☐ Right anterior temporal
62 ☐ Right midtemporal
63 ☐ Right posterior temporal
64 ☐ Unclear

65 DURATION

[0] Not applicable
[1] Less than 30 seconds
[2] 31–60 seconds
[3] 1–3 minutes
[4] 3–6 minutes
[5] More than 6 minutes

66–70 ☐☐☐☐☐ Patient number
71–72 ☐☐ Project number
73–74 ☐☐ Deck number
75–76 ☐☐ Evaluation number
77–78 [0][3] Department number
79–80 [0][4] Card number

CARD 5

FOCAL TEMPORAL SEIZURE (c) STARTS WITH SUPPRESSION OF ELECTRICAL ACTIVITY

AREA MOST INVOLVED SUBSEQUENTLY

2 ☐ Left anterior temporal
3 ☐ Left mid-temporal
4 ☐ Left posterior temporal
5 ☐ Right anterior temporal
6 ☐ Right mid-temporal
7 ☐ Right posterior temporal
8 ☐ Unclear

9 DURATION

[0] Not applicable
[1] Less than 30 seconds
[2] 31–60 seconds
[3] 1–3 minutes
[4] 3–6 minutes
[5] More than 6 minutes

FOCAL SEIZURE OTHER THAN TEMPORAL, STARTS WITH GRADUAL BUILDUP OF DISCHARGES

AREA OF ONSET

10 ☐ Left fronto-motor
11 ☐ Left motor-parietal
12 ☐ Left parieto-occipital
13 ☐ Right fronto-motor
14 ☐ Right motor-parietal
15 ☐ Right parieto-occipital

16 DURATION

[0] Not applicable
[1] Less than 30 seconds
[2] 31–60 seconds
[3] 1–3 minutes
[4] 3–9 minutes
[5] More than 9 minutes

FOCAL SEIZURE OTHER THAN TEMPORAL, STARTS WITH DIFFUSE BURST

AREA MOST INVOLVED SUBSEQUENTLY

17 ☐ Left fronto-motor
18 ☐ Left motor-parietal
19 ☐ Left parieto-occipital
20 ☐ Right fronto-motor
21 ☐ Right motor-parietal
22 ☐ Right parieto-occipital
23 ☐ Unclear

24 DURATION

[0] Not applicable
[1] Less than 30 seconds
[2] 31–60 seconds
[3] 1–3 minutes
[4] 3–9 minutes
[5] More than 9 minutes

GRAND MAL SEIZURE, STARTS WITH GRADUAL BUILDUP OF DISCHARGES

AREA OF ONSET

25 ☐ Left fronto-motor
26 ☐ Right fronto-motor
27 ☐ Left motor-parietal
28 ☐ Right motor-parietal
29 ☐ Left parieto-occipital
30 ☐ Right parieto-occipital
31 ☐ Left anterior-midtemporal
32 ☐ Right anterior-midtemporal
33 ☐ Left mid-posterior temporal
34 ☐ Right mid-posterior temporal
*35 ☐ Unclear

*36 ☐ GRAND MAL SEIZURE, STARTS WITH DIFFUSE BURST

SEIZURE DIFFICULT TO CLASSIFY ELECTROENCEPHALOGRAPHICALLY

*37 DURATION

[0] Not applicable
[1] Less than 10 seconds
[2] 11–30 seconds
[3] 31 seconds to 1 minute
[4] 1 minute to 3 minutes
[5] More than 3 minutes

POSTICTAL SLOW WAVE FOCUS

38 ☐ Left fronto-motor
39 ☐ Right fronto-motor
40 ☐ Left motor-parietal
41 ☐ Right motor-parietal
42 ☐ Left parieto-occipital
43 ☐ Right parieto-occipital
44 ☐ Left anterior-midtemporal
*45 ☐ Right anterior-midtemporal
46 ☐ Left mid-posterior temporal
*47 ☐ Right mid-posterior temporal
*48 ☐ Generalized slowing

CLINICAL TYPE OF RECORDED SEIZURE

*49	☐	Grand mal focal
*50	☐	Grand mal nonfocal
*51	☐	Major motor not typical grand mal focal
52	☐	Major motor not typical grand mal nonfocal
53	☐	Minor motor focal
54	☐	Minor motor nonfocal
55	☐	Absence with minimal myoclonic element
56	☐	Absence with marked myoclonic element
57	☐	Myoclonic jerks
*58	☐	Automatism
59	☐	Confusional state
60	☐	Psychic
61	☐	Sensory
62	☐	Akinetic
63	☐	Syncope
64	☐	Psychogenic
65	☐	Difficult to classify
66–78	Duplicate from Card 4, Department 3.	
79–80	0 5	Card number

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