Some Notes on Status Epilepticus and its Treatment.

By A. BANKS RAFFLE, M.D.(Dunelm), Assistant Medical Officer, Exeter City Asylum.

IN all asylums and places where epileptics are taken care of many cases of this condition must occur annually, and the treatment of it must be of grave consideration in the care of these cases. The figures of Dr. Lord ([1]) show us that in ten years in the Hanwell London County Asylum 26 *per cent.* of the deaths in epilepsy occurred in the "status," and these figures are borne out by the returns of the Ewell Colony for Epileptics. Much has been written on the subject, both by British workers and by our Continental *confrères*, but it is scattered through the literature in isolated monographs, and of late years the interest in the subject seems to have lapsed. The present paper is written with the purpose of inducing someone, more competent than the author, to give us further light on this very interesting condition.

Ætiology.

Age.—This seems to play a very small part in the production of the condition. A reference to the tabulated series will show how very wide is the range in the age-periods.

Sex.—In my cases there has been a remarkable preponderance of attacks in males over those in females—twenty-three cases in males, four in females. As far as I can gather this seems to be the experience of most workers amongst epileptics in this country, but Continental observers, Lorenz ([2]), Bournville ([3]), and others, state that twice as many cases occur in females as in males, while Clark ([4]) takes the middle view.

Causation.—The engorgement of the brain, œdema, flattening of the convolutions, increase in the fluid in the ventricles, perhaps punctate hæmorrhages into the brain substance, are amongst the more common findings *post-mortem.* Some work has also been done on the changes in the nerve-cells found in the condition, but these are apparently only an exaggeration of the chromolytic changes met with in cases of epilepsy dying from other causes.

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The fatty changes in the heart, liver, and renal epithelium are interesting. In forty-nine cases of epilepsy examined *post-mortem* these changes were only found in seven, and all these cases terminated in the status. The remarkable likeness between status epilepticus and eclampsia must strike one; in both we have muscular spasm, in both renal and liver changes, in both cases constipation, and in both we have the same tendency to death from cardiac collapse; there is possibly a close relationship between their respective causations. Death in this condition, as has been just said, takes place from heart failure; this has been made a reason for discarding one treatment after another, the idea being that this or that drug accelerated this termination. It would seem more likely that, as it is apparently the normal ending of a case, drugs have no great influence over it, or at least not so much as has been attributed to them.

Another point of interest that has been raised is the influence of the pyrexia upon the cells of the central nervous system. It has been pointed out by Mott ([5]) that the changes found could not be the result of the elevation of temperature since the cells in the anterior cornua of the cord are not affected; perhaps a more powerful argument is that these changes have been observed in cases where the temperature never rose above 101° F. This is another of the conditions that we must assign to the mysterious region of "toxæmia." The high temperature, due in a great extent to the violent muscular exertions, the albuminuria and kidney changes, the gradual culmination of the symptoms until a point is reached at which the activity of the cortical cells is dulled, the temperature falls sometimes to subnormal, and the patient becomes comatose and dies from heart failure, all seem to point to toxæmia. One thing must be put down as certain, and that is that the cardiac degeneration could not be the result of the muscular exertion, since some of the cases which have had fewest fits show marked change *post-mortem*.

Another interesting point is Pierce Clark's ([6]) statement that the sudden cessation of bromides causes the condition. Now in asylums the cases seem to occur amongst the older epileptic residents and not amongst the new arrivals, and this would at first incline one to the view that—as these older patients are usually untreated—this was a fallacy; and yet on several

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occasions on which the relative efficiency of the different treatments have been tried, cessation of treatment has been followed by a remarkable increase in the number of cases of "status," seeming to lend support to Dr. Clark's statement.

Points of Clinical Interest.

Variation in intensity.—Strümpel drew attention to the occurrence of mild and severe forms of status epilepticus, many writers having confirmed this. These mild attacks seem to occur in those cases which are specially prone to the condition, a mild attack often being followed by one of greater intensity: *e.g.*, A. B— had one slight attack in September, 1905, followed by severe attacks in February, 1906, and June, 1906, respectively.

In two of these slight cases occurring recently, the clinical picture was that of "status," but the duration—until recovery—was less than fifteen minutes; the coma was, as would be expected, short. Both cases were untreated.

Albuminuria has been constant in all the cases I have had an opportunity of examining; its disappearance from the urine coincides with the return of the temperature to normal. Hack Tuke ([7]) records two fatal cases in which it did not occur, and other observers have failed to find it in cases.

Reflexes.—Corneal reflex abolished, also the reflex to light. The other reflexes are not constant, but in most cases—between the seizures—the knee-jerks are exaggerated and Babinski's phenomenon and ankle-clonus are present.

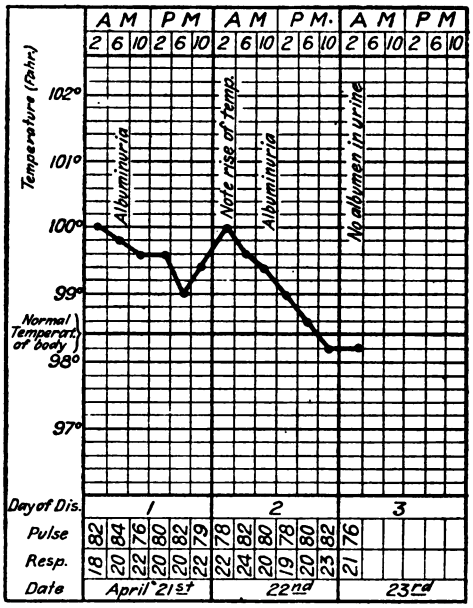
Temperature.—The temperature rises apparently in proportion to the number of fits and the duration of the seizure; this is clearly shown by the fact that in all the cases cut short by the hyoscine treatment the temperature never rose above 103° F. A very interesting point is also the unilateral variation in temperature, which depends on the fact that one side of the body is more convulsed than the other. The respiratory- and pulse-rates coincide fairly regularly with the temperature, as will be seen by the enclosed charts; these show the temperature, pulse, and respiratory rates in twenty cases of status epilepticus. Another point worth noticing is the rise in temperature which occurs on the day following the seizure, in those cases which recover: the three charts appended show this rise.

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What the cause of it is is impossible to say; possibly it is reactionary.

Relation of number of fits to onset.—A marked feature in the history of a case is the increase—from the normal number of the patient—of the number of fits immediately preceding the attack. In dealing with epileptics one is frequently able to tell when an attack of this condition is pending. Usually there is a number of fits immediately preceding the onset, and in most cases the patient has been having more than his, or her,

CHART 1.



average number of fits for some days previously. Reference to the tabulated cases will show how markedly this is the case in these cases, and it holds good also in a large number of other cases. A good illustration of this is:

J. H—, æt. 56, had two severe attacks of status epilepticus, from both of which he recovered under the influence of hyoscine hydro-bromide. During a year's residence in the asylum he had only twenty epileptic seizures, and five and six of these preceded each attack of the condition respectively. He had been an epileptic from childhood.

Recurrence.—The liability of the status epilepticus to recur

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has been pointed out by many writers on the subject, and there seems to be some ground for believing that each attack of the condition leaves the patient more prone to another.

Six of the cases in the tabulated series had more than one attack.

No. of case in series.	No. of attacks.	Result.
14	3	Recovered.
15	3	"
17	3	"
19	2	"
20	2	"
24	2	"

All these attacks were cut short with hyoscine hydro-bromide, and therefore it is impossible to say what is the effect of the recurrent attacks upon the severity of the condition, except to repeat that in some cases the first attack is sometimes a mild one and only the forerunner of a more severe one. The first of these cases (No. 14) presented the following curious clinical history.

F. D—, æt. 72, had thirty-six distinct fits and then passed into the "status." He was treated with hyoscine hydro-bromide and recovered—duration five hours. This was followed by a second attack twelve hours later; this was treated in the same way and he recovered—duration two hours. This in its turn was followed by a second attack twelve hours later, with the same treatment and result—duration one hour. I have not seen a similar case to this reported, nor has another case of the same nature occurred in the series. Some of these cases are always threatening to pass into the "status," and it is amongst these that many of the slighter cases occur.

Diagnosis.—This paper deals solely with the status epilepticus occurring in idiopathic epilepsy. The commonest condition —in asylums—that must be distinguished from it is the pseudo-status of general paralysis of the insane.

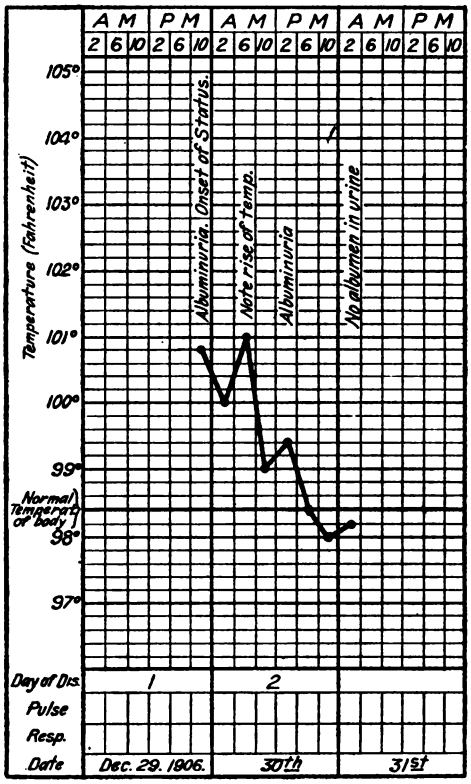
The former history of the case, the physical signs, and the milder form the attack takes should be sufficient to distinguish this from idiopathic status. Most of these cases in general paralysis seem to recover, although occasionally they terminate fatally. Two other conditions must be distinguished: these are the serial fits in Jacksonian epilepsy and the status hystericus: in neither of these cases is the temperature raised

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nearly so high as in true status—in fact, in the latter of the two it is not raised at all, nor is there such imminent danger to life. Jacksonian pseudo-status and that of general paralysis of the insane are probably very closely allied.

Prognosis.—The mild cases recover, nearly all the untreated severe cases die. The mortality in my cases—under all forms

CHART 2.



of treatment—was 44 *per cent.* The percentage of deaths given by various authors is:

Burney Yeo ([8])	50 *per cent.*
Nothnagel and Buisanger ([9]) . .	50 „
Lorenz ([10]) (less than) . . .	45 „
Clarke ([11]) (out of 52 cases) . .	33⅓ „

Under treatment by hyoscine hydro-bromide out of seventeen cases attacked there were fifteen recoveries and two deaths.

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The earlier the case comes under treatment the more favourable seems to be the chance of recovery.

Treatment.—With regard to the treatment of the condition there is no greater evidence of the difficulty met with in dealwith it than the number of remedies which have been recommended for its cure. Chloral is the drug which seems to have given the best all-round results, either with potassium bromide or without it. On the other hand, chloral has failed utterly in my cases, and this has also been the experience of others, amongst whom may be mentioned Dr. Bevan Lewis (12) and Dr. White (13). Citrate of ergotin ($\frac{1}{200}$ – $\frac{1}{60}$) hypodermically (14), digitalis (15), amyl nitrite (16), and a host of other drugs have all been useful in cases or groups of cases; all have been—with the exception of chloral—eventually discarded.

The most successful treatment in my cases has been that with hyoscine hydro-bromide. With regard to the usefulness and method of action of this drug there has been a great deal of discussion. As to the points raised, most have been, and will be, dealt with in other places, but an epitome of the action of the drug itself must preface the remarks as to its use.

"The dominant physiological action of hyoscine is upon the cerebral cortex, producing sleep often accompanied by a low delirium. It is also a centric depressant of respiration, and depresses, though somewhat feebly, the whole motor cord. . . Its influence upon the circulation is very slight and it appears to exert no influence on the nerves or muscles" (17).

Wood (18) also points out that the experiments made with hyoscine must have been made with different alkaloids or combinations of alkaloids. He insists most strongly on the point that hyoscine has little effect upon the heart:

"It has no sedative influence upon the heart; it may be used when the feeble condition of that viscus forbids chloral," and points out that the only depressing effect is upon the respiratory centre. In view of the fact that Mott has conclusively proved (19) that the tendency in status epilepticus is death from cardiac failure and not from asphyxia, one of the grave objections to the use of hyoscine—that it tends to increase cardiac failure—is proved a fallacy. Moreover, there are two other points with regard to this: First, our experience with the drug has not shown any indication that it acts as has

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been asserted. Second, I have used the drug in cases where senile changes had already made the heart feeble.

Another point of great importance with regard to this treatment is the nature of the hyoscine used. We have already pointed out Wood's contention that the drug, as used, was not always of the same composition, and this is borne out by the following data: Firstly, after a succession of recoveries extending over some years we had two fatal cases. Both these cases were no more severe at the onset than the ones cured, both were treated immediately on onset, *and both were treated with the same specimen of the drug, which was a new one.* Secondly, Amory Hare ([20]) and others have drawn attention to the fact that people greatly differ in reacting to the drug—is there more idiosyncrasy or variation in efficiency in this phenomenon? Thirdly, hyoscine hydro-bromide in the form of pellets standardised ready for use seems useless: of this I have satisfied myself by investigation of cases in several asylums in which it has been used extensively. The small dose necessary necessitates very careful preparation of our stock solutions.

The drug, as prepared by Merck, has been used in all our cases, and we find now that the same variety of the drug was used by Wood in his experiments.

Treatment by hyoscine hydro-bromide.—The routine treatment is as follows: The solid hyoscine hydro-bromide is procured from the source spoken of and a carefully prepared solution is made (1 in 400, *i.e.*, $\frac{1}{100}$ gr. is contained in 4 minims) and a small amount of a preservative is added. On the onset of the "status" 4 minims are given by hypodermic injection; half an hour is allowed to elapse and if the symptoms show no signs of amelioration another 2 or 4 minims are given; the following morning an enema is given. This treatment has been used upon every occasion during the past six years and has seldom failed.

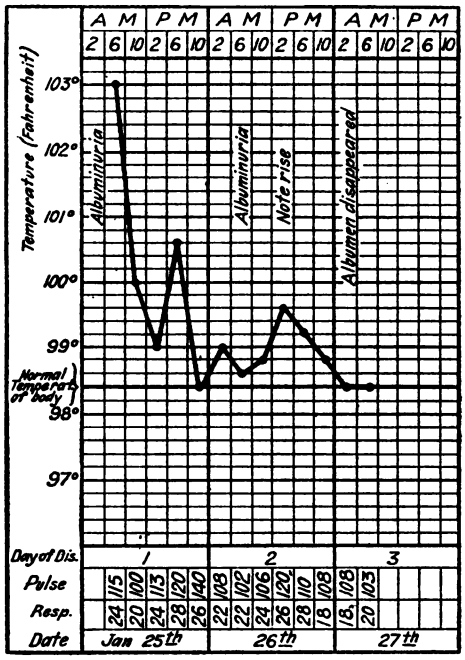
The following case shows the effect of the treatment:

A. B—, æt. 25, an epileptic from birth. At 9 p.m. patient had two sharp fits followed by a succession of smaller ones, and then passed into the "status." When seen at 9.20 p.m. he was having fits which followed each other at intervals of a few seconds—there was no return to consciousness. The fits started each time in the same sequence—lower lip, temporal muscles, flexors of the forearm, sartorii, adductores longi—then

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becoming general. The tonic spasm was badly marked in all cases; the temperature was raised and the pulse forcible and frequent. Four minims of the stock solution ($\frac{1}{100}$ gr. of the drug) of hyoscine was given hypodermically with almost immediate effect. Within three minutes the iris was widely dilated and the fits became less frequent, the convulsive movements of the leg being the first to cease. The fits ceased within fifteen minutes, and, after recovering partial consciousness, the patient fell asleep. Half an hour later he was sleeping

CHART 3.



soundly, the pulse was forcible and frequent (140), the skin moist and warm (102° F.), the respiration rather stertorous. He made an excellent recovery.

With regard to failures with this drug there are two apparent causes: (1) The drug, as has been pointed out, is not always procured active; (2) the doses used are too large. The more quickly the drug is administered the smaller is the dose necessary. Appended is a table showing the amount of the drug used in fifteen recovered cases:

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No. of case in series.		Dose given.
No. 14,	1st attack	$\frac{1}{60}$ gr.
	2nd ,,	$\frac{1}{60}$,,
	3rd ,,	$\frac{1}{60}$,,
No. 16		$\frac{1}{75}$,,

Charts showing Respiratory, Temperature, and Pulse Maximum in Twenty Cases of Status Epilepticus.

CHART 4.

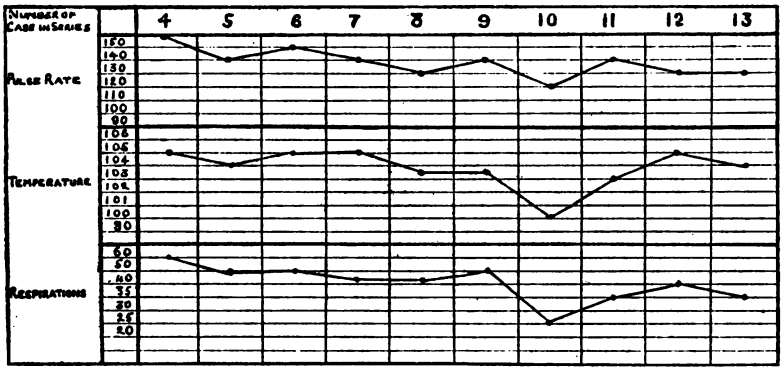
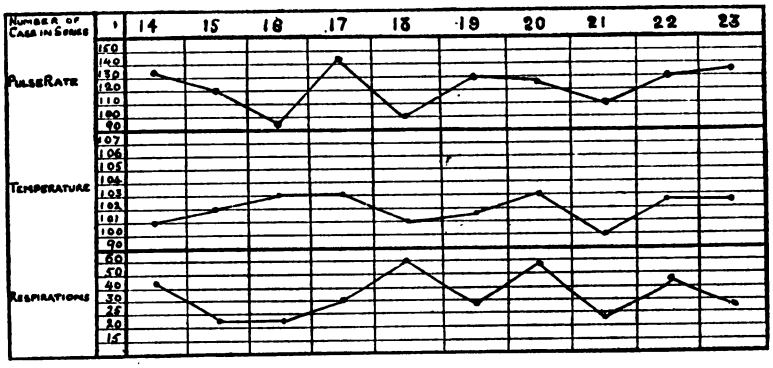


CHART 5.



The first ten cases (Chart 1) were treated in various ways, the last ten (Chart 2) with hyoscine hydro-bromide.

No. 17,	1st attack	$\frac{1}{100}$,,
	2nd ,,	$\frac{1}{100}$,,
No. 18		$\frac{1}{100}$,,
No. 19,	1st attack	$\frac{1}{100}$,,
	2nd ,,	$\frac{1}{100}$,,

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Table of Twenty-seven Cases of Status Epilepticus, showing (1) *Age*, (2) *Liability to Recurrence*, (3) *Relation of Onset to Number of Fits*, (4) *Influence of Treatment.*

No. of case in series.	Age.	Sex.	Number of fits immediately before onset.	Attacks.	Duration.	Treatment.	Result.	Remarks.
1	31	M.	One severe fit	1	24 hours	Chloral	Died	—
2	50	M.	38 fits	1	—	Potassium bromide and chloral	,,	—
3	26	M.	Bruit of fits	1	—	No treatment	,,	—
4	17	M.	7 to 8 fits	1	—	Chloral	Recovered	—
5	34	F.	Bruit of fits	1	2 days	Chloral gr. xxx	Died	—
6	45	F.	No record	1	7 hours	No treatment	,,	—
7	26	M.	,,	1	24 hours	Digitalis	Recovered	—
8	42	M.	Bruit of fits	1	72 hours	Chloral	Died	—
9	17	M.	15 fits	1	48 hours	,,	,,	—
10	25	M.	35 fits	1	48 hours	,,	,,	—
11	35	M.	No record	1	36 hours	Opium	,,	—
12	17	M.	Bruit of fits	1	Some days	Digitalis	,,	—
13	69	M.	14 fits	1	1 hour	Amyl nitrite	Recovered	—
14	72	M.	Bruit of fits (each time)	3	(1) 5 hours, (2) 2 hours, (3) 1 hour	(1) Hyoscine hydro-bromide $\frac{1}{60}$ gr. (2) ,, ,, ,, (3) ,, ,, ,,	,,	This case is the peculiar one noted under the head of "recurrence."
15	25	M.	5 fits	3	½ hour	,, ,, $\frac{1}{75}$ gr.	,,	—
16	20	M.	Bruit of fits	1	½ hour	,, ,, ,,	,,	—
17	13	M.	,,	3	—	,, ,, $\frac{1}{100}$ gr.	Recovered and still living	—
18	74	M.	10 fits	1	—	,, ,, ,,	Recovered and died a year later from phthisis	—
19	25	M.	8 fits and 17 fits	2	(1) ½ hour (2) 1 hour	,, ,, ,, ,, ,, ,,	Recovered	—
20	28	M.	Bruit of fits	2	1 hour	,, ,, $\frac{1}{60}$ gr.	,,	—
21	35	M.	7 fits	1	—	,, ,, $\frac{1}{300}$ gr.	,,	—
22	26	M.	No record	1	½ hour	,, ,, $\frac{1}{100}$ gr.	,,	—
23	71	M.	9 fits	1	—	,, ,, ,,	,,	—
24	15	F.	Bruit of fits	2	—	,, ,, ,,	,,	—
25	28	M.	No record	1	½ hour	,, ,, $\frac{1}{75}$ gr.	,,	—
26	45	F.	3 fits	1	14 hours	,, ,, $\frac{1}{60}$ gr.	Died	The two fatal cases discussed under the head of the variation in efficiency of the drug.
27	53	M.	10 to 12 fits	1	7½ hours	,, ,, ,,	,,	

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No. of case in series.	Dose given.
No. 20	$\frac{1}{60}$,,
No. 21	$\frac{1}{200}$,,
No. 22	$\frac{1}{100}$,,
No. 23	$\frac{1}{100}$,,
No. 24	$\frac{1}{100}$,,
No. 25	$\frac{1}{70}$,,

In conclusion, given a pure and active drug, speedy application, and a careful regulation of the dose, there seems to be no reason why we should not appreciably diminish the mortality in this condition. Lastly, I must express my indebtedness to Dr. Rutherford, Medical Superintendent of the Exeter City Asylum, both for permission to report these cases and also for much kindly advice and help given in its preparation.

(1) *Archives of Neurology.*—(2) *Recheras sur l'épilepsie.*—(3) Inaugural address at Kiel.—(4) Spratling's *Epilepsy.*—(5) *Archives of Neurology.*—(6) *Epilepsy*, Spratling.—(7) *Dictionary of Psychological Medicine.*—(8) *Manual of Medical Treatment and Therapeutics.*—(9) Eülemberg's *Realencyclopädië.*—(10) Inaugural address at Kiel.—(11) Spratling's *Epilepsy.*—(12) *Psychological Medicine*, Lewis.—(13) *Journal of Mental Science*, White.—(14) *Ibid.*, White.—(15) *Ibid.*, Greeve.—(16) *West Riding Asylum Reports*, Browne.—(17) *Therapeutics: its Principles and Practice*, H. C. Wood (12th edition).—(18) *Therapeutic Gazette*, Wood.—(19) *Archives of Neurology*, Mott.—(20) *Text-book of Practical Therapeutics*, Hare.

On the Treatment of Cases of Acute Insanity by Rest in Bed in the Open Air. By J. WIGLESWORTH, M.D., F.R.C.P.

HAVING been engaged during the past three years in treating cases of active insanity by rest in bed in the open air, I am able to add my testimony to that of Dr. Easterbrook, as published in the last number of the *Journal of Mental Science*, as to the value of this method of treatment in suitable cases.

In the summer of 1904 I first tried the experiment of treating cases of acute insanity in this way, and being satisfied with the results obtained I extended the system, and during the past two years all cases of recent insanity admitted into Rainhill Asylum, which were in any way suitable, have been given a trial of this method of treatment.

This institution being one of the older asylums is not structurally as well adapted as could be desired for treating

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