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Diabetes Mellitus at the Massachusetts General Hospital From 1824 to 1898. A Study of the Medical Records.

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DIABETES MELLITUS AT THE MASSACHUSETTS GENERAL HOSPITAL FROM 1824 TO 1898. A STUDY OF THE MEDICAL RECORDS.

BY REGINAL H. FITZ, M.D.
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The examination of the records of the cases of saccharine diabetes treated in the wards of the Massachusetts General Hospital during the past seventy-four years was begun for the purpose of seeking evidence with regard to the pancreatic origin of this disease. (See *Yale Medical Journal*, 1898, iv, 275.) Since several hundred volumes were to be searched it seemed desirable to obtain at the same time information upon other points which might contribute to the statistics of diabetes. Facts of interest in diagnosis and treatment were elicited as the study progressed and this paper is offered rather as a historical sketch of the progress of a disease drawn from the original records than as an attempt to advance in any way our knowledge of the subject. Since diabetes mellitus was first sharply differentiated from diabetes insipidus early in the present century, the hospital records may be considered to be nearly as old as is our knowledge of the disease in question.

During these seventy-four years the total number of cases of diabetes mellitus treated in the medical wards was 172, but of these, 9 were readmitted, making 181 separate entries. The following table shows the variation in the number of such patients during successive periods of years and their proportion to

the total number of cases treated during the same periods.

Period.	Total number of patients.	Number of cases of diabetes.	Per cent.
From 1824 to 1840	5,328	7	.13
From 1840 to 1855	6,136	16	.26
From 1855 to 1870	8,660	24	.27
From 1870 to 1885	11,690	39	.33
From 1885 to 1898	16,085	86	.53

It appears from this table that within the past thirteen years as many cases of diabetes were admitted to the hospital as in the previous sixty-one years and the per cent. in the past thirteen years in proportion to the total number of hospital entries has increased fourfold over that of the first fifteen years. This fact is not due to any recent increase in the number of beds open to this class of patients, nor, presumably to any considerable excess in the frequency of this disease in the region from which the hospital receives its patients. Whatever may be its cause this occurrence is to be regarded as evidence of the wholesome tendency of diabetics to place themselves under careful medical supervision for such length of time as shall permit suitable observations to determine the severity and controllability of the disease, that the future conduct of the patient may accordingly be regulated.

Age.	Number of cases.	Per cent.
From 0 to 10 years	3	1.8
From 10 to 20 years	15	8.8
From 20 to 30 years	41	24.1
From 30 to 40 years	43	25.3
From 40 to 50 years	29	17.1
From 50 to 60 years	28	16.5
From 60 to 70 years	11	6.4

Of the 172 cases, 127 (or disregarding fractions, 74 per cent.) were males and 45 (or 26 per cent.) were females. The oldest patient was 73 years of age and the youngest 5 years, the average age of 161 patients

being 33.4 years. The average age among 40 female patients was 39.1 years, being higher than that in 121 males in whom it was 31.4 years. The preceeding table represents the time of life at which the disease began.

Diabetes thus is shown to be a disease predominantly affecting the middle third of life, though sparing neither the child of five nor the senior of seventy-three.

But one of the patients was a negro, a further illustration of the rarity of diabetes in this race, although Tyson (Practice of Medicine, 1896, 751) has met with several instances. Ninety-seven of the patients lived in the United States, and 83 claimed this country as their birthplace. Thirty-nine of the patients were born in Ireland, 11 in the British Provinces, 9 in England, 4 in Scotland, 7 in Germany, 2 in Sweden and 1 in Denmark. Forty-three of the patients were mechanics, 23 servants, 17 laborers and 13 farmers. Of merchants there were 5, and of clerks 7. There were 5 mariners and 4 teamsters. Although four of the patients were students there were but two professions represented, a clergyman and an artist being included among the entries. There were single or a few representatives of several other occupations, and conspicuous for its absence was that of liquor dealer.

In 42 cases the question of an inherited tendency to the disease was raised and this factor was stated to have been present in 10 patients and absent in 32. In one case the father died of possible diabetes and this disease was the cause of the death of a brother and his daughter. The brother of one diabetic patient fell upon the ice, striking his head and died of diabetes four days later. In three of the cases the symptoms of diabetes came on within a few weeks after severe injury.

One of these patients while working in a mill in July so strained his back by lifting a heavy weight that he was unable to accomplish much afterward on account of supposed weakness of the spine. In August the appetite became increased and in December he entered

the hospital for treatment of diabetes. The second was buried in a sand bank three months before entrance and was taken out unconscious. Six weeks later thirst made its appearance as the first symptom indicative of the onset of the diabetes. The third fell fourteen feet and struck on the back of the head. He was unable to work for a fortnight. Very soon afterward he began to have great thirst, hunger, and frequent micturition of large quantities of urine. The disease began in a female patient one month after very hard work in caring for a sick sister. The possibility of contagion was entertained in the case of a servant whose mistress was suffering from a severe variety of diabetes.

Post-mortem examinations were made in 15 of the 47 fatal cases. As is usual in this disease no characteristic lesions were found. The liver generally was normal in appearance although sometimes enlarged and in one instance it was rather small. The kidneys as a rule were normal, were enlarged in one instance, congested and with fat drops in the cortex in another, enlarged and hemorrhagic in a third, enlarged and infiltrated with round cells in a fourth. The stomach was large in two cases and Brunner's glands were found "developed" in a case under the care of Henry I. Bowditch in 1848. The condition of the pancreas was not mentioned in seven of the cases. This gland was stated to be normal in five and small in three instances. In one of the three its tissues were not remarkable, in another there was a moderate infiltration of fat tissue around the head of the gland, and in the third the weight was recorded as an ounce and a half, the section showing a coarsely granular surface.

No attempt has been made to note the relative frequency and the severity of the various symptoms. Particular attention has been paid, however, to the records of the condition of the urine, since they furnish a valuable commentary of the progress of our knowledge concerning the methods of studying this secretion.

In the earliest volumes of the records especial importance was attached to the measurements of the quantity of urine passed as compared with the quantity of liquids ingested, since formerly it was the belief that patients excreted more urine than they drank liquid. As an illustration the following table is copied from the record of a case.

TREATED IN 1861.

Date.	Water drank—Pints.	Urine voided —Pints.	Specific gravity.
April 28.	7½	23	1030
April 29.	4½	9+	1030
April 30.	4	11	1034
May 1.	3	8	1033
May 2.	4	9	?
May 3.	4	10	1027
May 4.	4½	10	1025
May 5.	About 4½	5	1025
May 6.	About 6	10	1027
May 7.	About 7½	11	1025
May 8.	Out of house.	6	1025
May 9.	Out of house, 5.	9	1030
May 10.	Not known.	6	1030
May 11.	Not recorded, patient went frequently to stool.	..	. .
May 12.	6½	10	1033
May 13.	4½	10	1027
May 14.	7	11	1025
May 15.	7	10	1024
May 16.	6½	10	. .
May 17.	6, bread out.	10	1027
May 18.	7	10	1030
May 19.	8	10	1030
May 20.	7	12	1030
May 21.	8½	14	1031
May 22.	8	18	1031
May 23.	7½	14	1033
May 24.	10	17	1031
May 25.	7, bread renewed.	16	. .
May 26.	5½	16	1031
May 27.	14	15	1031
May 28.	. .	16	1033
May 29.	8	16	1034
May 30.	. .	10	1032
May 31.	6½	10	1032
June 1.	7½	12	1030
June 2.	6½	9	1031
June 3.	7	12	1030
June 4.	7½	9	1030
June 5.	. .	11	1030
June 6.	6½	12	1025
June 7.	7½	12	1026
June 8.	. .	10	1023
June 9.	9	14	1022
June 10	. .	18	1022
June 11	11	18	1020
June 12	11	18	1020
June 13	Out of the house.	..	1021

It is noted, for instance, in Vol. i, that a patient with diabetes simplex from Dec. 2 to Dec. 11, 1821, ingested forty-five pints and seven gills, but excreted forty-five pints and four gills. The first patient who is recorded to have had diabetes mellitus entered the hospital in 1824, and during the first three days of his stay is credited with drinking twenty and one-half pints of fluid, and is charged with passing twenty-five pints of urine.

This doctrine of an excess of outgo of urine over income of fluids appears in 1847 in Watson's Practice of Physic (3d American Edition, p. 869) as a statement that the "quantity of urine secreted and voided is sometimes enormous, far more than could be supplied by the quantity of fluid taken as a drink."

Twenty years later, Harley in his work on diabetes says (p. 50), "diabetic patients generally pass more liquid than they take, about one-fifth or one-fourth more."

Lauder Brunton in 1879 (Reynold's System of Medicine, 1879, p. 387) opposes this view in the following words: "It has been said that the quantity of urine excreted by the patients is greater than that of their beverages, but this can hardly be the case, and the observations which seem to support this view have probably been made for too short a time, the apparent excess being most likely derived from water lodged in the system."

The difficulty of eradicating this erroneous idea is indicated by the fact that a recent graduate of the Harvard Medical School and of the Massachusetts General Hospital, seriously asserted that "it is perfectly well known that a person passes more urine than he drinks fluids." Such a view is based probably upon a misinterpretation of the physiologic teaching that more fluid is eliminated from the body in respiration and in secretion from the various glands than is taken in as liquid. In this connection it is interesting to note that a metabolism experiment in diabetes was made at the hospital in 1845. For it is then recorded that

thirty-six times; voided thirty-six pints. . . . It contained 3 per cent. of sugar, corresponding to 227 grains in one pint." Only six of 166 patients passed over 300 ounces in one day. The highest sp. gravity recorded is 1054, although repeatedly it was found above 1045. The highest percentage of sugar mentioned was 12.5 per cent. In many instances there was present between 9 and 10 per cent. of sugar.

The finding of sugar in the urine was determined in the first instance until 1851 by means of the taste.

These rude methods of testing the saccharine condition of the urine were supplemented in 1827 by evaporating the specimen. It is recorded "urine yesterday sixteen ounces, . . . seven ounces this morning, . . . sixteen being boiled about two remains (*sic*), resembling molasses, of saccharine smell and taste." In the following year, "urine seven pints, natural appearance, without sediment, not giving syrup on evaporation." It is stated also that eight ounces of urine yielded one ounce of syrup, and at

It seems worthy of reproduction as an illustration of the scientific methods employed even fifty years ago in the investigation of disease.

BOSTON, May 12, 1846.

DR. J. B. S. JACKSON.

Dear Sir:—The microscopic examination which I have made at your request, of the sugar from diabetic urine has afforded some results worthy of mention. The specimens of saccharine urine placed in my hands were from two diabetic patients now in the hospital. My first attempt was to obtain the sugar in a crystallized state by the evaporation of successive portions of the urine on slips of glass, both spontaneously and by the aid of a gentle heat. But the results obtained in this way were unsatisfactory from the difficulty with which this variety of sugar crystallizes, and the following process was substituted. The urine was evaporated over a salt water bath, to the consistence of a thick syrup, and drops of this, spread very thinly on slips of glass, were left to spontaneous evaporation. In the course of a few days the liquid disappeared, leaving on the glass little hemispherical grains of a white color (none of them as large as the head of a pin), either isolated or collected into mammillated crusts. With the urine of the male patient, Pettigrew, two or three days were sufficient for this purpose; that of the female patient, Gould, which appeared to contain less sugar in proportion to the other constituents, required more than a week's exposure.

The objects thus procured were prepared for the microscope by covering them with Canada balsam. Being now examined with moderate powers, each little grain resolved itself into a compact group of fibers radiating from a central point, many of their ends projected beyond the mass, but exhibited no distinct crystalline faces. This radiated structure, with a fine silky lustre, becomes distinctly visible to the naked eye in the larger grains, when they are covered with the balsam. The aid of the polarizing attachment to the microscope was now called in to decide the question as to the crystalline structure of the grains, when the rich and varied colors exhibited in the polarized light left no doubt of their really being groups of radiating acicular crystals. Among these masses of sugar there were noticed a few groups of more distinct crystal, not arranged like them in a stellate manner, and presenting entirely different appearances in polarized light. These are doubtless some of the saline constituents of the urine. As diabetic sugar is classed with that variety, to which from its abundance in the juice of ripe grapes the name of grape sugar is given, it became of interest to compare the appearance of the two under the microscope. Grape sugar is present in large quantity in honey, and is the variety formed from starch or from cane sugar by long continued boiling with dilute

sulphuric acid. This variety is entirely distinct in its character from the common or cane sugar. A portion was prepared from honey and dissolved in alcohol, the solution, evaporated to a syrup and prepared for the microscope in the same manner as the diabetic urine, crystallized in groups of radiating fibers like the diabetic sugar, and presented similar appearances under the microscope, both with and without the polarizing attachment. An alcoholic solution of the diabetic sugar was also prepared, which crystallized in the same manner; a similar solution of cane sugar afforded no radiated groups, but distinct prismatic crystals which gave fine colored rings in polarized light. Under the microscope the urine of both patients (before evaporation) is seen to contain great numbers of colorless globules, often connected in chains or groups of half a dozen or more. I made a cursory examination for urea, by evaporating an ounce of the urine from each patient to one quarter and adding an equal volume of nitric acid. Pearly crystalline plates of nitrate of urea soon made their appearance in both, showing urea to be present in considerable amount, but the quantity of urine operated upon was too small to allow of a correct determination of the amount.

Yours respectfully, JOHN BACON, JR.

Although Moore's test had been made known in 1844, the first mention of its use in the hospital was in 1851, when the following record appears "glucose strongly marked on the addition of heat and liquor potassæ."

In 1852 Dr. Bacon determined, by what means it is not stated, that the per cent. of sugar in a given urine was 4 per cent. and two years later the fermentation method was employed for ascertaining the percentage.

The breath of diabetic patients first attracted attention in 1835, when a man entered the hospital with a note from his physician stating that it had a "peculiar sour smell." The observation made of this patient while in the hospital was of "a curious smell in breath which he has had since entrance." In three cases the breath is stated to have the odor of new milk. In 1846 it is noted of one of these "odor of breath considered by some of aromatic sweetness." Other expressions are in 1846 "odor of boiled milk;" in 1848 "ward distinctly tainted with smell peculiar to diabetes," "fruity odor;" in 1869 "sweet chloroform-like smell in neighborhood of patient's bed."

That the acetone odor of the breath then was attracting general attention is apparent in 1847 from the statement made in Watson's Practice (op. cit. p. 868) that "according to Dr. Prout the scent somewhat resembles that of sweet hay, but to my nose it is more like the smell of certain apples or rather of an apple chamber." He attributes the peculiar odor to the sugar. In 1866 in Harley on Diabetes (op. cit.) there is no mention of acetone or of diacetic acid, although Petters (*Prager Vierteljahrsch.* 1857, lv) several years before had attributed the coma of diabetes to the former agent.

Acetone was sought for in the breath of 19 cases, and in the urine of 24 cases. Its presence was indicated by the odor in 16 of the former, and by chemical tests in 14 of the latter series. It is interesting to note in connection with the result of recent investigations on the increase of acetone in consequence of a change to an absolute proteid diet, that the records state in 1894 that the "acetone smell has been more since disappearance of sugar than at any other time." Ten days later, however, without any change in diet there had been no return of sugar and no smell to the breath.

The ferric chlorid reaction, which, when positive, is considered generally to be evidence of the presence of diacetic acid, was sought for in 22 cases and found in 13. Albuminuria was present in the urine in 67 cases and was absent in 60 cases. Casts were found in 36 cases.

In four instances only is there a record of the examination of the feces. In 1844 a patient reported that his "food frequently passes away in lumps undigested" and fat is reported as absent in the stools of three patients.

In six cases there was tinnitus aurium and two patients had sciatica. Sexual power is noted as absent in 9 cases and present in 4. The catamenia were present in 11 cases and absent in 9. Jaundice is mentioned to have occurred in five cases, and three of

these patients died in the hospital, one of pneumonia and one of atrophied pancreas. Syphilis is stated to have existed in one case. Diabetes and myxedema coexisted in one patient and in another diabetic there was a tumor of the thyroid body. Three of the patients suffered from gangrene of the toe, a fourth had a gangrenous slough of the tissues of the leg, and a fifth died with a carbuncular-like inflammation of the thigh. Three of the patients had abscesses, one being of the hip, another of the wrist, both cases ending fatally. The third abscess was of the jaw, but the patient grew better. In one case there was a round ulcer of the toe, which improved under treatment.

The records afford some evidence concerning the duration of the disease, which in one case is stated to have existed for twelve years, while three patients had suffered but two weeks. Of the latter, one died, one was relieved and one unrelieved. The average duration was one year and a half.

The length of the illness in the fatal cases is indicated in the following table:

DURATION.	NUMBER OF CASES.
From 0 to 1 year	27
From 1 to 2 years	7
From 2 to 3 years	3
From 3 to 4 years	1
From 4 to 5 years	0
From 5 to 6 years	1
From 6 to 7 years	1
Unknown	7
	47

These cases, necessarily those of grave diabetes, thus ended fatally in nearly three-fourths of the number in which this point could be determined within one year after the disease made itself manifest, and within two years in nearly seven-eighths of the entire series. That diabetes may prove fatal at the end of a longer period of time, from 6 to 7 years as in one instance, is attributable to the well known fact that cases of mild diabetes may become suddenly severe, and that the symptoms of this disease may for a while disappear to return at a later period. An illustration of the latter condition, one which may be

called recurrent diabetes, is to be found in the record of a patient who was in the hospital in 1862. In March, 1861, he suffered from cough with abundant yellow expectoration. In the latter part of the month the thirst increased and became excessive; the patient drank freely and passed large quantities of pale urine. The appetite failed and there was progressive debility. At the end of four months the quantity of urine became normal. The patient remained apparently well until the following February, when excessive thirst, polyuria and debility returned, and it was observed that the urine left a sticky and sparkling deposit on cloth. Another instance of recurrence is noted in 1866. Two years previous to the entrance of this patient he observed that an abnormally large quantity of urine was being passed in the twenty-four hours and that the thirst was excessive. These and other symptoms continued for three months and then disappeared without treatment. At the end of eighteen months, however, they returned, accompanied by general weakness and faintness. It is recorded that the house physician tasted the urine of this patient.

Of the 172 patients 47 or 27 per cent. died. The mortality among the 127 male patients was 39 or 30.7 per cent.; of the 45 female patients 8 died, a mortality of 17.7 per cent. The death rate among the males thus proved nearly twice as high as among the females. The following table illustrates the variation in the rate of mortality during successive periods of years.

Period.	No. of cases.	No. of deaths.	Percentage of deaths.
From 1824 to 1840	7	1	14
From 1840 to 1855	16	7	44
From 1855 to 1870	24	5	20
From 1870 to 1885	39	11	28
From 1885 to 1898	86	23	27
From 1824 to 1898	172	47	27

It has previously been remarked that from 1824 to 1885 there were treated 86 cases, the same number of cases as in the period from 1885 to 1898. It is cer-

tainly noteworthy that in each of these intervals there was an average of 27 per cent. of fatal cases, which again was the average mortality rate of the cases treated throughout the entire period from 1824 to to 1898. It might be thought from the inspection of this table that the method of treatment was superior from 1824 to 1840 and from 1855 to 1870 and that in the intervening years it was inferior. The information on this point later given affords no justification for such an inference.

Although it appears from the study of the records that most cases of grave diabetes die within a year or two of the onset of the disease and that 27 per cent. of all cases are fatal, some evidence has been obtained with regard to the prognosis in the individual case. Heredity appears to have less importance than is usually assigned to it. Of ten cases in which heredity may have been of etiologic significance three died, while of thirty-two cases in which heredity had no influence eight died. Thus the percentage of deaths was merely a trifle higher in those cases in which an inherited tendency to diabetes may have played a part than in those in which no such influence existed.

The time of life at which the patient suffers from the disease appears to be of greater prognostic importance, as may be inferred from the following table:

Age.	No. of Cases.	Deaths.	Per cent.
From 0 to 10 years	3	1	33
From 10 to 20 years	15	3	20
From 20 to 30 years	41	14	34
From 30 to 40 years	43	13	30
From 40 to 50 years	29	4	14
From 59 to 60 years	28	5	18
From 60 to 70 years	11	5	45
	170	45	

Thus about one-third of the patients suffering from diabetes during the first ten years of life and between the ages of 20 and 40 years die, and nearly one-half of the cases between 60 and 70 years prove

fatal. The number of cases of diabetes in young children, however, is so small as not to be of much value in generalizing. The high rate of mortality after the age of 60 is due, possibly, only indirectly to the diabetes, the patients perhaps being unable to resist the effects of other disease, even if mild, in the presence of so grave an affection.

Thirty-eight of the 47 fatal cases died comatose, the coma lasting one day in 10 cases, two days in 14 and three days in 5 patients. In the remaining 9 cases the duration of the coma was not to be determined. The frequency of the coma in relation to the age of the patient is indicated in the following table:

Age.	No. of cases.	Deaths from coma.	Per cent.
From 0 to 10 years.	3	1	33
From 10 to 20 years.	15	3	20
From 20 to 30 years.	41	12	29
From 30 to 40 years.	43	9	21
From 40 to 50 years.	29	3	10
From 50 to 60 years.	28	4	14
From 60 to 70 years.	11	3	27

The suddenness of its onset in certain instances is apparent from the record of a patient in 1828 who was able to leave the hospital for a few hours, at the end of which he became comatose and died. In 1846 another patient absented himself from the hospital without leave and became intoxicated; two days later he was comatose and died at the end of another two days. On the other hand, a third patient while in the hospital became intoxicated, had no coma and lived.

It is to be observed that of twenty fatal cases of diabetes there was present chronic nephritis in six, pulmonary tuberculosis and carbuncle or gangrene each in three, myocarditis in two and pneumonia, pleurisy, cerebral thrombosis, alveolar abscess and atrophied pancreas each in one. A patient with diabetes suffered at the same time from acute catarrhal cholangitis, acute rheumatism and chronic bronchitis.

The study of the records of these cases affords some

evidence relating to the prognostic value of the presence of acetone and diacetic acid. Although the odor of acetone was present in the breath of 12 out of 14 fatal cases, that is, in more than 85 per cent., and in the urine of 6 out of 9 fatal cases, namely 66 per cent., in which the records show that attention was directed to this point, it was present also in the breath of 4 out of 5 non-fatal cases, 80 per cent., and in the urine of 8 out of 15 non-fatal cases, 53 per cent. It is evident from this comparison that the presence of an acetone odor in the breath or in the urine throws but little light upon the severity or mildness of the disease.

The ferric chlorid reaction was present in 6 out of 8 fatal cases and in one-half of the 14 non-fatal cases in which it was sought for. This evidence, so far as it goes, therefore, is in support of the view that this reaction has a somewhat serious significance.

It is interesting to note that in the earliest days of the hospital the improvement of the patient's condition was based upon an increase in weight.

It is to be remembered that John Rollo (Notes of a Diabetic Case, 1897) first ascertained that an animal diet not only decreased the quantity of urine, but also diminished the amount of sugar. The diet, therefore, from 1824 to 1840 was based evidently upon this discovery and the first diabetic patient in the hospital was fed on "animal food and bread in small quantities. Only one potato (*sic*) at dinner." Later molasses, beer and apples were excluded from his diet. In 1827 a patient's fare consisted of two eggs, at a meal, meat, milk, butter and salt. Such a diet, however, was not exclusive, for mention is made that vegetable food and sugar were not to be taken, but rice and milk porridge were allowed. Toast water and broth were permitted, and crackers were given instead of bread. Thirst was quenched with chamomile tea or balm tea, and lemons also served for this purpose.

The unlimited use of liquids was not permitted, for one patient was allowed only a "teacup of liquid at

meals." Another was given, "balm tea as little as will suffice," and it is stated of a third that he "thinks he has not drank all his allowance."

The first treatment the first patient received was a warm bath, and as the quantity of urine appeared to be less after the bath had been taken it was ordered to be repeated every other day. Warm salt baths also were used.

The advantages of exercise were appreciated at an early period, for one patient in 1831 was advised to ride horseback, and another was recommended to take as much exercise as his strength would permit.

Alcohol was given as early as 1828, when the physician in charge ordered, "let her take some brandy and water, taking one teaspoonful of brandy in hot or cold water, repeating it once in 3 or 4 hours if the effects are grateful." There is nothing in the record to show that its action was displeasing to the patient. The recent investigations of von Noorden ("Die Zuckerkranheit und Ihre Behandlung," 1895, 146), show that this treatment has a sound scientific basis since one gram of alcohol is the equivalent of seven calories, while the same quantity of proteids and carbohydrates is equivalent only to four calories.

This patient was treated also with opium and "by error took following in A. M.

℞ Infus. Sennæ Comp., ʒiij."

On the next day he "was uncomfortable in head with some depression of spirits." During this patient's stay in the hospital he was ordered powdered rhubarb and the infusion of rhubarb and magnesia; a trial was made also of uva ursi and of the sodium and potassium tartrate.

During the first fifteen years the treatment in general consisted of opium, either alone or with camphor and aloes. Cathartics were used liberally, and frequent mention is made of rhubarb, aloes, colocynth, senna, calomel, magnesium sulphate, castor oil and croton oil. Enemata were employed freely, some of them being especially designated "active." One

patient who complained of nausea promptly received a dose of ipecac.

Among other drugs in use during this period were quinin and dilute nitric acid, the decoction of sumac and powdered guiac.

Blisters and cupping often were used, and one patient "thinks opium and blisters have been followed by the greatest improvement." More severe counter-irritation was ordered sometimes, as appears from the record, "apply caustic issue on each side of the spine." In one case this application proved to be directly injurious.

During the period of high mortality, that is from 1840 to 1855, the following dietary is ordered: "Lean meat, with a small quantity of stale, dry or toasted bread, avoiding all fatty, farinaceous and saccharine articles. For drink, cold water and weak tea." The use of liquids continued to be restricted, although slippery elm tea now came into use. Alcohol was not given regularly, and blisters no longer were applied. Leeches appeared to serve in the place of the latter and of issues for it is recorded, "Leach (*sic*) bites now ulcerated."

Opium continued to be given, but not so largely as previous to 1840. Cathartics were prescribed with freedom, and the liberal use of calomel is suggested by the frequent records of spongy gums and myrrh mouth washes. Iron now was used in the form of the tincture of the chlorid or the carbonate. Other remedies employed were argentic nitrate, ammonium hydrosulphuret, ammonium carbonate, conium, hyoscyamus and valerian, aromatic sulphuric acid and creosote. During this period the use of yeast was tried by McGregor (Watson's Practice, p. 872), who stated that it made the patients feel as if they were "on the eve of being blown up." A patient in the hospital was ordered to "take yeast ʒss. in milk *ter die*." This quantity was increased to an ounce daily and then was resumed and omitted at intervals during a month, the yeast being taken five-sixths of the

time. The effect was not that mentioned by Watson, but a sense of constant nausea was the chief resulting complaint.

From 1855 to 1870 especial attention was paid to the selection of a suitable bread, and bran bread, stale bread, brown dyspepsia bread, toasted dyspepsia bread, ship biscuit and toasted ship bread were ordered. Butter, cabbage, cheese and greens were allowed, but shellfish and liver were excluded. Liquids at times were restricted, and cocoa was given somewhat frequently. Alcohol was ordered occasionally, and one patient, notwithstanding milk punch was prescribed *p. r. n.*, remained in the hospital but a single day, at the end of which he was discharged unrelieved. Opium was but little used, counter-irritants were discontinued and there was but little variety in the use of drugs. One patient received a half pint of iron rust water at dinner. To another in 1866 was given a half ounce of cod liver oil three times daily. As " she likes it and don't have enough," the dose was increased to three ounces three times daily. This maximum dose was reduced in consequence of the production of loose movements of the bowels.

From 1870 to 1885 gluten bread was used, but was discovered to contain 33 per cent. of starch. Patients were advised " to drink as little water as possible," but as much as four quarts of skim-milk were given daily. Opium and codeia were used frequently, but alcohol, blisters, baths and exercise were not advised as a part of the routine treatment. On the contrary, a large number of drugs were employed, including ...ler's solution, bromid of arsenic, antimony, bis-

405). On the day after his admission he was given thirty-three ounces of glycerin and died comatose on the same day. The coma was accompanied by spasms, to relieve which ether was given, but the house physician apparently feared that the death might be attributed to the effects of the ether.

In the period since 1885, Soya bean bread has been added to the dietary, and fats are used with freedom. The use of water is frequently, by no means always, restricted, and the use of skim-milk gradually has lessened. Alcohol, baths and exercise, are not made matters of routine. Opium and codeia are more often used than before, and trials have been made with potassium citrate, lithium carbonate, jambul, salol, salicin, antipyrin and urethan. Saccharin occasionally is used. Up to this period comatose patients had been treated solely with stimulants and diuretics, and brandy, nitroglycerin and oxygen were given frequently at the onset of coma. The use of solutions of sodium chlorid or sodium bicarbonate in enema, subcutaneous injection or by transfusion was begun and eight patients were thus treated. Although these patients died, as had those otherwise treated, it appears from the records that in certain instances life was somewhat prolonged. The patient's mind usually became clearer after the administration of the saline, and one person was aroused to such a degree that he is recorded to have said, "Oh! doctor, I'm glad you did that; I have not felt so well for a long time."

The practical outcome of this examination of the records of cases of diabetes treated at the Massachusetts General Hospital during the past seventy-four years can be stated in a very few words.