Blanche L. La Du, State Board of Control: I did not expect to preside this morning, so I haven't an original or new thought in my head, but I do want to say that we are very glad, as always, to welcome the superintendents again, and glad so many of you were able to be here today.

On behalf of the program committee, of which I happen to be the chairman, I wish to state that it is getting to be a rather difficult matter to arrange programs of general interest to this group. It is very difficult *for us to find something new and interesting to all of you. You have been* having quarterly conferences for years. You not only know the work of your own institution and know it well, but you know in a general way how everybody else is carrying on in their institutions. It is quite unusual for a state to have such a fortunate arrangement, and we know that other states feel that way about it. We talked over various subjects for a program, and decided that this time we would try to select something that would be of general interest to all; something that would be practical; something from which we might gain some ideas and suggestions that could be put into operation in our institutions that might help in the improvement of our work.

We are invited to hold our February meeting at the University Hospital. I have not consulted with the members of the program committee and have not decided what our program will be, but they are quite anxious that we stress Minnesota's need for a psychopathic hospital at that time. They expect to entertain members of the legislature who are interested in securing a psychopathic hospital for Minnesota.

Before we start our program this morning, I have the pleasure of introducing some new superintendents, officially.

You will recall Mr. Stevenson, who was superintendent of the School for the Deaf. We very much regretted his leaving Minnesota, but we were pleased to have him receive a position that was considered quite a promotion. We wish him success where he has gone. While we regret his going, we feel that he has been replaced by one who will be just as welcome in this group; one who will carry on the work in Minnesota in a successful and satisfactory manner. I am very happy to introduce to you this morning Mr. Skyberg, superintendent of the School for the Deaf.

We all miss our genial, kind, lovable Doctor Hall, who was taken from our group last July. In his place we expected today to introduce Doctor Burns, who now has charge of the State Sanatorium, but Doctor Burns was unable to be here. We shall have to postpone his introduction until some other date.

We have with us this morning a man who is new as a superintendent but not new to this group. Doctor McBroom. You have known him as senior physician at the School for Feeble-Minded. Doctor McBroom was asked to take charge of the Colony for Epileptics at Cambridge recently. I should like to have Doctor McBroom stand and meet you, not as senior physician at Faribault, but as superintendent of the Colony for Epileptics.

Doctor Smith, of Willmar, is one of our newer superintendents.

28-GSK-TNW

Perhaps Doctor Smith has been introduced before. I am not sure, however. Doctor Smith, who was assistant physician at St. Peter, is now in charge of the Willmar State Asylum. Doctor Smith.

We have a new department head. As you understand, we have various departments here in charge of executive secretaries, and Doctor Anderson has charge of the department for the care of the tuberculous in the state. Doctor Anderson.

We will now proceed with our program. As you see by your program, we have chosen for the general subject today "foodstuffs in the institutions," the problem of "feeding the multitudes," that is what it amounts to to some of you who have the larger institutions. The members of the program committee feel that this is a very practical subject, one that, if discussed freely, may prove of real constructive value.

Knowing that public institutions are human laboratories where problems of human growth, development and response to treatment, can be scientifically studied under controlled conditions, it has been the policy of the Board of Control at various times to use such institutions for purposes of study and research.

A few months ago Doctor Barborka, of the Mayo Clinic, made a proposition to our Board, asking permission to make a study of a certain group in the institution at Cambridge; that is, a certain treatment for epileptics. This was to be done by dietary process. The Board granted that permission.

Doctor Barborka was to have been here this morning to tell us something about the work he is doing there, and something about what he hoped to accomplish. On account of illness he is unable to be here. He has sent in his place, however, Doctor Wheeler, who is a consultant physchiatrist and who has worked on this study at Cambridge with Doctor Barborka. In fact, I think it was she who made and outlined the clinical background on which Doctor Barborka founded his study.

I am pleased to introduce to you this morning Doctor Wheeler, who will speak on the same subject that Doctor Barborka was to have given, "The Ketogenic Diet." Doctor Wheeler.

GROUP STUDY ON THE KETOGENIC DIET IN EPILEPSY—PRELIMINARY REPORT

Theodora Wheeler, M. D., Mayo Clinic, Rochester, Minn.

It has been proposed to make a prolonged study at the Cambridge State Hospital with a number of epileptic patients who are undergoing *the rigid regime of a ketogenic diet. This proposal* involves a number of conditions, some of which will be considered here.

A ketogenic diet is one in which fats are largely substituted for carbohydrates. It is so called because it causes the appearance of ketone bodies in the urine, as will be explained later. Our foods are composed of proteins, carbohydrates and fats which must include a necessary amount of inorganic salts and vitamines. An average diet for a normal adult should supply during the 24 hours approximately 16 calories for each

pound of body weight, and for a child the number of calories should be about 25 for each pound. This is called a maintenance diet since it provides the body with heating material, renewing substances, and has an additional 40 per cent calories to provide for daily work.

In ordinary diets the proportion of food constituents varies widely, but certain small amounts of each of the three major food factors are necessary. The amount of fat needed is around 100 grams. This contains enough butter fat to supply vitamine A in adequate amounts and furnishes its share of fuel. The number of grams of protein necessary is equal to around one-half the number of pounds of normal body weight. Under ordinary dietary conditions carbohydrates and fats together are the source of body heat and energy. They bear a metabolic inter-relationship, and a minimal portion of from 30 to 50 grams of carbohydrate has been found sufficient to effect thorough fat oxidation in the body.

In 1885 Rosenfeld described their inter-dependency by saying that the fats burn in the fire of the carbohydrates. If less than the above amount of carbohydrates is ingested, a condition of ketosis may supervene in which the ketone bodies, diacetic acid, beta-oxybutyric acid, and acetone, appear in the urine. These are fatty acids and are evidence of incomplete oxidation of fats. In the ketosis resulting from controlled dietary manipulation the ketone bodies are present only in such quantities as the body fluids can neutralize. There is no uncompensated acidosis present. When such an increased amount of these bodies is produced as to disturb the acid-base equilibrium—as occurs, for instance, in diabetes—an uncompensated acidosis is said to be present. Since carbohydrates greatly outrank fats in customary dietary supplies, there is ordinarily no approach to the low safety margin of carbohydrate intake.

In starvation, however, acidosis may appear. The body, forced back on its own stores, finds that these are chiefly fat. The carbohydrates normally present in blood and in tissues as glucose and in the liver as glycogen become quickly exhausted when they are not continually renewed by an ample diet.

The present work was developed following the discussion of fasting as a dietary measure in the treatment of epilepsy as reported by Guelpa and Marie in 1910. Geyelin, in 1921, noted that the number of convulsions was sometimes diminished when epileptic children were being starved, and he attributed this remission to the resultant acidosis.

Dr. Russell Wilder originated the hypothesis that the improvement might be due less to acidosis than to the presence of ketone bodies in the blood, and he began investigating the effect of their presence. In July, 1921, he reported (in a Mayo Clinic Bulletin) the cases of three patients, a boy of 12, a man of 31, and a young woman of 23, whose *accustomed convulsion sequences* were at least temporarily interrupted over a number of weeks' time coincident with a ketogenic diet therapy. Since then Dr. Wilder has continued his interest in the problem. Other reports have been forthcoming by Dr. Barborka with a group of 49 adults. They could report improvement in half of the cases. Drs. Helmholz and Peterman, with a larger group of children, noted apparent benefit in half the cases also.

Other medical investigators in this country and abroad have carried on extensive investigations on this question. The results of all this activity have furnished a substantial basis and indications for further study of the problem. It is important that as exact an estimation of the action of this diet in epilepsy be determined as is possible by modern scientific means. That this is no easy task will be realized by anyone who is familiar with the extent of the problem of epilepsy.

Early history gives descriptions and comments on the occurrence of convulsions as a human malady. Outstanding persons of all times have exhibited its strange phenomena. Such individuals as St. Paul, Caesar, Napoleon, and the Russian writer, Dostoievsky, are numbered among those supposed to be affected. Besides such examples of brilliant persons, we know that innumerable feeble-minded formerly have had, and others now have, the disease, so that it extends through the entire range of the mentality of civilization. It is estimated that in the United States alone, at the present time, over 500,000 persons have the disease, many thousands of whom are in state institutions as public charges. Some 28 states have hospitals devoted to the care of these patients alone.

One can make broad statements with regard to the clinical aspects of epilepsy. It may be said to have probably been found in connection with every disease known to man. The aurae or preliminary warnings are of interest as contributory central nervous system phenomena. Here the vagus and sympathetic system are often evidenced symptomatically. Such representations as vertigo, syncope, and narcolepsy occurring in other diseases are of allied interest.

The history of therapeutic efforts is cumulatively negative. At times the removal of an apparently independent benign growth or clearing up a focus of infection stops the seizures. The coincidental cure is apt to be a temporary one. The records of the disease are only too familiar with this occurrence. Occasionally a spontaneous cessation of seizures takes place.

When the present study was begun by a diversified group of scientific workers in the spring of 1928, it was felt that a distinct opportunity had presented itself. In particular it was advantageous for those who had been familiar with only the milder forms of epilepsy to observe the varied and severe syndromes of advanced epilepsy. The friendly welcome extended by the institution has been a challenge to the extramural personnel to sustained effort.

At the beginning, 24 patients were included in the experimental group, but recently a more rigorous selection has reduced the number to six. These patients will be kept on the ketogenic diet for as long a time as is feasible. A control group of some 20 patients is being followed closely. Before taking the ketogenic diet, each patient in the experimental group was on a restricted caloric intake for six months.

At this point reference may be made to certain technicalities for arranging the diet itself. As often happens, the formulae used in new methods are rather complicated. This was the case in the ketogenic diet, and Dr. Barborka rendered a useful service when he devised a practical

table that enables a ready estimate to be made of the correct quantities of the different food factors for any patient. This table is self-explanatory and is given at the end of this paper.

Note may be made here that a disagreeable, if not untoward symptom of nausea, appears sometimes during the transition from the normal to the ketogenic diet. This nausea can be controlled effectively by administration of small amounts of orange juice. When nausea does appear and the orange juice is given, it may delay somewhat the appearance of ketosis.

Observers are at hand who will record the large amount of necessary material on forms and graphs, and by sifting the data a critical background will be obtained. Among the factors to be noted are the number and severity of each patient's seizures. Special diagrams have been found for this, showing an entire year horizontally, with the hours of the days vertically. Interesting factors regarding the periodicity of the seizures are clearly demonstrated by this means.

The general behavior of the patients is being noted on monthly sheets where lists of appropriate descriptive terms are checked daily by the attendants. These lists include observations on both the patients' spontaneous and required behavior. Under the division of spontaneous activities these charts allow recording of the full range of activities, from extremely disturbed to very subdued. These forms were obtained from Dr. Adolf Meyer at the Phipps Psychiatric Clinic at the Johns Hopkins Hospital in Baltimore.

The plan for medical surveillance includes both a neurologic and psychiatric examination at the beginning and end of the experimental period. Several psychologic procedures have been planned for the present study. From the State Board of Control, Dr. Kuhlmann provides for intelligence tests with retesting at half-year intervals when he thinks this desirable. The Department of Psychology at the University of Minnesota has interested Mr. Paulson, a graduate student, in making a special study of the motor control of the patients of the experimental and control groups. An adaptation of the Kent-Rosanoff association tests is also being undertaken as a part of the general psychologic survey.

It is of particular interest to observe the effect of the diet on institutional types of epilepsy as are here available. Most of the studies heretofore presented have been on patients with much milder forms of the disease.

Since the prolonged time element of epilepsy is such an outstanding feature of the disease, and since many studies of originally sincere endeavors have pursued the path of short-lived adventures, it is hoped to continue this work over a protracted period of time.

It is often claimed that our institutions furnish splendid material for study. The opportunities to really do this, however, are only too few. It is desirable that the unusual possibilities in the present situation be allowed gradual maturing for a serviceable piece of work to result therefrom.

TABLE 1

Methods of Calculation for Ketogenic Diet

Diet	Carbohydrate, gm.	Protein, gm.	Fat, gm.	Procedure
1.	Estimated calories* x 0.035	Adult—½ weight† Child—⅔ weight	Estimated calories x 0.09	Continue for from three to four days.
2.	Estimated calories x 0.02	Adult—⅓ weight Child—⅔ weight	Estimated calories x 0.09	Continue for from one to two days. Intermediate diet prior to production of ketosis, or fast patient for two days and begin diet 3.
3.	Estimated calories x 0.015	Adult—⅓ weight Child—⅔ weight	Estimated calories x 0.10	Continue for from three to five days. Ketosis may develop.
4.	Estimated calories x 0.010	Adult—⅓ weight Child—⅔ weight	Estimated calories x 0.10	
5.	Estimated calories x 0.008	Adult—⅓ weight Child—⅔ weight	Estimated calories x 0.10	*Continue indefinitely.*
6.	Estimated calories x 0.006	Adult—⅓ weight Child—⅔ weight	Estimated calories x 0.10	Diets 4, 5 and 6 to be used in order to develop or intensify ketosis, if necessary. Continue indefinitely. Diets 4, 5 and 6 to be used in order to develop or intensify ketosis, if necessary.

*Total estimated calories—weight in pounds x 15 for adults; total estimated calories—weight in pounds x 25 for children.

†Weight means weight in pounds.

BIBLIOGRAPHY

1. Barborka, C. J.: Ketogenic Diet Treatment of Epilepsy in Adults, J. A. M. A. 1928, xci, 73-78; The Ketogenic Diet in Epilepsy, Western Hosp. and Nurses Review, October, 1928; Ketogenic Diet in Epilepsy, The Trained Nurse and Hosp. Review, December, 1928; The Ketogenic Diet and Its Use, Mod. Clinics of N. Amer. (In press)
2. Geyelin, H. R.: Fasting as a Method for Treating Epilepsy, M. Record 99: 1037-1038, 1921.
3. Guelpa, G., and Marie, A.: La lutte contre l'epilepsie par la desintoxication et par la reeducation alimentaire, Rev. de therap. 78: 8-13, 1911.
4. Holmhola, H. F.: The Treatment of Epilepsy in Childhood, J. A. M. A. 88: 2028-2032 (June 25) 1927.
5. Peterman, M. G.: The Ketogenic Diet in the Treatment of Epilepsy, Am. J. Dis. Child. 28: 28-33 (July) 1924; The Ketogenic Diet in Epilepsy, J. A. M. A. 84: 1979-1983 (June 27) 1925; Epilepsy in Childhood, ibid. 88: 1869-1870 (June 11) 1927.
6. Rosenfeld, George: Ueber die Enstehung des Acetons, Deutsche med. Wohnschr., 1885, pp. 683-686.
7. Talbot, F. B.: Metcalf, Kenneth; and Moriarty, Margaret: The Ketogenic Diet in the Treatment of Idiopathic Epilepsy, Tr. Am. Pediat. Soc. 38: 30-34, 1926; Am. J. Dis. Child. 32: 316-320 (Aug.) 1926; Epilepsy, Chemical Investigation of Rational Treatment by Production of Ketosis, Am. J. Dis. Child. 33: 218-225 (Feb.) 1927.
8. Weeks, D. F.: Renner, D. S.: Allen, F. M., and Wishart, Mary B.: Observations on Fasting and Diets in the Treatment of Epilepsy, J. Metabol. Research 3: 317-364 (Feb.) 1923.
9. Wilder, R. M.: The Effect of Ketonemia on the Course of Epilepsy, Mayo Clinic Bull. 2: 307, 1921.

Mrs. La Du: We wish to thank you, Doctor Wheeler, for giving us this very interesting and instructive talk on the ketogenic diet. It is so new to us that I am sure it has been extremely interesting.

No matter what institution you have charge of, you invariably come in contact with the feeble-minded and epileptic, whether in the insane, correctional or penal institutions. I am sure some of you must have questions you would like to ask Doctor Wheeler concerning this new treatment for the epileptics.

I am going to ask Doctor McBroom if he has anything he wishes to add. Doctor McBroom is in charge of the institution at Cambridge, as I stated before, and is following closely the work that is being done. Although he was not there at the time this study was begun, he is taking an active part in the demonstration at the present time.

D. E. McBroom, M. D., Colony for Epilepics: I do not think I have anything to add to Doctor Wheeler's remarks. She has covered the field very fully and has given you a good idea of what we are trying to do at Cambridge.

Before going on the ketogenic diet they had to determine the caloric requirements for every individual. This diet was carried on for a period of six months with exceptionally satisfactory results, as shown by the short period it took them to produce the condition of ketosis.

The preliminary diet meant the determination of the caloric intake needed under a certain amount of exercise. We all know that outside of institutions that is rather difficult to determine. One day they may go to a dance; the next day they may spend in bed. The caloric intake the day they spend in bed would be in excess of the caloric intake the day they were exercising. They were able to determine this very accurately at our institution, so when our patients finally went onto the ketogenic diet they were only three or four days going into a state of ketosis.

We are apt to be dealing with an entirely different group of patients than the individual investigator deals with. The individual investigator has been reporting improvements up to the point of about 30 to 33 per cent. I doubt very much our being able to get this in institutional life. I think the individual investigators select their cases with a great deal of care. Cases brought to them are incipient cases, while those we have to deal with in state institutions are the confirmed epileptics who have had seizures for years. By supplementing the study of one type by the other a very good differential picture of the problem may be obtained.

I am very happy to say that we went on this diet the first of November with practically no bad results. The diet consists almost entirely of fats. As you can readily realize, a diet of fats almost entirely is somewhat nauseating and must be watched very carefully. Out of our 24 patients who started this diet, we had only one case of gastric reaction which lasted for six hours, but was readily relieved by a small amount of orange juice.

Unfortunately we are not able to supply quite everything that is needed in the ketogenic diet. For instance, the cream used in this diet is supposed to be 40 per cent cream. Cambridge is a small community, and we have had difficulty in obtaining a 40 per cent cream. The best we could get was 30 per cent. We have had to offset that by adding butterfat to the diet, and it seems that the butterfat is a little excessive. If you should look at their plates at meal time, you would wonder what they were going to do with all that butter.

As to the results obtained by the ketogenic diet, I think we can not draw any definite conclusions until six years have elapsed because it is a lifetime disease.

If we can get favorable results from a group of children in the advanced stages of severe epilepsy and with a lowered mentality, it is worth the effort the Mayo Clinic is putting forth.

Mrs. La Du: That has been very helpful.

Doctor Murdoch, have you something to add, or would you like to ask any questions along this line? I am sure you are very familiar with epilepsy and with studies made concerning treatment. We therefore will be very glad to hear from you.

J. M. Murdoch, M. D., Superintendent School for Feeble-Minded: It

is indeed a pleasure to have the very explicit report which Doctor Wheeler has presented of the manner in which this very interesting and timely scientific research has been planned and is being carried on under the direction of the Mayo foundation with the cooperation of Doctor McBroom and his co-workers at the State Colony.

From the dawn of history epilepsy has been enveloped in a shroud of mystery, a mystery which even now persists. Only since the beginning of the present century has any material advance been made in scientific knowledge of the subject. Anatomic investigation, gross and microscopic, has revealed all sorts of organic lesions in epileptics, but none which can be considered characteristic or responsible for the epilepsy.

It is to the physiologist or biochemist that we now look for light upon the process that gives rise to the epileptic phenomena.

The treatment of the disease has embraced almost every imaginable therapeutic agency. In my early institutional days bromide was largely used in combating epileptic phenomena. It reduced the number and severity of seizures, but did not cure the patient. Large doses of this drug, which stupified the patient, were given. Then at Bethel Colony near Bielefeld in Germany, in which there are 3,000 or 4,000 epileptic patients, to whom bromides were given literally by the ton, it was found that by limiting the intake of chlorides with the food more satisfactory results could be obtained by much smaller doses of the bromides.

In more recent years luminal largely supplanted the bromides. With luminal more satisfactory results were obtained in the great majority of cases than with any drug previously used in the treatment of epilepsy.

It is interesting to note the correlation between the general use of luminal in the past ten or fifteen years and the fact that during this period such statistics as we have indicate a decrease in the number of epileptics.

The effects of the ketogenic diet seem to be somewhat similar to those produced by luminal. If these or more favorable results can be brought about by diet rather than by a drug which seriously affects normal metabolism, it would seem to be preferable.

We are indebted to Doctor Barborka, Doctor Wheeler and Doctor McBroom for the timely investigation they are making. The carefully controlled manner in which the ketogenic diet is being administered at the State Colony for Epileptics at Cambridge is of great scientific value, and a report on the effect of the diet in these controlled cases will be looked forward to with great interest.

Mrs. La Du: Certainly some of our physicians from the institutions for the insane, where there are a large number of epileptics who are mentally disturbed, have some questions to ask.

I am sure, Doctor Kilbourne, you have something of interest to add.

Arthur F. Kilbourne, M. D., Rochester State Hospital: I should like to ask Doctor Wheeler if this group consists of the younger children only.

Doctor Wheeler: No, they range from 12 years of age to 35 or 40.

Dr. Kilbourne: Those who have had anything to do with the treatment of the epileptic have been rather pessimistic as to the beneficial results of any treatment.

When I was at St. Peter I was very much set up over an epileptic that I thought I had cured. I was young then, with very little experience. I had carried that case for about a year without a seizure. Then he had his first and last epileptic seizure. He died in status epilepticus. All the seizures that he ought to have had in that year had accumulated and finished him up.

I am sure that all the state hospitals for the insane and all the other institutions are very much relieved that the epileptics are now colonized at Cambridge. They are very difficult cases to care for in an institution such as the hospitals for the insane. They seem to be out of place there.

The only treatment heretofore has been, as Doctor Murdoch said, the old one of bromides which rendered an epileptic demented and harmed him physically. Then luminal, which may limit the seizures and give the epileptic an opportunity to be more or less fitted for social contact.

I sincerely wish them Godspeed in this experiment at Cambridge, and hope that it will result either in some definite improvement or even in the cure of epilepsy.

Mrs. La Du: Doctor Patterson, have you something to add to this discussion or some question you would like to ask?

W. L. Patterson, M. D., Fergus Falls State Hospital: I think I haven't much to add, Madam Chairman.

In the hospitals for the insane the epileptics not only have epilepsy, but they are insane, which adds considerably to the difficulty of handling them. It would also add to the difficulty of getting their cooperation in going on to a diet of this kind. When you have different types of epileptics scattered through many wards, the only possible way of handling them, were they to be put on this kind of a diet, would be to gather them together in one particular place and endeavor to enforce their cooperation, although I have no doubt there would be great difficulty in getting cooperation from some of them.

As I understand it, this diet lessens the frequency of the seizures to about the same extent as if given luminal. We know we can reduce seizures very markedly in a certain number of epileptics by using this particular drug. In seven years' use of it I have never seen a particle of harm come to any patient that has used it, even at the rate of three or six grains a day. There have been no bad results whatsoever.

We know that certain simple measures that we adopt are helpful in epilepsy. For instance, they are better when taking an active outdoor exercise, doing active work in the open air. We know that if we regulate their diet, if their bowels move frequently, if they do not become toxic, it is of some assistance and will help somewhat in reducing their seizures. I hope that by the use of this diet at least a method will be

found so that we can do away with the use of drugs. Even if it accomplishes only that much it will be quite worth while.

Mrs. La Du: Doctor Freeman, may we hear from you? You are very familiar with cases and treatment of epilepsy.

Geo. H. Freemen, M. D., St. Peter State Hospital: No, I am not very familiar with epilepsy.

Although I have read from time to time about the ketogenic diet, I am not a dietitian, and I appreciated Doctor Wheeler's simple explanation of what the diet is.

Doctor Wheeler remarked that it has been said that nine-tenths of our research is useless. Even negative results are of value. If this experiment tells us that a ketogenic diet is not leading us any place, it will be of almost as much value as to tell us it is leading us some place.

I feel that the ultimate solving of the problems of epilepsy is going to lie in the use of finer chemical methods. As we know more of the chemistry of the cells in these patients, we are going to do more for them.

C. J. Swendsen, State Board of Control. I want to ask a question, a more practical question perhaps. I realize, of course, that if this experiment at Cambridge is successful, any amount of money needed should be spent in the institutions to carry on the work. If it is not successful, then of course it would not be adopted. From an economical point of view, I want to ask Doctor McBroom if it is a very expensive procedure.

Doctor McBroom: With us it has been. The preliminaries, of course, cost us nothing except a few incidentals here and there. It was merely to determine the intake of food necessary. But when we came on to the ketogenic diet the first of November, we were faced with the problem of supplying 480 quarts of 40-per-cent cream for these patients, canned fruits, low carbohydrates that we had to buy from a dietetic supply house. The bills came in pretty rapidly, so that at that time I asked the dietitian in charge of the work at Cambridge if she would make up a supplemental estimate covering this diet until about the first of the year, which she did. Much to our surprise that totaled almost $1,200.00. Anyhow, it was in the neighborhood of $500.00 or $600.00 a month additional for 24 patients. At that time it was thought advisable to reduce the number of patients we had on the diet.

As Doctor Wheeler stated, when they selected cases they took both sexes, all ages, and all mentalities. We had some people on that diet who, if we had absolutely cured the epilepsy, would have had seizures from habit. They had had them so long they could not be cured. We had to take them off the diet: also a few patients who could not be controlled and their diet watched. We have reduced our number to 14.

I can not give you the approximate cost other than to say that 14 properly supervised patients ought to be run through for 50 per cent of what 24 were, but I would say that as far as state institutions are concerned it is rather an expensive piece of research.

Mary L. Stewart, Home School for Girls: I should like to ask what the attitude of the patients is toward this diet. Do they have to be forced to take it?

Doctor McBroom: The patients on this diet were all voluntary patients. Volunteers were called for, and they all took the diet voluntarily. There has been no compulsion in any way or form.

The mental attitude of the patients toward the diet has been exceedingly gratifying. We all know epileptics are optimistic. They are always grasping at a straw, and those of any mentality at all are living up to the diet to the letter. Of course, in our deteriorated cases, and particularly during the apple season, we had a hard time keeping them away from the orchard.

Gertrude Thomas, Dietitian, General Hospital, University of Minnesota: Are you using any definite fatty ratio?

Doctor Wheeler: We are using a group menu. The quantity is regulated according to the patient's weight.

Miss Thomas: I should like to ask if your survey has been sufficient to make observations on the factor of age.

Doctor Wheeler: We have drawn no conclusions as yet on this group.

Victor O. Skyberg, Minnesota School for the Deaf: I suppose it is all very clear to most of you, but I am a layman, and I should like to ask this question. Is any treatment given to ordinary cases of ketosis? Do we have normal people with this who require treatment?

Doctor Wheeler: For acidosis in children very often they give orange juice. It is an acute situation usually.

Mr. Skyberg: It is not a situation that would do the epileptic any particular harm? I mean, you are not using an antidote which eventually will do him bodily injury?

Doctor Wheeler: No. The patients can live for months and months and years with this chemical condition in their bodies.

Doctor Kilbourne: Do you have any epileptics with diabetes?

Doctor Wheeler: Yes; but we have very few patients who have both epilepsy and diabetes.

Doctor Kilbourne: In the diabetic you have acidosis. You give them orange juice. There seems to be some connection between the diet prescribed for diabetics and the diet for epilepsy.

Doctor Wheeler: In diabetes deficiency in carbohydrate is brought about through the pancreas and the liver mal-function, so the diabetic has to largely burn fats to supply him with energy. The diabetic has a varied tolerance for carbohydrate, so his problem focuses on the carbohydrate, whereas now we are working with high fat.

A. S. Anderson, M. D., Executive Secretary, Division of Tuberculosis: There is apparently a diminishing of irritability of the nervous system with this ketogenic diet. I should like to ask if the mechanism that brings this about is the same mechanism that brings about the reduction in the irritability by means of luminal.

Doctor Wheeler: Doctor Wilder's theory, when he first started this work, was that there would be an anesthetic effect on the central nervous

system, but studies brought out last spring do not seem to be in accord with that. That question is still unanswered and in the process of being studied.

Mrs. La Du: Doctor Wheeler, would you like to summarize these facts that have been brought to bear on the subject?

Doctor Wheeler: I want to say, first, that when our spirits get low, and when we do get discouraged, it is Doctor McBroom's cheerful attitude that is our orange-juice antidote. We are very grateful for the cooperation and interest that he has shown and is showing.

In connection with the type of patient who has a tremendous number of seizures, this chart shows a girl of eleven who is of a very good family, of high mentality. The initial attack came on suddenly when she was eight years old. Since then she has had innumerable convulsions. You wonder how any organism can stand that onslaught.

The discussion has brought out the varying types of epilepsy, and the problem has been said not to be epilepsy, but the epilepsies. It is in separating out some of this chaotic material, in unraveling and analyzing a few from the multiplicity of details, that we hope to contribute our small quota. We do not know whether or not a group of patients that responds to luminal includes some that react to the ketogenic diet. From time to time doctors discuss what they consider an antidote for an individual case and report it. These reports are so scattered they have not been able to submit to statistical treatment.

This study is an effort to fit the ketogenic diet into its niche in the general regime of epilepsy. And the study we know is being watched in different parts of the country. I think Minnesota has an opportunity that a great many other institutions and communities are very envious of. We hope that we will do our share in making it worth while and of substantial value.

Mrs. La Du: If there are no further questions we will now leave this highly specialized field of study. I knew you would all be very interested in what we are trying to do at Cambridge, and I am sure you are going away with quite a definite idea as to the study that is being made there.

We are now going to take up one of the more practical problems concerning foodstuffs and diets in state institutions. I have asked one of our superintendents to present the subject of "Food Problems in State Institutions," this morning. After he has presented his subject, if we have further time this morning, we will enter into discussion of that, and I know you will all be very much interested in the discussion and will want to take part. I hope you will all return this afternoon. We want you all to take part in this program today.

Doctor Patterson, of the Fergus Falls State Hospital, is going to speak to us now on "Food Problems in State Institutions." Dr. Patterson.

FOOD PROBLEMS IN STATE INSTITUTIONS

W. L. Patterson, M. D., Superintendent, Fergus Falls State Hospital

Mr. Chairman, Ladies and Gentlemen: Instead of generalizing, I am going to present some specific problems from the Fergus Falls State

Hospital. Some of our troubles may have occurred in your institution in the past; some may occur in the future. I hope you will be interested enough to discuss the questions later. I want to learn how other institutions handle these problems.

The average patient and the problems that arise in feeding him will be considered. Patients who require a special diet, and those who refuse to eat and have to be spoon-fed or tube-fed constitute individual problems that must be solved separately.

The average patient should have a well-balanced ration that furnishes the proper amount of energy and nourishment to his body. His food should be simple enough to digest easily, varied and attractive enough to stimulate his appetite, should be adequate in amount and (it goes without saying) should be well-cooked, hot and clean.

Fergus Falls the last few years has had a woman who was not a trained dietitian in charge of kitchen and dining rooms, who has planned the menus and had general supervision of preparing the food, serving it, and taking care of the residue. She has left, so that our most important problem connected with food is what to do about this position. At present the chef has charge, and kitchen and dining-room affairs are going along as well under his control as they did before. Whether to continue this arrangement or look for another good food supervisor I have not decided, but hope to get some ideas on this subject in the discussion that will follow my paper.

Should I try to get a dietitian for this work? There has never been a successful dietitian at Fergus Falls. Those employed in the past were able to plan menus which met the needs of the various classes of patients —those who do a full day's work, those who do light work, and those who do nothing. They worked out on paper meals that were appetizing and they kept down the cost. But their work went no further; they took no interest in the actual food, and were incapable of or indifferent to bettering the service in the dining rooms.

Menu planning is important, but I believe that once a year's menus are worked out they can be used indefinitely thereafter, making such minor changes as are needed when fruit or vegetables do not ripen as expected, or a shortage or excess supply of certain foods is at hand. The meals should be more varied and better balanced than at present, yet I do not feel a trained dietitian is necessary. We need a sensible person with ingenuity enough to contrive good meals out of materials supplied, who can systematize the kitchen and dining room service to give better results with what we already have to work with, both humans and equipment. If this person is a trained dietitian, so much the better, but the right kind of personality is more important than a degree in dietetics.

The farm raises a fine lot of vegetables which furnish much of the food, both summer and winter. The patients and employees feel they are not adequately fed unless they have meat and potatoes every meal. These are not given them, of course; but vegetables do not play as important a part as they should because of this prejudice. It is difficult to change the food habits of people after they become inmates of a hospital for the insane.