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# The Outcome of Epilepsy and Its Measurement

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**Summary:** Epilepsy outcome data should be concerned not only with seizure frequency, but should also assess present potential as a function of preexisting capabilities. Reported findings on outcome are not consistent, although view of epilepsy outcome since the 1970's is much more optimistic. The founding of an Institute of Epilep-

tology can stimulate concerted action to provide the scientific community with improved information on measurement and analysis of the ways in which epilepsy changes the lives of the patient and those immediately involved. **Key Words:** Epilepsy—Outcome assessment—Prognosis—Psychometrics.

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Interest in the average or modal outcome of a disease can be motivated by very different reasons. Either the professional is eager to know whether the strategy used to treat the disease or at least its consequences has been successful or the health-care manager is eager to know whether investments provide sufficient return economically or politically and, preferably, both. Most important, however, is the wish to inform the patient of the predicted outcome. Anyone affected by a disease is anxious about future prospects, how long a cure will take, or whether there will be any lasting sequelae. Basically, epileptic persons and their families want to know the prognosis.

## SEIZURE REMITTANCE

Epilepsy is often a chronic disease. Comparison of prevalence and incidence data suggest that epilepsy persists 12 years on the average. Prevalence and incidence data are not in good agreement, however, and may vary by as much as 10-fold (Table 1).

The indication of 12-year duration is derived from the median incidence and the median prevalence. However, because epilepsy that occurs in the course of life is a life sentence, for some, others must carry the burden of epilepsy for a much shorter time. Can we predict for our patients the outcome of his or her epilepsy? What exactly are the problems associated with epilepsy.

## IMPACT ON SOCIAL FUNCTIONING AND FAMILY

Forty years ago, I became committed to epileptology. One of my fellow students, an exceptionally gifted woman, had a sister who had postmalaria partial epilepsy. Before onset of her seizures, this sister had performed much better academically than my fellow student herself, although the student later became a professor (however, not in epileptology, neurology, or psychiatry), whereas the sister with epilepsy could only perform menial work in a sheltered workshop. The impact of epilepsy on the whole family was clearly apparent. One day the epileptic sister had a seizure on the staircase and fell down the stairs. Her aging mother, who always walked behind her on the stairs, could no longer prevent the two of them from falling. The girl had to enter the residential section of a special center for epilepsy. She died a few years ago at the age of 58 in the Instituut voor Epilepsiebestrijding, Heemstede, The Netherlands, of a sudden unexplained death syndrome.

Persons with epilepsy must worry not only about seizures, but also about the impact of epilepsy on their functioning and their social circumstances. The prime characteristic of epilepsy and the one easiest to gauge is the occurrence of seizures. Can seizures be controlled? That epilepsy lasts 12 years on the average has no direct bearing on this question because persons are considered to have epilepsy not only if they have had at least two seizures in the past year but also as long as they are receiving antiepileptic drugs (AEDs), whether or not the seizures are in remission. The period of 12 years

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TABLE 1. Prevalence and incidence of epilepsy in several countries

Lowest prevalence	Prevalence (%)	Lowest incidence	Per annum per 100,000
Japan (4)	0.15	Norway (6)	11
Italy (5)	0.15	Japan (4)	17
The Netherlands (7)	0.29		
Highest prevalence		Highest incidence	
The Netherlands (8)	0.57	Japan (11)	145
Liberia (9)	4.9	The Netherlands (8)	180
England (10)	2.3		
Indicators in review by Rutgers (12), n = 76 publications		Indicators in review by Rutgers (12), n = 32 publications	
Mean	0.82	Mean	63.2
Median	0.57	Median	49.0

would be meaningful if one could discontinue prescription of AEDs as soon as the seizures had been brought under control, but this cannot be done. The average rate of relapse after discontinuation of medication is 30% (range 12–63%) (Table 2).

### PROGNOSIS

In many respects, certainly with regard to seizure-induced risks, freedom from seizures is the most important outcome, and the consequences of chronic AED administration are of secondary importance. How long must persons with epilepsy endure seizures before the seizures are brought under control? The information available is not very sound. Sometimes it is difficult to determine how the outcome parameter was exactly defined. Usually the term remission is used, although according to Webster's dictionary, remission means abatement, diminution—not complete arrest. Furthermore, whether the patients reported to be in remission are seizure-free because they are appropriately treated with AEDs or whether they can be considered as no longer having epilepsy because they remain seizure-free after discontinuation of medication is often not clearly reported.

With these caveats, let us examine what has happened over the years. A century ago, the only "therapies" for seizure control were bromides and

valerian tincture. Phenobarbital (PB) was discovered just before World War I and phenytoin (PHT) just before World War II. In the past 25 years, two equally potent AEDs—carbamazepine and valproate—were added, along with several AEDs with more limited or more specific function. Recently, and not yet everywhere, several new AEDs have been registered or are about to reach the market.

Has the greater assortment in the AED armamentarium made a difference in outcome? A report from the Instituut voor Epilepsiebestrijding, The Netherlands, about the total number of seizures registered in that hospital in the years 1910–1930, gives a favorable impression (Fig. 1). However, a source with a wider scope is the book *Prognosis of Epilepsy* by Rodin (1), which reported on the period 1900–1968. Rodin's findings were not very optimistic. Notwithstanding increasing knowledge about epilepsy and the introduction of several effective AEDs, the outcome of epilepsy appeared not to change over the years. Over that period, all cited studies about prognosis reported that approximately one-third of patients had their epilepsy controlled by AEDs; two-thirds did not. A second point of reference is the book by Hauser and Hesdorffer (2), that quotes much better remission rates, sometimes even 80% (Table 3).

How this discrepancy between the reports before the 1970s and published reports in the past 25 years can be explained is not clear. Some researchers believe that the advent of accurate monitoring of serum levels of AEDs has shown that some persons rapidly metabolize AEDs, and thus do not benefit sufficiently from them. By examining the amount of AED in serum, one can also ascertain whether the patient has regularly ingested the prescribed AED; this issue might otherwise not be discussed with the attending physician. Multiple explanations for the discrepancy in reports of outcome of treatment can

TABLE 2. Relapse after discontinuation of AEDs

Reference	Age group (yr)	Years seizure-free	Relapse (%)
13	4–19	>2	12
14	18–60	>3	63
2			
[Average from Table 6.4 (2)]			30

AEDs, antiepileptic drugs.

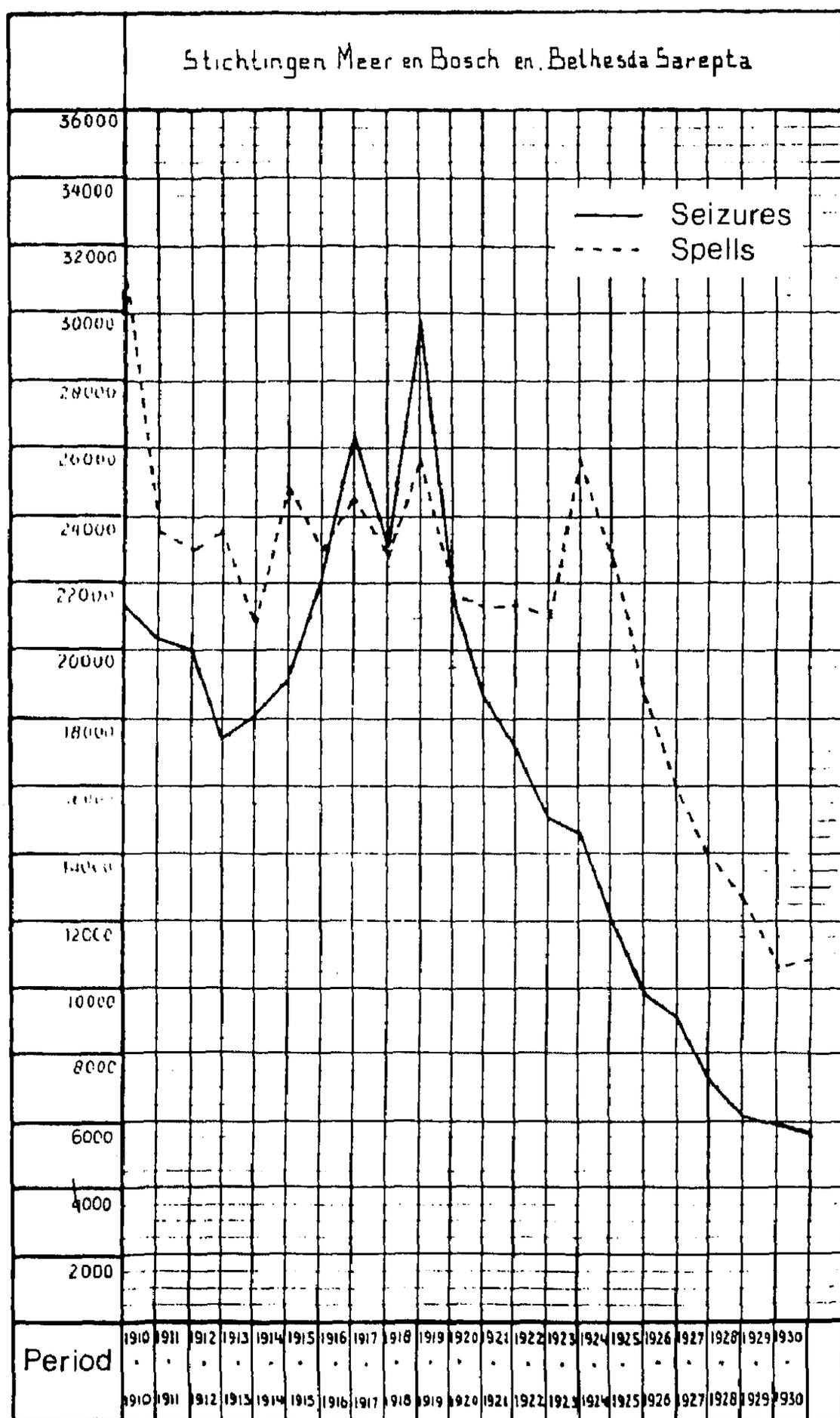


FIG. 1. Number of seizures and spells per 100,000 days of admission in the years 1910–1930 of patients admitted to the centres "Meer en Bosch" and "Bethesda Sarepta" of the Instituut voor Epilepsiebestrijding in The Netherlands. After World War I, i.e., 1919/1920, phenobarbital became available.

be postulated, but all are rather difficult to prove or disprove.

Nonetheless, if 0.6% of the population has epilepsy, the latest data show that 0.12 have intractable epilepsy; e.g., the present census of England is 58 million people. Therefore, in that country, ~70,000 people have intractable epilepsy. In this instance, we are considering only uncontrollable seizures. Unfortunately, a problem exists which can be illustrated by the model of compounded scales (Fig. 2), as follows. To restore the balance disturbed by epilepsy, medication must be administered as a counter-weight. Addition of medication will place a greater load on the "spring," which will

partly reduce the improvement achieved by the medication. It is indeed a nuisance that since the arm of the scale is prevented from dipping by a stopper, administration of too much medication as a counter-measure for the seizures will not be noticed. That is, epilepsy is a disorder characterized by paroxysmal seizures, and only after a time will it be clear whether the increase in dosage has actually been effective. Titration of the exact dosage to maintain seizure control is therefore very difficult. Thus, many patients may be seizure-free while consuming an excessive dosage of medicine. A feature not disclosed by this model, which would be equivalent to a shrinking of the scale, is the phenomenon

TABLE 3. Percentage in terminal remission (adults)

Reference	Year	Remitted (%)
15	1907	32
16	1950	22
17	1958	32
1	1968	32
18	1984	82
(Community-based)		
19	1963	32
20	1979	70
10	1983	69

of tolerance for the side effects of the AEDs, which unfortunately is often a pseudotolerance; the patient is no longer aware of diminished capacities.

When the epilepsy load is so heavy that the amount of medication to counterbalance its effect is intolerable, or when an unnecessary amount of medication has been administered, the attention of the treating physician should be directed at the assessment of the quality of life (QOL) provided. QOL outcome measures should also reveal whether a diminished quality exists, of which the patient is no longer aware, such as that induced by pseudotolerance. However, the QOL of a person with epilepsy is not determined only by proper pharmacotherapy. Imagine what it means for a person never to know when the next seizure will occur. Think of all the precautions one must take, and the restrictions that are imposed, sometimes reasonably and sometimes unreasonably, because society is not able to make the fine distinctions that result from patients with epilepsy presenting with different consequences. Furthermore, the cause of the epilepsy may have altered brain function, including between

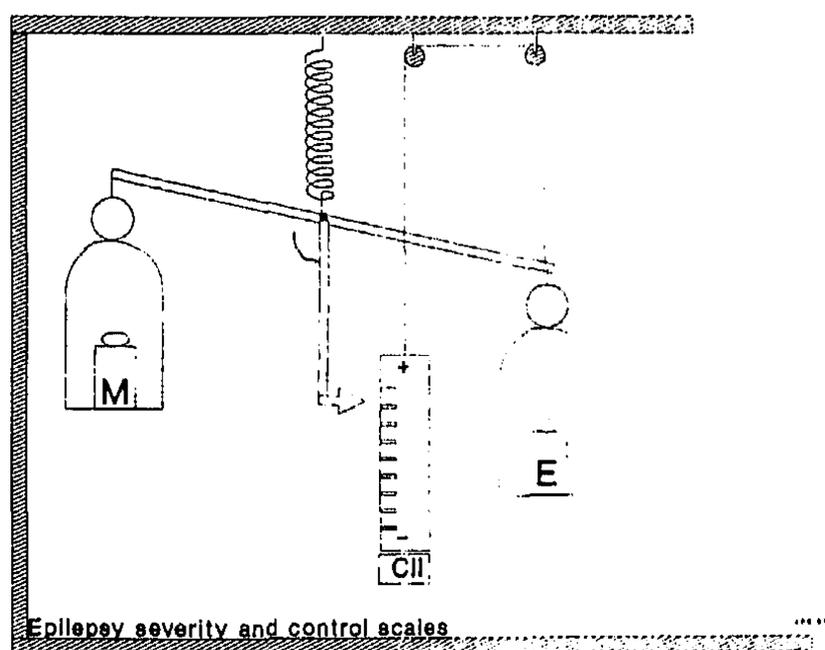


FIG. 2. Epilepsy severity and epilepsy control scales. A model to illustrate the need to treat more severe forms of epilepsy with a larger amount of antiepileptic drugs (AEDs), which has a negative impact on outcome. It also demonstrates the difficulty to titrate the exact amount of AEDs needed to control seizures.

TABLE 4. Washington Psychosocial Seizure Inventory: Percentage of people with epilepsy aged >16 years with poor performance<sup>a</sup>

Canada: University Hospital Regional Epilepsy Unit	47
Finland: University Hospital and Epilepsy Research Center	31
Germany: Clinic of Neuropsychiatry	10
United States: Seattle Regional Epilepsy Center, study I	55
United States: Seattle Regional Epilepsy Center, study II	
2-10 GTCS	39
11-100 GTCS	41
>100 GTCS	58
Status epilepticus	67
United States: Mississippi—private practice and EFA members	41
United States: Rochester, Minnesota—all residents	19

GTCS, generalized tonic-clonic seizures; EFA Epilepsy Foundation of America.

<sup>a</sup> Adapted with permission from Hauser and Hesdorffer (2).

seizures. To assess the interictal state, the Washington Psychosocial Seizure Inventory (WPSI) was developed by Dodrill et al. (3) to measure psychosocial functioning in epilepsy. The scale is composed of 132 items divided into the areas of family background, emotional adjustment, interpersonal adjustment, vocational adjustment, financial status, adjustment to seizures, medicine and medical management, and overall psychosocial functioning.

Cases that were experiencing problems were reported in 10-67% of different series, depending on the study group characteristics (Table 4). However, the WPSI is not truly a desk instrument that permits the attending physician to gauge the psychosocial level of the patient. Nor does the outcome on the WPSI immediately clarify the reasons for the score.

This volume commemorates the founding of the London Institute of Epileptology. This occurs at a most appropriate moment. The outline of the field to be attacked has been charted, and tools with which a multidisciplinary team should be able to address it have been developed. At present, the prognosis for an individual person who has a first seizure is difficult to define. However, the prognosis that many persons with epilepsy will be very grateful that the London Institute of Epileptology has been established is crystal clear.

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