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THE ULSTER MEDICAL JOURNAL

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THE ULSTER MEDICAL SOCIETY

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THE
ULSTER MEDICAL JOURNAL

PUBLISHED ON BEHALF OF THE ULSTER MEDICAL SOCIETY

Vol. XXIII 1st NOVEMBER, 1954 No. 2

Diabetes: Past, Present and Future

By J. A. SMYTH, B.SC., M.D., D.P.H.

Presidential Address to Ulster Medical Society,
21st October, 1954.

I MAKE no apology for speaking to you tonight in my presidential address on diabetes. During more than thirty years I have done much work at this disease, having seen more than ten thousand cases of it in all, and having been concerned in its investigation and treatment both in the pre-insulin and insulin eras. At the beginning of my medical life very little in the way of practical useful treatment was available to sufferers from the disease, and I doubt whether half a dozen blood sugar estimations had been carried out in the North of Ireland. The life of the diabetic was then indeed a miserable existence, in which he went on in a state of semi-starvation and invalidism, trying to postpone for as long as possible the evil day when he would die in coma, or of some intercurrent infection. Today, with proper care and a not unduly exacting co-operation, he can be perfectly fit and well, and carry on successfully with almost any work he cares to undertake. I often hear the remark, "Your diabetics look so fit and well." Last year, in the Royal Victoria Hospital alone, twenty thousand blood sugar determinations were carried out.

I would briefly like to review the medical history—not the history of diabetes itself, for that is probably longer than that of the human species. It is now known to occur in some of the lower animals.

The disease was mentioned in the Ebers papyrus, which dates from approximately 1500 B.C., almost one thousand years before the birth of Hippocrates. It was recognised as a clinical condition in very early Indian writings and was then probably, as now, prevalent among Hindus. The early Greek physicians seem to have been ignorant of it, but it was mentioned by those of a later date. Knowledge of the pancreas was set forth by Galen in the second century A.D., but he, of course, did not appreciate its connection with diabetes, of which condition he only recognised two cases. About the same period the disease was named "diabetes"

by Aretæus the Cappadocian, who described it as "a wonderful affection, melting down the flesh and limbs into urine." Not much further knowledge of the malady was acquired until the advent of Thomas Willis, who lived from 1621 to 1675. He might be regarded as the first clinical pathologist, and while carrying on the largest fashionable practice in London, found time to make many researches in natural and experimental philosophy, anatomy, and chemistry. His account of the disease was not published until 1679, four years after his death. It is the first important medical treatise on the subject in the English language. In it he reports the case of "a certain noble Earl who became much inclined to excessive urination and when, for several months he had been used every now and then to make great quantities of water, he at last (it seemed) fell into a diabetes, which was obstinate and strong and almost desperate. For beside that, in a space of twenty-four hours, he voided almost a gallon and a half of limpid, clear and wonderful sweet water that tasted as if it had been mixed with honey, he was likewise troubled with an extraordinary thirst—and, as it were, an hectic fever, with a mighty languishing of his spirits, weakness in his limbs and consumption of his whole body."

He then goes on to describe the remedies prescribed consisting of whites of egg, tops of cypress, gum arabick, rhubarb, syrup of poppies, etc. His diet was to be only of milk, with some barley and white bread taken several times a day. "By the use of these things he grew daily better and better and seemed within a month to be almost quite well. When he began to be pretty hearty his urine, which was insipid, did not much exceed the quantity of that liquid matter which he took in. But yet the disposition to this distemper did not so totally leave him but that afterwards oftentimes, through his diet, and, perhaps, irregularities in the seasons of the year, being inclined to a relapse, he made water at first in great quantities and then clear and sweet, with thirstiness, feverishness and languishment of his spirits."

Evidently even in those days a little was understood of the importance of diet, and patients sometimes broke it. A century after Willis's death another Englishman, Dr. Dobson, in the Liverpool Infirmary, by the investigation of "a white cake about 2 os. 4 drachms and 2 scruples in weight" obtained by evaporating down diabetic urine, determined that the sweetening substance was glucose. The presence of acetone was discovered by Peters in 1875 and Kulz and Minkowski identified oxybutyric and diacetic acids in 1884, completing the knowledge of the existence of the ordinary pathological urinary constituents. At this point—seventy years ago—the ordinary clinical knowledge of diabetes was pretty much as it is today, but the knowledge was only skin deep. Nothing was known of the underlying causes.

Causation.

In 1878 Claude Bernard, by puncturing the medulla in the floor of the fourth ventricle, brought about a marked glycosuria, but it was soon realised that the condition so produced had little in common with the disease of diabetes.

The epoch-making advance was when, following an argument about the possible effect, von Mering and Minkowski, working under Naunyn in 1889, by removing *in toto* the pancreas of a dog, produced to their surprise a condition substantially

similar to that seen in acute and severe diabetes mellitus, and when later Minowski showed that, if previously some of the pancreas had been grafted under the skin, removal of the main pancreas caused no ill effects.

In Berlin, in 1869, Paul Langerhans, in a thesis for his M.D. degree, described the islets in the pancreas which since bear his name. Between 1900 and 1902 Opie, in the Johns Hopkins and Ssobolew in Berlin described the hyaline degeneration and destruction of the islets which they had observed in cases of diabetes. It was noted, too, that by blocking the pancreatic duct in dogs, degeneration of the pancreas followed but that diabetes did not immediately supervene. They found that, although the acinar tissue of the gland had degenerated, the islet tissue still at first remained intact but that later, after about four months' interval, when the islet cells also had degenerated, diabetes then supervened. The significance of these facts was not lost on the observers and Ssobolew suggested that a method was thus available for studying the secretion of these islands. In 1912 an attempt was made to prepare an extract from a pancreas so degenerated to the first stage, and in 1916 Schafer, in Edinburgh, believing that the islets contained an internal secretion, a deficiency of which caused diabetes, named it "Insulin." Ten years later Dr. Frederick Banting, in the Toronto Medical School, and Charles H. Best, one of his second-year medical students in Professor MacLeod's laboratory, made its separation an accomplished fact.

In 1943 it was discovered that animals given alloxan intravenously rapidly developed a complete destruction of the islets of Langerhans, followed by a diabetes very closely resembling that seen clinically in man.

With all this evidence it would seem that the proof that diabetes is caused by failure of cells in the islets of Langerhans was complete. There were one or two disconcerting facts, however. Firstly, by the methods of examination then known, cases of diabetes might show no demonstrable abnormalities of the islet tissue, and, secondly, persons in whom a complete surgical pancreatectomy had been carried out were found to require only thirty to fifty units of insulin daily for control. Many cases of ordinary diabetes required very much larger amounts, sometimes, indeed, running into thousands of units.

Recently, more specialised methods of tissue staining have been developed which shew up much lesser degrees of damage of the islet cells than could previously be demonstrated, and counts of the islets themselves have sometimes shown notable diminution of their numbers, or of the number of beta cells (which are now believed to secrete the insulin) relative to alpha cells where no actual deterioration of the individual cells was manifest. These findings go some way to answer the first objection but the second is not so easily met, and there are probably other factors of which we are only partly cognisant. If thirty to fifty units of insulin are adequate to metabolise an ordinary day's food, it would follow that in those cases where a larger amount is required there must be present another substance which in some way neutralises the additional amount.

About 1932 several workers both in the British Isles and in America had produced a hormone from the anterior pituitary gland which they designated the growth hormone. When given to young puppies daily for many months it produced an

increased physical development, but when continued after full growth had taken place it was found that many of the puppies became ill and wasted, and were found to have developed diabetes. In the early stages, when growth was taking place, it was noted that the islet cells showed increased activity, but that in the diabetic phase degenerative changes were present. It was as if the islets had been called on for an increased insulin secretion because of partial neutralisation of circulating insulin, and that under the excessive strain had failed. An interesting finding about the growth hormone is that it stimulates milk production in many lactating animals and, although it produces diabetes when administered to ordinary adult animals, it will not do so in a mother suckling a litter. Evidently the increased lactation gives the necessary outlet to the anabolic action of the hormone and stimulation of the islet cells does not occur. These findings probably supply the explanation of the classical experiment of Paul Best in France in 1884, when he carried out mastectomy on pregnant goats, and produced at parturition a transient diabetes thereby. It would appear that there is a physiological increase of secretion of growth hormone in the later stages of pregnancy and during lactation. How often does one get an account from an obesity patient of its onset after her first pregnancy with a steady step-like increase after each succeeding birth.

The growth hormone may evidently do one of three things—(1) accelerate growth; (2) increase lactation; (3) if neither of these two courses is possible, diabetes may result.

Another observation which suggests that many diabetics may first suffer from increased growth hormone is the now well-known tendency of certain women to have over-large babies and then develop diabetes at a later date.

In 1936 Houssay, in the Argentine, found that experimental diabetes could be greatly alleviated by removal of either the whole of the pituitary gland or of its anterior lobe.

For a few years the dominant rôle of the anterior pituitary in the development of diabetes held the field in the minds of many investigators, but a good deal of controversy has arisen as to the validity of some of the findings on which it was based.

Another possible counteraction to insulin may arise in the islets themselves. As you know, these islets are made up of two separate types of cells known as alpha and beta. It is the beta cells which are believed to produce insulin, of course. Recently there have been adduced several facts which suggest the production of a secretion by the alpha cells which acts counter to insulin. The most important is that diabetes resulting from a total pancreatectomy, in which both alpha and beta cells are of course removed, requires much less insulin for control than in naturally occurring diabetes and in alloxan diabetes, in both of which the alpha cells remain intact. It has also been known for a little that insulins prepared from pancreas in certain ways produce on intravenous injection a transient hyperglycæmia, to be followed, of course, by their characteristic hypoglycæmic action, and it is believed that this hyperglycæmia may be produced by a secretion extracted from the alpha cells. It has been separated out as a protein factor present in these insulins, but

it has not yet been definitely proved to originate in the alpha cells. Were these proved to be its origin, it might be that we have there the explanation for the so far unexplained magnitude of insulin dosage in most cases of naturally occurring diabetes, and, possibly, an important fact in its causation. This substance is known as the hyperglycæmic-glycogenolytic factor (H.G.F.), or as glucagon, which it was originally named by Murlin when he identified it in 1923. It has been prepared in pure crystalline form, and about a year ago a group working in the Eli Lilly Laboratories and the Indianapolis General Hospital isolated sufficient of it from commercial amorphous insulin to conduct an extensive investigation of its properties.

Coma.

Coma used to be the sword of Damocles which hung suspended over every diabetic. Every diabetic had a six to four chance of quitting this sphere without being at the time acutely aware of it—perhaps not the worst way after all, but one most unsatisfactory to the medical faculty. Approximately the same treatment was tried in all, but only a very rare case survived. Now with modern massive doses of insulin and other adjuncts, the mortality has fallen to less than 2 per cent. of all diabetic deaths, in the hands of those accustomed to the condition. I am glad to say the last case of my own I have seen die in coma was over ten years ago, and if cases are got under treatment before, or directly complete coma supervenes and there are no other serious complicating diseases, it should be possible to recover practically all of them.

It should always be remembered that ketosis coma has no direct connection with blood sugar. You can have a blood sugar ever so high and have no tendency to coma, and you may possibly have coma present with a normal blood sugar. I find housemen, and even their seniors, often come to my laboratory in a considerable anxiety when they have a blood sugar of 500 or 600 mg. per cent. returned to them.

Vascular Disease.

If the mortality from coma has fallen so markedly since insulin appeared, that from arteriosclerosis has made up for it. Before insulin the mortality from arteriosclerosis accounted for about twenty per cent. of diabetic deaths: it now stands between seventy and eighty. The explanation is not far to seek. In 1914 the average age of diabetics at death was 44½ years. In 1946 it was 64½. Diabetics are now living on the average three times as long with diabetes as they used to, and long enough for arteriosclerosis to develop. This especially applies to persons developing the disease in youth.

Of two hundred diabetics whose diabetes had begun in childhood and had lasted more than twenty years, Priscilla White reports that 92 per cent. showed evidence of vascular disease. This state of affairs is amply confirmed by the finding in many other centres, and, as we will see, is probably due to unsatisfactory control, and so largely preventable. Analysing this vascular disease Priscilla White found that 2.5 per cent. had had cerebral vascular accidents; coronary insufficiency was present in 8 per cent.; hypertensions in 40 per cent.; 75 per cent. had calcified arteries;

nephritis claimed 50 per cent.; 85 per cent. had retinal arteriosclerosis and hæmorrhages.

Of 2,300 deaths among diabetic patients just under 70 per cent. were due to arteriosclerotic degenerations. Of these just under 46 per cent. were due to heart disease, just under 12 per cent. to cerebral vascular disease, 7 per cent. to nephritis and just over 3 per cent. to gangrene.

Bell has found in an analysis of fifty thousand post-mortems that 4 per cent. of all deaths from coronary disease were associated with diabetes in males and 14 per cent. in females. Gangrene, due to arteriosclerosis, was forty times as frequent in diabetics as in non-diabetics. Severe renal arteriosclerosis was one hundred times as frequent in the diabetic as in the non-diabetic group. Joslin and Wilson found that of 135 cases of diabetes beginning in childhood, dying after ten years' duration, seventy-two died of nephritis. In the Mayo Clinic arterial insufficiency in the legs of diabetics was found to be eleven times as frequent as in non-diabetics and in women arteriosclerosis obliterans was eighty times as frequent in diabetics as in non-diabetics.

From these figures and findings it will be evident that the prevention of arterial degeneration constitutes without doubt the greatest challenge in the treatment of diabetes today. It is gradually, but now almost universally, being conceded that the fault lies in failure of accurate control, and in many centres a more vigorous attempt is being made in that direction.

A good deal of attention has been paid to the renal lesions since 1936, when Kimmelstiel and Wilson pointed out a correlation between a clinical syndrome developing in diabetics—gross albuminuria, nephrotic œdema and hypertension—and a peculiar type of intercapillary sclerosis of the glomeruli in which one or more ball-like hyaline masses appear in the glomerular tuft. There is also a diffuse type, and both are often associated with frank pyelonephritis. In its typical form it is almost pathognomonic of diabetes. The hyaline material seems to be a muco-polysaccharide and to be identical with that found in the atherosclerotic arteries in association with the aneurysms found in the retina, and also, probably, with the substance deposited in the islands of Langerhans. At present a good deal of work is being carried out in investigating the nature of this substance and the factors influencing its deposition, and information of practical value may accrue, not alone in regard to diabetic arteriosclerosis, but to arteriosclerosis in general.

As in the kidney, so in the retina the lesion arising in diabetes is often pathognomonic, and the ophthalmologist can often diagnose this disease from what he sees in the fundi. It arises chiefly from the development in the capillaries of saccular micro-aneurysms which are believed to be caused by deposition of the muco-polysaccharide in the vessel walls, weakening them and so allowing pouching. Later the aneurysms are often filled with the same muco-polysaccharide as in the lesions in the kidney, and indeed the globular masses in the glomeruli may be micro-aneurysms filled with the muco-polysaccharide. The aneurysms in the retinæ show an increased permeability of their walls and are often surrounded by hæmorrhages and white exudates composed of protein.

For a long time no one was able to reproduce these muco-polysaccharide lesions experimentally except in one single dog which Lukens had rendered diabetic by injection of anterior pituitary extract, and which, on being killed after five years, showed the typical Kimmelstiel-Wilson lesions. It has just recently been discovered that they can readily be brought about in rabbits by daily intramuscular injections of cortisone and of A.C.T.H. and that this can be greatly accelerated if the rabbits have previously been rendered diabetic by alloxan. Evidently there is some interaction between diabetes and increased anterior pituitary and adrenal hormones in the production of this dystrophy.

The incidence of retinal lesions parallels closely that of the intercapillary glomerulosclerosis, generally occurring like it only after about ten or more years of diabetes and in badly controlled or neglected cases.

Lens opacities frequently occur with diabetes even in young patients, but statistical evidence of their higher incidence is indefinite. It is noteworthy, though, that in Denmark, among cataracts requiring surgery, diabetes was fifteen times as expected in the age period 65-74 years, and 202 times as great as expected in the period 25-34 years.

Diabetic Neuropathy.

We expect smaller or greater involvement of the C.N.S. in many diabetics, and it will not surprise most of you to know that some degree occurs in over 50 per cent. Frequently it may be the small fact of the absence of the Achilles jerks, but occasionally much more serious lesions are encountered. Sensory changes often bother the patient: sometimes it is only a matter of diminished sensitivity of the feet, but I remember a case where the patient screamed with pain every time one touched her, or when the bed on which she lay was jarred. Her diabetes had been in existence and untreated for an indefinite number of years. After about a month of control she was improved enough to do without morphia, but it was several months before she was able to get out of bed.

Severe diabetic neuropathy is found frequently in association with diabetic retinitis and nephropathy and its onset is also frequently after a similar duration of the disease. It also seems generally to be brought on by bad control of the diabetes, and an exacerbation often follows a period of complete absence of control. The conclusion is unavoidable that the neuropathy results from the abnormal metabolism of unregulated diabetes, though the exact mechanism is not clear.

There are several features of diabetic neuropathy which may sometimes not be appreciated as being of this origin. First, a typical Argyll-Robertson pupil is occasionally found. I saw an example of this quite recently in one of my patients in the Royal Victoria Hospital and have encountered three or four previously. Sometimes one finds a fully developed pseudo-tabetic condition which it may be difficult to differentiate from that of syphilitic origin, for example—Charcot joint. This seems generally to affect the tarsal and proximal metatarsal region, and is first evidenced by a thickening there. Later the joints become disorganised in the typical charcot fashion. This is an unusual complication and I can recollect only two cases. A third is an even rarer complication, urinary bladder paresis, with

which a typical automatic "cord" bladder may develop. A fourth is more frequent—diabetic nocturnal diarrhœa. One sometimes sees lesser degrees of this, but occasionally it can be a most troublesome complication, with one, two or more loose motions passed almost every night; there may be incontintence. It does not generally occur during the day, for some unexplained reason. One might jump to the conclusion that it is due to a complete pancreatic lesion with resultant steatorrhœa, but this is not found to be so. I have done fat analyses on a number of these cases and obtained perfectly normal figures.

These four complications seem to arise from irreversible degenerations and very little can be done for them. The latter two can be most distressing.

Treatment.

The treatment of diabetes should be directed towards the production of a normal physiological environment of the tissues and anything departing from this ideal must necessarily be wrong. Since the introduction of insulin there has been a great deal of loose thinking in this matter. The almost miraculous immediate effects produced by the use of insulin, even where there is no careful adjustment of dosage and very little attempt at dieting, tempted many physicians and patients to take the cash in hand and pay very little attention to the brave music of the distant drum. No real effort was made even to try to keep the excretion of sugar within limits, and blood sugar levels were scarcely thought of. For them the chickens have come home to roost in the shape of the 92 per cent. vascular diseases in a series of diabetics of twenty years' standing who had developed diabetes at the age of 15 years or under.

The publication of this analysis has had a most sobering effect on those who have in the past been happy with an easygoing regime for their patients and has produced a considerable change of attitude. In the last edition of his encyclopædic textbook on diabetes published just over a year ago, Joslin constantly reiterates this necessity for accurate control, and at the first meeting of the International Federation on Diabetes held at Leyden two years ago he referred to it almost every time he got on his feet to speak. In his "Treatment of Diabetes Mellitus" he states that, while he was convinced that raised blood sugar causes overwork and degeneration of the islet tissue, he had at one time some doubt as to whether it could cause, among other things, degenerative phenomena in arteries and nerves, but that this is not so today.

He poses the question, "Does careful meticulous treatment of diabetes pay?" Stating that his opinion is based on contacts with forty thousand glycosurics in a period of fifty-four years, "He believes it does in added years of vigour and happiness" and that "those who knew most and followed the rules most implicitly were the happiest and the most comfortable." He points out that of the recipients of the Quarter Century Victory Medal awarded to those diabetics of twenty-five years' standing who were certified after examination by physicians, ophthalmologists and radiologists to be sound, with eyes and blood vessels free from degenerative changes, not one had disregarded a strict regime. He goes on to say, "We believe *a priori* that the blood sugar should be normal, because the blood

sugar is the index of the disease. It is the red light which we should no more disregard than we would fail to heed the red signal at the railroad crossing."

He ends the paragraph—"Whatever may be the direct and immediate causes of the diabetic sequelæ, good diabetic control will postpone or prevent these complications."

With regard to vascular diseases, he states : "The most advanced lesions will be found in that group of patients who have been under the least careful control with diet and insulin." Again, "The frequency of angina pectoris in diabetes in middle and late life depends largely on the duration and poor control of diabetes."

Wilson, Root and Marble, in an analysis of 247 patients who had had diabetes from 10-34 years, found evidence of diabetic nephropathy in 25 per cent. Not one of these 247 who had adequately controlled his diabetes by attention to a programme that included early and continued use of insulin, careful measurement of a planned diet and regular medical examination, had developed the lesion, but sixty-two patients who had had poor, or only fair control, developed the typical nephropathy. Of these last thirteen died during the year in which they were examined.

Root has made an extensive investigation into the factors influencing the development of retinopathy and found that severe retinal complications were much more frequent with patients under poor control than under fairly good control. In his series already mentioned of 247 cases examined with Wilson and Marble, he again found that no patient under good control had developed retinal changes of any importance. Of the cases with moderate to marked retinopathy all but five had had poor or only fair control. None had had excellent control. In investigating 326 cases of retinitis proliferans, the more or less end condition in severe diabetic retinitis, he found that only in three cases could it be said that dietary instructions had been closely followed with satisfactory blood and urine tests. One-third of the patients were known to have frankly given up any attempt at approximating a careful diet. A common statement of this group was that the food was carefully measured for the first few years of diabetes, and then for a period of six or more years very little, if any, dietary restrictions had been carried out. None of this group could possibly have been considered under excellent dietary control. He concludes : "Whatever the specific etiologic factors causing diabetic degenerative lesions may be, this series has demonstrated that the regulation of diabetes controls these factors. The control of diabetes thus appears more important than any other known factor, such as duration or severity of diabetes, in preventing or postponing these degenerative complications in the retina."

From Vienna also comes the opinion that vascular diseases are due to bad control.

Diabetic neuropathies also appear practically always only where there has been a failure of control. Joslin states that most diabetic cases who develop neuropathy have had antecedent periods, usually of months' or years' duration, of neglect or poorly managed and uncontrolled diabetes. Of 113 cases occurring during the year 1950 at the New England and Deaconess Hospital in no case could it be said that the neuropathy had begun at a time when diabetes was well controlled.

Many of these findings and opinions have been duplicated by Sherrill and by Jackson and his associates, and in the Mayo Clinic and elsewhere. Frederick M. Allen states that the blood sugar can nearly always be kept within the normal range (that is, not above 150 mg. per cent. throughout the twenty-four hours) without frequent hypoglycæmic troubles and without spoiling the happiness of any sincerely co-operative patient. With this control he believes that complications are absolutely prevented or, when they exist, are generally arrested. He suggests that the reward of diabetic patients for their strict care may be a lower incidence of premature degenerations than among the general population. Dunlop, in Edinburgh, discovered that while so-called "free diets"—where no control of food was tried and no attempt made to maintain aglycosuria or normal blood sugars—did not produce many bad effects during the first five years, in the next four years the results were disastrous. After the nine years, only nine of an original fifty patients were still in good shape. As a result, from being in the opposite camp, he comes down heavily in favour of accurate control by weighed diets and frequent supervision in a diabetic clinic. He regards it as most exceptional to encounter a well-controlled patient who has been responsible for his own treatment.

This new and widespread emphasis on the necessity for accurate control confirms those of us who are specially interested in diabetes here in our opinion that it is the only real treatment of the disease and that to give the patient to understand that anything less is effective is, to put it no worse, pandering to his desire for an easy cure. Although slipshod methods will often keep him reasonably well for five or even ten years, at the end of that time he is likely to develop serious incapacity, a likelihood which will increase with the passage of each additional year of the disease. The trouble is, too, that once these degenerative complications have appeared there is no going back. Accurate control, if then instituted, may slow them down, though in my experience they steadily progress, and in any case, the existent damage can never be recovered. On looking back over my thesis for my M.D. degree presented in 1924 when insulin had been in use for two years, I find myself pointing out there that it would not be in the immediate results that the importance of accurate treatment would be seen, but rather after years, when degenerative lesions had had time to develop.

In the Metabolic Extern at the Royal Victoria Hospital we have long been aware of all this. We there see patients much more frequently than is done in most diabetic clinics, and they are seen by doctors with a good deal of experience in general medicine as well as in diabetes. We find that where exact control is instituted and maintained vascular degenerations and neuropathies rarely, if ever, appear. These patients are at least as fit as if they had not diabetes. On the other hand, when we find the record dotted with resting blood sugars of 180, 220 and suchlike figures, and notes of warnings and threats, sooner or later some serious complication begins to develop and the patient steadily progresses towards a sticky end.

Having made up our minds as to the necessity of satisfactory control, we next proceed to examine what constitutes it. Quite briefly, it means the production and maintenance of a normal physiological condition—a normal way of life with normal mental and physical exercise, kept going by a diet adequate for normal nutrition,

with a constantly normal biochemical status—normal blood sugar, never exceeding 180 mg. per cent. and for the most part below 120 mg. per cent. throughout the twenty-four hours. This will generally be so if the blood sugar at four times of the day—before insulin, before the midday meal, before the evening meal and before the last meal at night—be 120 mg. per cent. or less. There may be some short intervals when 180 mg. per cent. is exceeded after the meals, but they will generally be of brief duration. In my opinion that and no less constitutes proper control and treatment of the case. In the odd patient, owing to certain difficulties it may not be completely possible, but in the great majority it is practicable and should be ensured.

To bring this about often requires a good deal of juggling of the amounts of different foods at the various meals and of both quick- and slow-acting insulins, relatively as well as absolutely. The patient must feel satisfied with his diet so as to diminish the chances of his kicking over the traces; its calorie value must be such as to maintain his weight within normal limits, and it must be balanced as to its constituents so that it will not produce a ketosis. In practice, when the diagnosis of diabetes is made, if it is of such degree as to necessitate the use of insulin, the patient is admitted to the ward. The doctor or dietitian there discovers by enquiry what the patient ordinarily eats and in what amounts. A suitable diet, based on his normal habit, is then drawn up and an experimental dose of insulin begun, to be adjusted from day to day on blood sugar results until the desired goal is reached. The patient is then discharged and attends the Metabolic Extern at intervals, longer or shorter, depending on the smoothness or otherwise of the course he runs. In large numbers of patients, especially in the older groups, where full co-operation is forthcoming, the dose can be slowly reduced, still maintaining a normal blood sugar status, and in a few eventually stopped altogether, leaving them on diet alone.

The question of the type of insulin to be used arises. There is (1) the ordinary soluble insulin which begins to act immediately and whose action only lasts for six to eight hours. It generally only gives satisfactory control for the meal which it precedes; (2) globin insulin, whose main action lasts over a period beginning about four hours after injection, and ending about eight hours later. A dose given before breakfast will not usually control that meal satisfactorily, but will control the midday meal, and occasionally the evening meal, but not food taken at bedtime. The weight of the action is in the afternoon; (3) N.P.H. insulin, a compound with protamine zinc and phenol. This is not obtainable in this country—a great pity. Its action is a little more delayed than that of globin insulin and less so than that of (4) protamine insulin with zinc, whose action has a lag of about eight hours and is continued for a further sixteen hours or a little more. The maximum effect is often in the late evening and through the night. Recently insulins (5) semi-lente or insulin zinc suspension (amorphous), (6) lente or insulin zinc suspension, and (7) ultra lente or insulin zinc suspension (crystalline) have appeared as a result of the experiments of Hallas-Møller and his co-workers in Copenhagen. The first names, semi-lente, lente and ultra-lente are of their choice, and are used everywhere outside the British Isles, but there has been, to my mind, a most confusing attempt to adopt the second series in this country.

The elaboration of these last three insulins has been a rather interesting piece of chemistry. It has for some time been known that zinc has some important rôle in the action of insulin. Zinc is present in greater concentration in the islet cells than in any other tissue in the body and the liberation of insulin from them is accompanied by a simultaneous fall in their zinc content. Insulin can combine with zinc, and zinc added to insulin will enhance its action. When animals are given compounds like alloxan, oxin, or dithizone which bind zinc, the metal is taken out of action and diabetes develops.

The iso-electric point for insulin, at which it is insoluble, is 5.3, and at the pH of the body, 7.3, both ordinary insulin and insulin with small amount of zinc alone are completely soluble. As a result, both of them are what are known as quick-acting insulins. If, however, to the insulin zinc compound is added either globin or protamine the resultant compound is only slowly soluble at 7.3 and, as a result, its action is delayed.

The pH of insulin mixtures has in the past been kept right by a phosphate buffer solution. Recently Hallas-Møller and his fellow-workers discovered that if instead of using phosphate as a buffer, acetate were substituted it then was not necessary to add protamine, or any other substance, to render the insulin-zinc compound only slowly soluble at body pH. Also the insulin zinc compound could be precipitated out of solution as the pH rose from 4. Between pH 4.5 and 5.8 the deposit is crystalline with the crystals in various sizes. Outside this zone it is amorphous.

It was presently noted that when a suspension of the crystals was injected into animals rendered diabetic the amount of retardation of the insulin action was directly proportional to the size of the crystals.

A further step was the discovery that the higher the pH of the acetate buffered medium from which the insulin zinc compound was precipitated, the larger the amount of zinc which the insulin would combine with. This also enhanced the delaying action. So they now had three factors to play with in producing delay—first, the insolubility of the zinc insulin compound in acetate buffer; second, the size of the crystals, and, third, the amount of zinc in the compound. Hallas-Møller ended by producing the three suspensions of zinc insulin mentioned (5) the "amorphous," which is quick-acting—almost as quick as ordinary soluble insulin but a little longer in duration and which he designated "semi-lente"; (7) the crystalline, which is very slow-acting—rather like protamine insulin with zinc, but lasting longer than twenty-four hours, and which he designated "ultra-lente," and (6) a mixture of these two containing three parts amorphous and seven parts crystalline which he labelled "lente." This mixture, composed partly of amorphous insulin to control in the early part of the day, and partly of crystalline insulin to control in the later part of the day and through the night would, he thought, be suitable to regularise the blood sugar content of the great majority of diabetics throughout the twenty-four hours with a morning injection from one phial. It has since been claimed that this is so in 90 per cent. of cases. I have not found this claim borne out within the practical limits of dietary. If one varied diets to extreme degrees it would undoubtedly be possible to reach this high proportion, but the

arrangements of food at the various meals would sometimes be far from the patients' wishes, and would produce great objections from them. The alternative is, however, often a fairly easy one. It is simply that the patient be graded on the necessary number of units of semi-lente insulin and of ultra-lente insulin before breakfast, just as one uses soluble insulin and protamine insulin with zinc. The one (perhaps doubtful) advantage over the older insulins is that whereas soluble and protamine insulin with zinc should not be mixed in the same syringe, with semi- and ultra-lente insulin it is quite in order. It seems a small advantage to have made headlines in the daily papers and a B.B.C. broadcast over!

Pregnancy in Diabetics.

Naunyn, with his wide experience in Vienna, writing as recently as 1906, stated that he had seen only one example of pregnancy in a diabetic woman. Until the appearance of insulin in 1922 it was an infrequent occurrence. The first increase followed the use of soluble insulin, and a greater increase came with the development of the slow-acting insulins which provided more complete control. Today the diabetic woman requiring investigation for sterility is the exception.

There are four matters for consideration in connection with diabetic mothers:—

1. Heredity.
2. Maternal mortality.
3. The effect of pregnancy on the course of the disease.
4. Fœtal mortality.

The question of *heredity* arises prominently in the minds of diabetics and, unfortunately, with justice. Examination of a group of my cases found the presence of the disease also in a blood relation in over 40 per cent., and this agrees closely with the figure obtained by Joslin in a survey of his unique experience of forty thousand cases. He found, too, that diabetes was five times as common among relations of diabetics as it was among the general population. He regards the inheritance of diabetes as a Mendelian recessive trait. He considers that the child of a father and mother, both diabetic, is certain to develop it if he lives long enough, and that the child of one diabetic, although he may not develop the disease, may be a carrier. If a diabetic carrier marries a member of a non-diabetic family the offspring will not develop diabetes but some will be carriers. Should a diabetic marry a carrier, as many as 75 per cent. of the offspring may develop diabetes. If two carriers marry the offspring can show 25 per cent. diabetes. On this basis Joslin estimates that 25 per cent. of the population are carriers, although only about 3 per cent. develop the disease.

Similar views have been expressed by many others who have explored the matter, among them Pincus and White and, also, Buchanan in America, Cammidge and Howard in England. Von Noorden, in Germany, and Hogben, in London, considered it to be dominant rather than recessive.

In Joslin's clinic 1 per cent. of the children of diabetic mothers are known to be diabetic, whereas in the general population the incidence of diabetes in children

under the age of 15 years is only 1/2,500. The high incidence when diabetes occurs in the family of the father also should entail great care to avoid, where possible, such a union.

Maternal mortality.—With proper treatment this should be no higher than in the non-diabetic. I have not seen a maternal death.

The effect on the course of the disease.—Except where vascular disease of fair degree is already present there seems to be no permanent effect. The dose of insulin is liable to vary a good deal during the pregnancy and for a short time after delivery, being usually increased, but later settles down to something like the amount necessary before the pregnancy.

Fœtal mortality.—That is the big question in diabetic pregnancies. Even with the greatest care, it is undoubtedly much higher that in non-diabetic mothers. In the most carefully treated it remains at about 10 per cent., and congenital abnormalities are six times as common in children of diabetic mothers. These abnormalities do not, however, account for many of the deaths, and the exact cause is often a matter of conjecture. Ketosis, unless severe, does not seem to be a factor, nor hyper nor hypoglycæmia *at the time of the death.* At one time it was thought that hypertrophy of the fœtal islets of Langerhans with over-secretion of insulin, which was used by the mother during pregnancy and produced a hypoglycæmia in the baby when born, was often the cause where death supervened a few hours after birth. This was based on the finding in such babies of blood sugars as low as 30 mg. per cent., and seemed to be the answer until it was found that the same low level was often reached in children of non-diabetic mothers. It had already been realised that giving them glucose did not increase their chances. We are driven back to the clinical finding that these babies are often big and flabby, and have a low vitality and just don't live. It is becoming more and more evident, though, that the chances of a live and viable baby are greatly increased by two things: (1) accurate control of the diabetes during the pregnancy—that is a blood sugar continuously within normal limits and a freedom from ketosis; and (2) termination of the pregnancy at thirty-seven or thirty-eight weeks, before the overgrowth and flabbiness have occurred.

Graham and Lowrey, in the Michigan Medical Bulletin of 1953, write: "Better control of diabetes in the mother is the one factor which seems to contribute to a reduction of fœtal and neonatal deaths."

In the present year, Long, Hartman, Fletcher and Eastman, from the Johns Hopkins Hospital, published their results in the Journal of Obstetrics and Gynæcology, showing 36 per cent. fœtal loss in sixty-two pregnancies between the years 1942 and 1948, and 18 per cent. loss in fifty-six pregnancies between 1948 and 1952. They consider that, by adhering to two principles, (a) increased efforts at maintaining the maternal blood sugar within normal range, (b) increased use of Cæsarean section before the end of the thirty-eighth week, 59 per cent. of the infant mortality over the entire period could have been prevented.

Obstetricians tell me that Cæsarean section provides a greater maternal risk than does parturition per vias naturales, but I have no doubt it is best from the baby's point of view. The strain on a not very vigorous infant, further prolonged and

increased by its being somewhat oversize, militates against its chances, if birth is per vaginam. This large fœtus is said to occur in 80 per cent. of diabetics, and was noted as far back as 1824 by Bennewitz. In such a birth he says, "The shoulders stuck like a wedge in the vaginal outlet and would not go up or down." The infant "seemed anxious and sighed with a clear voice," but was finally still-born, "not without great difficulty." This infant, "whom you would surely say Hercules had begotten," weighed 12 lb., and "the arms were of such breadth that I could not encircle their circumference with all my fingers spread."

I am sure this description stirs up a memory in the minds of some of my older listeners.

My colleagues in the Royal Maternity Hospital used to agree with me when I suggested Cæsarean section, but I notice lately a certain swing towards induction. I have not, of course, seen the cases which go wrong following Cæsarean section. In any case, there is no doubt we get excellent results, and although our series is small, I think that in cases where we were able to look after the control of the mother during pregnancy, and where proper co-operation by her was forthcoming, we have probably obtained better results than any I have heard of elsewhere. We have not attempted to carry out the hormone treatment pioneered by Priscilla White in Joslin's Clinic, and it seems to me to be of doubtful value. She, too, does consider that meticulous control of the diabetes, early hospitalisation and early delivery are essential.

The Future.

We have now mentioned the past of diabetes and discussed salient points of its present. What of its future? In the past twenty-eight years since insulin became our main defensive agent, great changes have been seen. Before 1926 the outlook for a diabetes developing in the first decade of life was at most a year or so—more often about six months. These children now live twenty, twenty-five or more years from the beginning of the disease. The present life expectancy for the middle-aged diabetic is about three-quarters of that of the average individual. Pregnancies in diabetics can be brought to a successful conclusion so that these young women can live in normal family surroundings. Diabetics, apart from engine-driving, piloting aeroplanes and one or two occupations of that kind where the lives of large numbers are involved, can engage in almost any occupation. They are found in all kinds of important posts, among the ranks of scientists and as heads of large business organisations. They can participate in strenuous and competitive sports, and even compete for world championships. Many improvements can, however, still be made, even in the present state of our knowledge, and these are largely in the direction of more accurate control. As Joslin says: "Of these complications which have ravaged our diabetics, most can be explained by failure to control the disease." These result largely from vascular degeneration which we have seen is largely preventible. Many young diabetics are difficult cases, partly inherently, but partly because of lack of discipline. It is very hard to have to ask a young boy or girl to stick to accurately controlled diet and refuse so many attractive things other children enjoy, but in the more mature deviations are often not so forgivable.

One often feels that the demonstration of one gangrenous foot, one uræmia, one diabetic coma, or one blind patient would make transgressions rarer.

The physician himself is often to blame. The standards set are frequently not sufficiently high, and there is often a good deal of laxity, or failure to strive after any standard at all.

I may perhaps be thought to lay too much stress on accuracy of control, but I feel that our policy here, which has always had that as its main objective, has been vindicated by the results obtained by more easygoing methods, and collected and analysed in the last few years. It is only now that these free diets and uncontrolled blood sugars have had time to produce their harvest, and it is a very sad harvest indeed.

Apart from more accurate control, it may be possible that some new and better type of insulin may be developed, though one can hardly see how this is likely. Perhaps, though, one may appear which will have continuously constant action and for longer periods, making injections less frequent.

While at the moment it seems that the only advances may be in improvement of present methods, and that no progress to date has been made in the direction of prevention or cure, yet with the wealth of information and experience now available, one can look forward confidently to a future in which an even happier, longer, and more useful life will be possible.

The Church and Medicine

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Opening Address of the Winter Session, October, 1954

My first duty is to refer to the retirement of three members of the visiting staff.

Dr. J. E. Morison, who joined us in 1948, is one of the few members of staff to retire before the age limit. He leaves us to take charge of another laboratory in the hospital service, after a fine record of brilliant and painstaking research.

Our two senior physicians also retire. Dr. S. B. Boyd-Campbell, a son of Ulster, but a graduate of the University of Edinburgh, was elected to the staff in 1921. He had served in the 1914-18 War, and had been awarded the Military Cross. He had also achieved renown in other spheres, having played rugby football for Ireland on twelve occasions. A clinician of outstanding ability, he has been one of the most acceptable teachers of my time. By his contact with hundreds of students and house-physicians, his influence has affected the well-being of thousands of patients in the British Isles, and even much farther afield. Dr. Boyd-Campbell has always maintained a kindly interest in our undergraduates, especially those with strong convictions and athletic ability. He holds strong views on every conceivable subject, which he has never hesitated to express without provocation, with force and pungency.

Dr. Robert Marshall also leaves us, a most able clinician and teacher. A graduate of this school, he served with distinction in the War of 1914-18, and was elected to the staff in 1924. He has been an exceptionally loyal son of this hospital, a local historian of no mean repute, being the author of the Book of Belfast in connection with the visit of the British Medical Association in 1937. His other work on this hospital is monumental; it should be read by each of you, and it is regarded by his colleagues with admiration. The glass of fashion and the authority on protocol, Dr. Marshall has been the last word on the propriety and correctness of almost every social activity in this hospital. His silver tongue has often been used with elegant phraseology in defence of our profession to safeguard the interests of fair play and justice. It was due to the efforts of Dr. Marshall that I became a member of the auxiliary staff of the hospital in 1928. I regard it as a privilege to be the orator to salute him on his retirement.

It is not banal to say that we shall greatly miss these colleagues. The corridor will seem a very strange place without them; and they take with them a record of great service and our affectionate respect and esteem.

For over one hundred years an address on some facet of medicine has been given at the opening of the Session. By now there is hardly an aspect which has not been

touched. However, one still remains, and I propose to address you on the subject of the Church and Medicine.

This may naturally evoke the witticism: "Is Saul also among the prophets?" Our profession, as we are all aware, has sometimes had the unenviable reputation of hanging loosely by the Church. This reputation, whether deserved or not, is a very old one. In the Middle Ages education had become, with rare exceptions, the exclusive privilege of the clergy. They were the poets, historians, philosophers, and, for a time, the lawyers of the period. Physical science alone, in general, they declined, though not completely so, as we shall see later. The study of the human body was thought to be inconsistent with the fastidious modesty of their vocation, and so the serious pursuit of medicine and its cognate subjects was generally left to others. It was this division of labour which gave to medical men a measure of independence from the Church, and which gave rise to the tradition that they were more interested in bodies than in souls. This tradition was well expressed by Chaucer in his prologue on the Doctor of Physique, concerning whom he tells us that

His studie was but littel on the Bible,

and it is even more strongly put in the old Latin saying: "Ubi tres medici duo athei" (Where there are three doctors there are two atheists). Such a generalization is, of course, highly inaccurate, but it indicates the necessity for a statement of the reasons which lead me to discuss the subject of the relation between the Church and Medicine.

These reasons are—(a) the inherent interest and importance of the subject; (b) the fact that there are good precedents for such a study. One has only to think, for example, of Sir Thomas Browne's classic, *Religio Medici*; (c) the Church and the medical profession have always had much in common, and Medicine has for long enjoyed the blessing and patronage of the Church; (d) the final reasons which I may adduce for my choice of subject are my own interest in it, and the fact that it has not already been the subject of the annual address.

Even the person whose "studie is but littel on the Bible" must acknowledge that the Scriptures are full of interest for us. The Jews knew little of the healing art as practised in Greece or Rome, but their sanitary and hygienic laws were of great importance. Physical cleanliness was put on a par with moral purity, and one has only to read the Book of Leviticus, for example, to see the point in S. M. Blair's statement that "the Mosaic Law contains the very first code of preventive medicine." This book contains a code of clean living and instructions as to the handling of infectious diseases which could not be improved upon even to-day. The obvious intention was to provide the Jewish race with a health system which would enable them safely to undertake the rigours of the campaign to capture and to hold the Promised Land.

These health regulations were believed to have divine sanction, and were, therefore, observed as a religious duty, and when one considers the squalor and poverty of life in the East their importance as a means of maintaining reasonable health standards will at once be seen.

There are many passages in Leviticus which might be quoted as examples of the Mosaic health regulations, but in the interests of brevity I shall confine myself to one.

> And the Lord spake unto Moses and to Aaron, saying,
>
> Speak unto the children of Israel, and say unto them, When any man hath a running issue out of his flesh, because of his issue he is unclean.
>
> And this shall be his uncleanness in his issue: whether his flesh run with his issue, or his flesh be stopped from his issue, it is his uncleanness.
>
> Every bed, whereon he lieth that hath the issue, is unclean: and everything, whereon he sitteth, shall be unclean.
>
> And whosoever toucheth his bed shall wash his clothes, and bathe himself in water, and be unclean until the even.
>
> And he that sitteth on any thing whereon he sat that hath the issue shall wash his clothes, and bathe himself in water, and be unclean until the even.
>
> And he that toucheth the flesh of him that hath the issue shall wash his clothes, and bathe himself in water, and be unclean until the even.
>
> And if he that hath the issue spit upon him that is clean; then he shall wash his clothes, and bathe himself in water, and be unclean until the even.
>
> And what saddle soever he rideth upon that hath the issue shall be unclean.
>
> And whosoever toucheth any thing that was under him shall be unclean until the even: and he that beareth any of those things shall wash his clothes, and bathe himself in water, and be unclean until the even.
>
> And whomsoever he toucheth that hath the issue, and hath not rinsed his hands in water, he shall wash his clothes, and bathe himself in water, and be unclean until the even.
>
> And the vessel of earth, that he toucheth which hath the issue, shall be broken: and every vessel of wood shall be rinsed in water.
>
> And when he that hath an issue is cleansed of his issue; then he shall number to himself seven days for his cleansing, and wash his clothes, and bathe his flesh in running water, and shall be clean. (Leviticus XV: 1-13.)

At first the Jews had no doctors but tended to use magical rites in the healing of disease. Later we find mention of physicians and learn that they are held in high esteem. Thus Ben Sirach (180 B.C.), in one of the books of the Apocrypha, says :—

> "Honour the physician according to thy need of him, for verily the Lord hath created him, and from the Most High cometh healing." The patient is to pray and "put away wrongdoing," and he is then to "Give place to the Physician." "Let him not go from thee," says the sacred writer, "for thou hast need of him. There is a time when in their very hands is the issue for good" (Ecclesiasticus XXXVIII: 1-15).

When we turn to the New Testament we are immediately confronted with the healing miracles performed by Christ. This is not the place to study these in detail, but even apart from such study, they are important for their implications. Hippocrates had looked upon disease as an internal condition of disharmony caused by a wrong proportion of cardinal juices. Galen, on the other hand, emphasized the attack from without. In the teaching of Christ a true synthesis is found. He taught that illness was due to inward disharmony which often had moral and spiritual roots. It was not simply a physical condition caused by a mechanically wrong proportion of cardinal juices. He knew that disease might have its roots primarily on the bodily level, but He emphasized the fact that they could be on mental and spiritual levels. He did not treat the body alone, nor did He practise medicine though He knew the value of material remedies. His aim was to put sufferers in right relationship with God. When they were morally and spiritually healthy a fresh inrush of vitality suffused their being, and they were made whole. He did not share the prevailing Jewish idea that suffering was necessarily due to one's own sin : a belief which was based on such passages as Exodus XV : 26 :—

> If thou wilt diligently hearken to the voice of the Lord Thy God, and wilt do that which is right in His sight, and wilt give ear to His commandments, and keep all His statutes, I will put none of these diseases upon thee, which I have brought upon the Egyptians : for I am the Lord that healeth thee.

Suffering, to Christ, was indeed an evil, but its causes could be and should be eliminated. He Himself is said to have healed "all manner of diseases," and He seems to have worked continually for the perfect integration of spirit, mind and body.

The fundamental concept of biblical medicine then is the idea that God is the source of life and health. Indeed, one of the names given Him in the Scriptures is Jehovah—Rapha, which literally means the Lord that healeth (Exodus XV : 26). Material remedies were not ruled out as unnecessary. Thus, for example, in 2 Kings XX : 7, and Isaiah XXXVIII : 21, we have references to the healing of Hezekiah by the use of figs. But it was believed that even when such remedies were used the physician was merely assisting nature, and that healing ultimately came from God.

From apostolic times the ministry of healing was considered as much an integral part of the Church's work as the preaching of the Word and the administration of the sacraments. The entire pastoral care of the sick was taken over by the clergy, who established hospitals and infirmaries where serious cases might be nursed. It is true that there were hospitals of a kind in the ancient world, but hospital organization, as we know it, is Christian in origin. Even Julian the Apostate (331-63) declared that the old pagan religion of the Roman Empire was in danger of dying out unless it could show such care for others as the Christians exhibited. Writing to Arsacius, the pagan high-priest of Galatia, he urges him to follow the Christian example.

> Now we can see what it is that makes these Christians such powerful enemies to our gods. It is the brotherly love which they manifest towards strangers,

> and towards the sick and poor, the thoughtful manner in which they care for the dead, and the purity of their own lives.

Accordingly, he advised Arsacius to follow the Christian example and to "establish abundance of hospitals in every city, that our kindness may be enjoyed by strangers, not only of our own people but of others who are in need."

This obligation of caring for the sick is to be found even in the prayers used at the ordination of the clergy. Thus, the 17th Canon of Hippolytus (third century) enjoins upon the Church the use of the following prayer at the ordination of priests and bishops :—

> Grant to him, O Lord, a mild spirit, and power to remit sins, and grant to him to loose all bonds of the iniquity of demons, and to heal all diseases. . . .

Apart from the nursing of the sick, much of the healing practised at this time was what is now known as faith healing or spiritual healing, that is, healing by prayer and the laying on of hands, or by anointing with oil. There are references to such healing in the writings of the Church Fathers, and anointing with oil for the healing of the sick is to be found in use as late as the eighth century. It was, however, in its care for the sick and suffering rather than in its curative efforts that the Church showed its interest in the welfare of the community. Nevertheless, it had much success in cases of mental illness and nervous disorders, and the cure of such illness was pointed to by the Apologists (for example, Justin Martyr) as proof of the deity of Christ and of the divine power vested in His Church. In cases of mental illness the patient received individual attention, and his personal dignity was respected. He was kept in association with healthy minds, and, when possible, had a simple task given him to perform, a proof of the early recognition of the wholesome effects of occupational therapy. The malady being psychically caused, an attempt was made to cure it psychically, by exorcism. The theory of demon possession, however crude, was at least a recognition of the fact that illness may come from without. An attempt was made to remove the patient's fears by imparting to him a courageous optimism, and faith in God as a loving Father. He was taught to fight manfully against all difficulties in the belief that God was with him.

We are not to assume, however, that faith healing and the nursing of the sick were the only methods used by the Church. Such an assumption has often been made, but it calls for modification. Tertullian, the Church Father, possessed a wide knowledge of medicine which he called "the sister of philosophy." Clement of Alexandria stressed the importance of hygiene. Lactantius speaks in his writings about the structure of the human body, and the learned St. Isadore of Seville treats of medicine in one of his books. Benedict of Nursia made it a duty for the members of his Order to study the sciences, and particularly medicine, as an aid to hospitality :

> The care of the sick (he stated) is to be placed above and before any other duty, as if indeed Christ were being directly served in waiting on them. It must be the peculiar care of the Abbot that they suffer from no negligence.

Benedict was the founder of the monastery at Monte Cassino (which, by force of circumstances, we were compelled to destroy during the last war), and at least one

Abbot of Monte Cassino, Bertharius in the ninth century, was well known as a physician.

Cassiodorus (468-560) founded his monastery on Benedictine principles, and his rule also stressed the care of the sick.

> I insist, brothers, that those who treat the health of the body of the brethren who have come into the sacred places from the world should fulfil their duties with exemplary piety. . . . Let them serve with sincere study to help those who are ailing as becomes their knowledge of medicine, and let them look for their reward from Him Who can compensate temporal work by eternal wages. Learn, therefore, the nature of herbs, and study diligently the way to combine their various species for human health. But do not place your entire hope on herbs, nor seek to restore health only by human counsels. Since medicine has been created by God, and since it is He Who gives back health and restores life, turn to him. . . . And if you are not capable of reading Greek, read, above all, the translations of the Herbarium of Dioscorides, which describes with surprising exactness the herbs of the field. After this read translations of Hippocrates and Galen . . . and divers other books written on the art of medicine, which, by God's help, I have been able to provide for you in my library.

Thus, in the Middle Ages, the monasteries played their part in the care of the sick Their regime was generally that of kindness, comparative cleanliness and wholesome food, together with a few simple herbal remedies grown in the monastery garden. But it is evident from the above quotation that some at least of the monasteries were in touch with Greek medical science from early medieval times.

There are numerous manuscripts in the old cathedral libraries which show how diligently the monastic study of medicine was pursued, and from this time we constantly meet with clergymen who had a knowledge of medicine, and who wrote on the subject. The Popes also were well disposed to this trend in clerical studies, and Innocent III recommended that hospitals should be built in every diocese. Pope John XXI, "the only Pope whom Dante met in paradise," who, before his elevation to the chair of St. Peter, had been a professor of medicine and a papal physician, wrote a book on the diseases of the eye in the latter part of the thirteenth century. This book has come down to us, but it must be acknowledged that the remedies prescribed in it for such diseases as cataract make strange reading to-day.

We are all aware of the place held by women in the Italian medical schools of the Middle Ages. It is not so well known, however, that, in the Benedictine convents for women, room was found for intellectual pursuits, and that an important work on medicine was written by Hildegarde (1098-1178), a Benedictine abbess from near Bingen-on-the-Rhine. Indeed, it has been stated in a modern work that the Abbess Hildegarde was the most important medical writer of her time.

There were influences at work, however, in the medieval world which tended to hinder the development of medical science. In the first place, despite the insistence of men like Cassiodorus on the study of Hippocrates and Galen, there was a decline

in the Greek scientific spirit. In earlier centuries the pagans had prayed to their gods for relief from illness, and in the Middle Ages such prayers were transferred to the saints, some of whom were regarded as being most effective in the case of certain diseases. Thus, for example, St. Roch was (and is) the saint prayed to for relief from infectious diseases. Incantations, amulets and charms were popular, and as disease was generally attributed by the common people to supernatural agencies scientific medicine, as we know it to-day, was undreamt of.

There was, in the second place, an instinctive dislike for any form of healing which involved either cutting or burning of the body. Thus the Fourth Lateran Council, in 1215, laid down the rule :—

> Let no sub-deacon, deacon, or priest exercise any art of medicine which involves cutting or burning.

This prohibition was due to the belief in the dignity of the human body, the "temple of the Holy Ghost" (1 Corinthians VI : 19), and to belief in a literal bodily resurrection. The practice of anatomy was unknown during the greater part of the Middle Ages, though its study by lay doctors was later encouraged by the Church.

Finally, owing to abuses which arose, canons were passed in the twelfth century which became more and more adverse to the practice of medicine by the clergy, lest

> through such sciences spiritual men be again plunged into worldly cares,

and lest monks should leave the cloisters under the pretext of attending university lectures. For a time they were permitted to study medicine privately, and even to teach it publicly. Later the prohibition was made absolute, and the clergy were forbidden to practise medicine at all, inasmuch as it was a secular science, and involved the danger of incurring an ecclesiastical irregularity by the accidental death or mutilation of the patient. Accordingly, all physicians and surgeons were held to contract irregularity for possible future sacred orders should any of their patients die through want of proper diligence or of a due study of the art of medicine on the part of the physician. Hence Benedict XIV (1740-58) declared that, in general, when physicians wish to enter the clerical state, a dispensation should be obtained *ad cautelam* (as a precaution) since they can never certainly know that they have always used all the means prescribed by medical science on behalf of those patients who died under their treatment. Regular clergy living in missionary countries are permitted by the Roman Church to practise medicine, but they must prescribe gratuitously, and abstain from cutting and burning. Where there are lay doctors the clergy may not practise. Permission to practise surgery is much more difficult to obtain than in the case of physicians.

In general, therefore, it may be said that healing, like education, was once a function of the Church. Until Renaissance times European medicine was largely dispensed by religious orders. With the Renaissance came the growing claims of science to stand apart, and medical practice, since then, has been independent of the Church, though, in fact, the two can never be completely independent, since truth, whether scientific or religious, is one and indivisible.

When we look at the modern period it is to find that medical progress has consistently enjoyed the blessing of the Church. As examples of this I may mention,

first of all, the fact that, in Christian churches everywhere, prayers are offered up for doctors and nurses. Thus, to quote from one of the books of Common Order, there is a prayer that God might

> grant to the physicians and surgeons wisdom and skill, and to the nurses diligence and patience,

and another that

> Thou wouldst aid physicians, surgeons and nurses in their work of mercy, and that Thou wouldst again dispense Thy healing virtue and comfort through every institution for the benefit of the weak and the aged.

Another prayer book asks God to

> Give power, wisdom, and gentleness to all Thy ministering servants, our physicians, surgeons and nurses; that, always bearing Thy presence with them, they may not only heal but bless, and shine as lamps of hope in the darkest hours of distress and fear.

There is surely none of us here but would long to have such a prayer answered in his own case.

But the Church has not confined herself to prayers. One has only to think of the medical missions scattered throughout the world and of the work of such splendid medical missionaries as Grenfell of Labrador and Schweitzer of Africa (who holds doctorates in theology, music, and medicine, and who gave up a brilliant professorial career at home (in Strassburg) to devote himself to mission work, and who has just received the Nobel Peace Prize). There is the work of men like Father Damien, who, though not a doctor, devoted his life to the welfare of the lepers of Molokai and whose example has been an inspiration to many. There are many fine hospitals on the mission fields, not to speak of the numerous hospitals here and there throughout Christendom which are directly or indirectly under Church control. Many outstanding medical scientists, for example, Lister, Simpson, and Pasteur, have been men of simple faith and piety, and for such men the practice of medicine was simply the expression of an inner urge to serve their Creator while alleviating the sufferings of their fellow-men. Many doctors have been sons or daughters of manse or rectory, and these have naturally retained a veneration for the Church.

As a further example of the Church's interest in medicine and hospital administration, I may perhaps mention the fact that at a meeting held in Belfast on 30th November, 1843, to consider ways and means of opening a General Hospital, no fewer than seven clergymen took part in the proceedings; and one of the resolutions, proposed and seconded by clergymen and passed unanimously, was to the effect that a collection should be taken up in all the city churches in support of the new hospital. In 1884 the churches in the city decided to organize an annual collection for this hospital, and between that year and 1948 (when the scheme came to an end) the total amount raised in this way was £205,142, no inconsiderable amount when one considers that many of these years were years of industrial depression.

We are indebted also to the Church in Belfast for another important activity, for in 1793 the Belfast lying-in hospital grew out of a suggestion made by the Rev. John Clarke, curate of St. Anne's Parish Church. This hospital started in a house rented in Donegall Street, and was the forerunner of the present Royal Maternity Hospital in these grounds.

On the other hand, it must be acknowledged that advances in medical science have sometimes been opposed by pious but conservative people. Thus, when Simpson discovered chloroform he met with opposition not only from surgeons and physicians, but from many devout people, who argued, on the basis of Genesis III : 16, that pain in childbirth was divinely ordained and that its prevention was sacrilege. Simpson, however, knew his Bible too well to be perturbed by such arguments, and was quick in citing another Genesis passage which relates that, when God wanted to deprive Adam of one of his ribs, He first put him into a deep sleep !

The Christian Church (or at least important sections of it) has expressed its views on such matters as euthanasia and the mother-child problem. With regard to the former, there is no fundamental difference of opinion between the Church and the medical profession. With regard to the latter, the equality of mother and fœtus is an authoritative dogma of the Roman Catholic Church. "The life of each is equally sacred," said Pope Pius XI in his encyclical *Casti Connubii,* "and no one has the power, not even the public authority, to destroy it." There has, however, been an important advance in medical skill which makes the problem a much more remote one than it once was. The sulfa drugs and antibiotics together have made delivery by Cæsarean section so much safer, even in the infected cases (e.g., a failed forceps delivery), that the operation of craniotomy on the living child is now no longer practised; and it is probably true to say that better ante-natal care and prognosis may do much to eliminate the partial disaster of the failed forceps delivery.

Another advance is in the care of the premature infant, so that babies have been reared even in the sixth month. The old seventh month need no longer be a limit of viability for the obstetrician.

The problem of morbidity in the early weeks of pregnancy was often solved in the past by terminating the pregnancy. With pernicious vomiting now happily receding into an ugly past, the modern indications are mostly the toxemias of pregnancy, and it is doubtful if there is, in fact, any indication for termination of pregnancy before the viability of the child. Moreover, it is admitted by all authorities that the risk of operating is often greater than the danger of an expectant line of treatment.

I mention these matters to show that, even where medical practice has not fully approximated to the teaching of the Roman Catholic Church, the advance of medical science is bringing the ideal of both bodies (the preservation of the life of both mother and child) much nearer than it once was.

There is wide discussion in these days about what are known as the "stress diseases," and while much of it may lack scientific precision there can be little doubt regarding the relationship between our highly-civilized mode of life, with its

anxiety to get somewhere and do something quickly, and such diseases as duodenal ulcer and asthma. If there are diseases with a non-physical origin, it follows that the remedy for these cannot be a purely physical one. Or, to put it in another way, if one state of mind produces a disease, another state of mind may effect a cure. In a recent issue of one of our professional journals the editor put this point as follows :—

> Science is just on the verge of that no-man's land that at the moment separates mind from body, and there is ever-increasing evidence that its exploration and conquest are merely a matter of time. In this exploration all the skills of modern science will be required, but the contributions of the philosopher, poet and priest must not be overlooked.

And Sir Heneage Ogilvie, in the same issue, stated that

> the most effective weapon in the treatment of the troubled spirit may be the faith in a Power higher than ourselves.

From this it would seem to follow that there is room for some form of co-operation between Medicine and the Church, and one may recall Thomas Huxley's provocative statement,

> My work in the London hospitals taught me that the preacher often does as much good as the doctor.

It is obviously impossible in the time allotted to me to enter upon the difficult but all-absorbing question of what is sometimes described as faith healing or divine healing. But in a paper on the subject of Church and Medicine it must at least be mentioned if only for the sake of completeness. It may be recalled that the English archbishops have set up a commission to study the whole question, and that, in doing so, they have sought the assistance of the British Medical Association. This is an interesting example of the co-operation about which I have spoken. The point was once put in a facetious and intriguing way. Two brothers, members of a well-known Ulster family, lived together. One was a doctor, the other a clergyman. On coming down one morning they found the following notice attached to the door :—

> Souls and bodies repaired with skill
> By the Rev. Richard and Doctor Dill.

This paper may have shown that the area of their common interest is a wide one, and that co-operation between the two may be as normal in the future as it was centuries ago. It is to be hoped that the paper has also shown that to both doctor and clergyman alike there comes the Apostolic injunction,

> Walk worthy of the vocation wherewith ye are called.

Let me now change to a different theme in a different key. You have left the cloistered study of the university, where you have been taught a great deal, and where you may even have learned a great deal. As to your study here, tradition and custom, which are stronger than rules, decree that I should offer you some advice. It has been said that "advice is seldom welcome; and those who want it most, always like it least." You may well ask—what are my qualifications for this purpose? I answer that experience is always valuable, and perhaps it is wise to

listen to one who has made mistakes, who has not avoided all the pitfalls, who, perhaps, shows evidence of a youth misspent as to his opportunities—in short, it may be wiser to listen to the sinner than to the saint, for the sinner, at any rate, has the benefit of experience.

Henceforth, the emphasis in your training will be on the clinical aspect of medicine. The word "clinical" is derived from the Greek, cline—a bed. Your teachers will now take you to the bedside, and instruct you in the taking of a good history, the careful and systematic examination of the patient, the observation of facts and clinical findings, the differentiation of these facts with induction as to the laws governing them. They will teach you that clinical features change with progression or regression of the disease, but that the governing laws do not change. They will interpret findings in the light of these facts and in the knowledge of their experience.

Do not hesitate to question your clinical teachers. It may sometimes be the only way to have a point clarified. At any rate, you will probably flatter, and you will certainly surprise them by your attention and interest. "I have more understanding than my teachers," you may say to yourself, and this may very well be true. In the long run, you will learn more by your own efforts than by the efforts of your teachers. Lean on Kipling's men :—

I keep six honest serving men
(They taught me all I knew)
Their names are what, and why, and where
And how, and when, and who.

You are now about to make your first real contact with the patient. To you, her attendance will become an everyday affair. It is not so to the patient; it is almost certain to be a new experience. She has stepped into a new world, a world almost entirely unknown to her. She is probably wondering, anxious, and afraid. What does she fear? She does not know, but fear of the unknown is a very real fear, and one of the conclusions you will make in your clinical studies is that illness saps morale.

You will meet all sorts and conditions of men in this great hospital, among them those who are "afflicted or distressed, in mind, body, or estate" and those "who, in this transitory life, are in trouble, sorrow, need, sickness, or any other adversity."

Avoid talking to your patient in technical language. Do not blind her with science. Remember that her own descriptions in her own words will probably paint a clearer picture. Do not put words into her mouth. It may lead you astray in the diagnosis, and the average patient knows what she wants to say; so let her say it in her own way. She is probably not interested in our technicalities and jargon. What interests her is when she is going to be cured. Do not discuss serious diagnoses or grave prognosis in front of the patient. The violation of this sane rule was observed by the famous Irish clinician Graves in another school, where he noted "the expression of despair settling on his (the patient's) countenance when the prognosis was too clearly announced."

The study of clinical medicine is absorbing; it means hard work, but you must gain your clinical experience. "Experience doth take dreadfully high wages, but she teacheth like none other."

Never regard your patient as a number in the register, or as the third bed on the left. It is one of the dangers of the welfare state that human beings may become anonymous.

Remember, at all times, that you are dealing with such human beings. Every patient is somebody's mother or father, sister or brother, daughter or son, someone who loves or is loved. You will never get the full co-operation of the patient without kindness and sympathy. No matter the degree of your skill, without the patient's co-operation diagnosis will be difficult and treatment may be impossible or unavailing.

So be patient and understanding, be gentle and kind. Without these qualities you will never become a really good doctor.

> And though I have the gift of prophecy, and understand all mysteries, and all knowledge; and though I have all faith, so that I could remove mountains, and have not charity, I am nothing.

Remember that in medical practice you will be treating a patient in the first instance, and a disease in the second instance. Most of you, I hope, will become family doctors, and the family doctor, much more than the consultant, recognizes this truth and the value of its application.

Plato gave us an undeniable truth when he said of medicine that "this is an art which considers the constitution of the patient, and has principles of action and reasons in each case."

In the wards you will see the ravages of disease, the hopelessness of incurable disease, the tragic euphoria of chronic disease; you will see the failure of treatment, and you will see the success of treatment much more often. You will see hope, fear, anxiety and gratitude. You will see courage, patience, fortitude, and suffering bravely borne. There you will find men and women as they really are, without veneer or artificiality. You will go away a very humble person, with a greater respect for human life, and become uplifted for having seen the decencies, the kindliness, the courage and the faith of ordinary people.

But do not make the mistake of regarding the hospital as a house of tragedy and failure. While your heart will often be hurt, and you will see much that you cannot understand in the way of suffering, I suggest that you will find it oftener a temple of triumph and success.

The age of miracles is not past. You will see miracles here every day. We have perhaps ceased to marvel because of their very frequency.

When you see the blessing of skilled anæsthesia, the scope of surgery, the return of the spark of life in the face of an exsanguinated patient after blood transfusion; when you see pneumonia, peritonitis, puerperal infection successfully treated by the antibiotics; pernicious anæmia treated by liver extract, diabetes mellitus treated by insulin; when you see the baby, until a few years ago born to live for a few days but doomed to die from Rhesus incompatibility, now grow into a healthy child

following exchange transfusion; when you see the wonders of child-birth, and the start of a baby's respiration probably to continue for three score years and ten; when you see the look on a mother's face as you place her newly-born babe in her arms, and when you compare the present-day optimistic approach to geriatrics with the classical and pessimistic description of old age in the Book of Ecclesiastes, then, my young friends, then you are seeing miracles.

When you see these miracles, as assuredly you will see them every day, pause, and thank your God that you live to see them, and that you are privileged to play a part.

> And here I cease to write, but will not cease
> To wish you live in health, and die in peace;
> And ye our Physicke rules that friendly read,
> God grant that Physicke you may never need.
>
> (The Schoole of Salerne.)

I have to thank the Reverend Robert Allen, M.A., Ph.D., F.R.Hist.S., for his interest, guidance, and help in the preparation of this address.

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Problems in Operability

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The first Sir Thomas and Lady Dixon Lecture delivered on 11th May, 1954, in the Institute of Clinical Science, Belfast.

DR. MARSHALL, MR. FRASER, DEAN BIGGART, LADIES AND GENTLEMEN—

I want first to thank Mr. Fraser and other responsible individuals for the honour conferred upon me by inviting me to give the Sir Thomas and Lady Dixon lecture. I consider this a great honour—and doubly so since I have been invited to give the first of the series.

Since coming to Belfast I have had the opportunity and privilege of learning a great deal about Sir Thomas Dixon. It is difficult to understand how one person could find the time, and more important, possess the ability to take the leading part in so many activities devoted to the welfare of his fellow-men. Although busy in the Government of Northern Ireland, he found time to serve on innumerable commissions and committees which were devoted to public service. The medical profession, and in fact all the citizens of this community are particularly indebted to Sir Thomas and Lady Dixon for the gift of their home as a hospital.

Although the major purpose of this lecture today is to honour the memory of Sir Thomas Dixon, I want to pay particular tribute to Lady Dixon for her foresight, for her thoughtfulness, and benevolence in establishing this lectureship.

Medicine owes a lasting debt of gratitude to such benefactors. May we, in the medical profession, be worthy of their trust.

I want you to know that I shall always be very grateful for the honour you have bestowed upon me today.

ALL of us are aware of the great improvement made in the operative mortality rate during the past two or three decades. Perhaps the greatest single factor in the lowering of the rate is a better understanding of surgical physiology. Likewise important is the improvement in our ability to determine operability, although it must be admitted our knowledge in this field is woefully inadequate. Part of my theme today is the urgent request to pay more attention to operability and not inflict an operative load upon a patient which he cannot tolerate. We realize, of course, that one patient may tolerate a given operation better or worse than another; accordingly, we must make all possible effort to improve operability particularly since unexpected complications are so apt to develop following operation of great magnitude.

Deficiencies constituting Poor Operability.

Malnutrition.—Perhaps the most serious of all the deficiencies constituting poor operability is malnutrition; one of the reasons it is so serious is because it is often not readily apparent.

Malnutrition may be due to one of several causes, including anorexia, vomiting, gastro-intestinal fistulæ, hepatic disease, diarrhœa, poor teeth, etc. Often it is due to a readily correctible factor such as anorexia alone; under such circumstances nothing more need be done than emphasize to the patient the necessity of eating an adequate amount of food. Disease processes within the abdominal cavity are particularly apt to result in anorexia with or without vomiting. It must be remembered that complete obstruction of the colon produces anorexia, but little or no vomiting. Complete obstruction of the small intestine usually produces vomiting, but a partial obstruction often produces no vomiting if it has developed gradually. In the latter instance the patient gradually cuts his intake down to a very low amount, simply because he has learned he is less uncomfortable if intake is small. Such is the case, for example, in stenosing ulcer of the duodenum.

Weight loss is often fairly good evidence of malnutrition, but it is not realized that a weight loss of five or six pounds may be more serious than a loss of twenty-five or thirty pounds if all of the small loss has taken place in a few days, whereas the larger weight loss may have developed slowly over a period of several weeks with no weight loss during the last few days.

One of the most serious factors in malnutrition is *hypoproteinemia.* Most of the various causes of malnutrition previously listed will result in hypoproteinemia, but additional factors resulting particularly in this phase of malnutrition should be mentioned. For example, the loss of plasma from a chronic ulcer will quickly give rise to hypoproteinemia if the ulcer is large. Ulcers of the skin resulting from burns are good examples of lesions resulting in protein loss; a much smaller ulceration in the intestinal tract will likewise give rise to hypoproteinemia, probably because anorexia is present and blood loss is also taking place. Liver disease may give rise to hypoproteinemia, probably because there is a defect in protein formation. Transudates and exudates into the thoracic or abdominal cavity rapidly result in hypoproteinemia because these fluids have a high protein content, and are lost to the vascular system. Renal disease, particularly of the nephrotic type, usually produces hypoproteinemia because of the loss of protein in the urine. Trauma itself is an important cause of hypoproteinemia largely because of anorexia and loss of plasma into the tissues or to the exterior. Numerous functions of the body are dependent upon a normal protein content in the blood stream; important in these functions are cellular nutrition and osmotic tension, which are related to wound healing and distribution of body fluids respectively. If the blood protein falls much below normal wound healing is impaired; if the total protein falls to a level as low as 5 grams per cent., little or no healing takes place. Below this level tissue edema develops, particularly if the plasma albumin is below 2.5 grams per cent.

It must be remembered that, following a major operation, there is a serious loss of protein as determined by nitrogen loss. During the first four or five post-

operative days as much as 250 grams of protein may be lost. The cause of this protein loss may be related to the alarm reaction, i.e., excessive secretion of adrenocortical hormones incident to the operation. However, the nitrogen loss is comparatively much less in malnourished patients than in patients with normal nutrition.

Anemia.—This is one of the most common, but fortunately the most readily corrected decrements encountered in patients needing major operation, particularly for lesions involving the gastrointestinal tract. Accordingly, all patients upon whom a major operation is being considered should have a hematocrit and hemoglobin determination. However, it must be remembered that these tests do not accurately portray the blood needs because they reveal only the red cell concentration; in other words, their relationship to blood volume itself are meagre. Blood volume deficits in patients with surgical lesions have been emphasized by numerous workers. For example, Nelson, Clark and Lindem (1950) noted that the average blood volume deficit in depleted patients was 2,000 c.c.

Even though blood volume tests are not utilized in studying the patient's physical reserve, deficits in the hemoglobin and hematocrit readings must be corrected preoperatively. Without doubt it is desirable to make this correction a day or two before operation, and not on the operating table, because of the danger of transfusion reactions related to blood grouping and toxicity of citrate. If a lot of transfusions are necessary in one day it is desirable to give about a gram of calcium gluconate intravenously (into a vein other than the one receiving donor blood) after every second transfusion.

At the present time there are three major methods available for determination of blood volume. These include the Evans blue dye, the tagged (cobalt) red cell, and radio-active iodinated serum albumin methods. Each has its advantages and disadvantages. The former is the simplest, but its chief disadvantage is the fact that if more than one test is needed over the course of a few days the tissues including skin are stained blue.

The importance of correcting blood volume deficits before operation can be appreciated by the experiences of Beling, Bosch and Carter (1952), who noted that the mortality rate following major operations in their patients given blood, according to clinical indications (by hemoglobin and hematocrit determinations), was 17.4 per cent., whereas it was only 8 per cent. in patients having blood given in amounts indicated by blood volume determinations.

Inadequate Cardiac Reserve.—Adequate cardiac reserve is obviously important in determining operability, but in general the danger of serious complications from cardiac disease has been exaggerated. True enough, any patient with cardiac decompensation or a history of recent coronory thrombosis (within three months of a contemplated operation) will not tolerate a major operation with any degree of safety. Edema of the ankles or ascites indicates poor operability; even though symptoms are minimal; medical therapy, including diuretics, digitalis, bed rest, etc., should be instituted and the edema eliminated.

The electrocardiogram is of very little aid in determining operability. It may reveal evidence of a coronary thrombosis, but as intimated above, if the occlusion

took place more than three months previously the patient will tolerate the average major operation with comparative safety; on the other hand, if the pain of coronary infarction is interpreted as an acute abdominal emergency, and an operation performed, death (probably on the operating table) will usually take place.

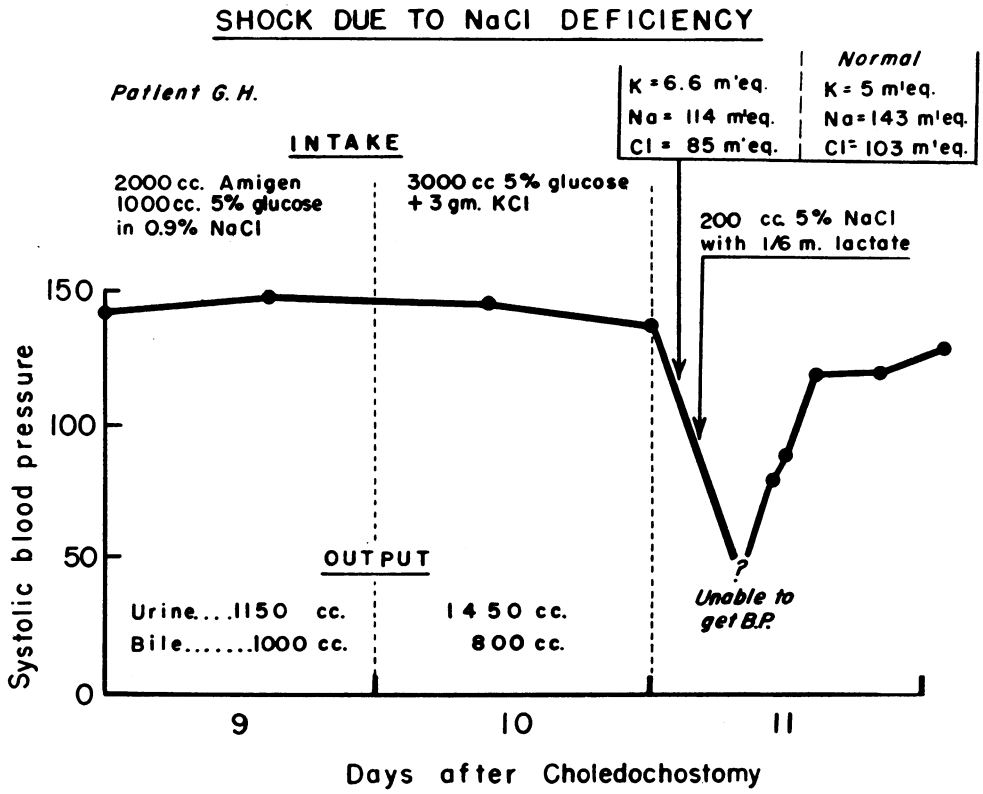

Fig. 1.—This patient had a T tube drainage of the common duct following removal of stones. Daily bile output was high and food intake smaller than we appreciated. In retrospect we gave the patient inadequate salt, even though he had ten grams two days before his collapse. On the eleventh post-operative day he was found in vascular shock with an unobtainable blood pressure. Note the immediate response following administration of only six grams of salt intravenously. Nearly thirty grams were given during the next twenty-four hours to obtain a balance.

Of much more value in determining operability from the cardiac standpoint is the answer to a few simple questions such as :—(a) how far can you walk? (b) can you climb a flight of stairs without stopping to rest? (c) have you had any swelling of the ankles? and (d) do you have any pain in the chest during exertion?

Fluids and Electrolyte Imbalance.—Dehydration may be produced by any of numerous factors such as lack of fluid intake, vomiting, diarrhœa, excessive

sweating, intestinal fistulæ, etc. Operability is jeopardized by dehydration, primarily because of the decreased blood volume. Accordingly, fluid deficit must be corrected before a major operation is contemplated.

Of the electrolytes significantly related to operability sodium, potassium and chloride are the most important; their deficiency is created by the same factor as those producing dehydration as listed above. The average daily need for sodium

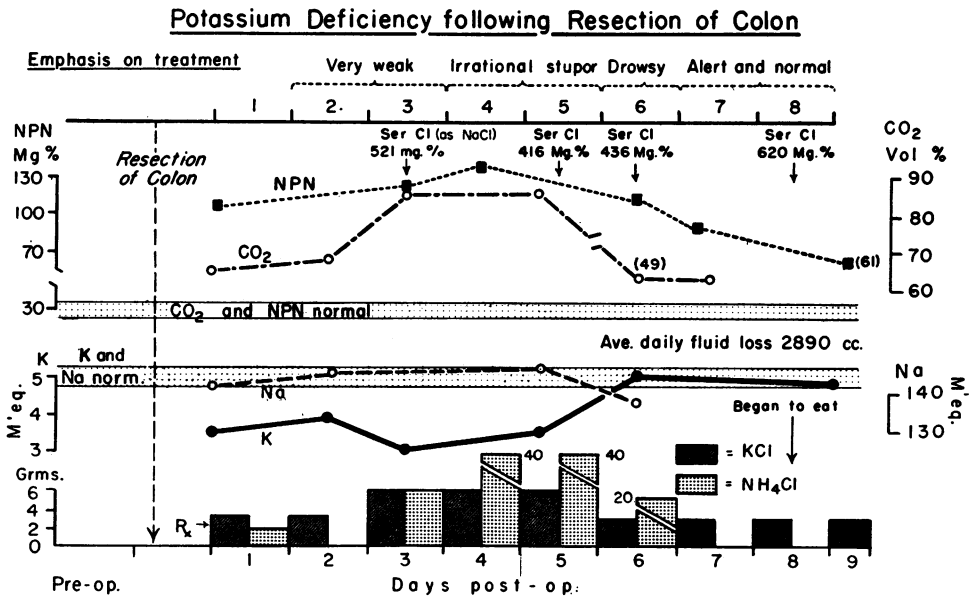

Fig. 2.—Potassium deficiency developed in this patient within a day or two after resection of the colon for carcinoma. The sodium was normal but the chloride low. Alkalosis parallels reversely the low potassium curve. Six to eight grams of potassium chloride over a period of three or four days brought the potassium level up to normal. Larger doses over a shorter time should have been given. Massive doses of ammonium chloride (up to forty grams per day) were given to correct the chloride deficit without overloading the patient with sodium.

chloride is 5 to 8 grams, and for potassium 2 to 3 grams. Following operation, the kidney tends to conserve sodium chloride, but continues to excrete potassium chloride.

The manifestation of sodium chloride and potassium deficiency are variable, but remarkably similar. For example, weakness, anorexia, nausea, vomiting, abdominal pain, abdominal distention, sleeplessness, general discomfort, and irrationality may be present in each, except that weakness is usually more prominent in potassium deficiency. Oliguria is encountered not infrequently in sodium chloride deficiency, but rarely in potassium deficiency; vascular shock is encountered in the former when depletion is serious (see Fig. 1), but practically never in the

latter. Paralysis and difficulty in talking are reported in serious deficiency of potassium chloride, but the author has not observed these manifestations.

In correcting potassium deficiency, it must be remembered that administration of potassium chloride is dangerous if the kidneys are not secreting urine, because of the toxic effect of potassium on the heart. Accordingly, before beginning active treatment of potassium deficiency, it must be demonstrated that urinary secretion is active. Two to three grams of potassium chloride represent a maintenance dose for the average adult, but as much as 15 to 18 grams per day may be needed and given in the presence of serious deficiency. Hypopotassemia as well as hyperpotassemia may be detected by the electrocardiograph. Alkalosis is commonly observed in potassium deficiency (see Fig 2).

Inadequate Kidney Reserve.—Obviously, nephrotic and acute infection of the kidneys represent contraindications to elective operations. Urine examination will reveal most kidney deficiencies jeoparding operability, but in renal damage due to urinary retention induced by prostatic hypertrophy, examination of the urine may reveal nothing abnormal. However, the non-protein nitrogen (NPN) level in the blood will be elevated. Therefore, it is almost mandatory that this examination be carried out in all elderly men upon whom a major operation is contemplated. If there is any doubt about the absence of urinary retention, catheterization for residual urine should be carried out. Fortunately, an elevation of the blood NPN due to prostatic hypertrophy with urinary retention will usually clear up in a few days under increased fluid intake with a retention catheter in the bladder.

Common Errors in Determining Operability.

I would like to call attention to some common errors made in determining operability. In the first place, it should be emphasized that physicians and surgeons too often, indeed, fail to arrive at a decision as to whether or not the patient will tolerate the operation. Too often they are content to say the operation is a serious one and the patient is not a very good risk.

Perhaps the most common error made in determining operability is the *failure to inquire carefully into the caloric intake.* This may be very serious because malnutrition probably offers a greater threat to survival of the patient following a major operation than any other single decrement. We must find out if the patient is eating three meals per day and inquire as to the amount of food consumed. The patient is apt to mislead the physician, but accurate data is obtained when one asks if he eats one-third, one-half or as much as other members of the family. As intimated previously, weight loss is a very significant manifestation as related to nutrition, but the amount of loss over a six-month period of time is not as important as the actual intake during the few days prior to a contemplated operation.

Too often in surgical diseases of the gastro-intestinal tract we *fail to realize that partial obstruction of the stomach, colon, and small intestine (especially the former two) may be present in the absence of vomiting* or any other serious symptom except anorexia; this is particularly true if the obstruction has been gradual in its

onset. Here again specific questions as to amount of food intake may reveal the first intimation that the patients' physical reserve may be jeopardized.

Too often we fail to realize that the *hemoglobin and hematocrit determinations do not give us an accurate indication as to the amount of blood needed* before operation, and during the operation. It is well known that, in the presence of dehydration, the hematocrit and hemoglobin determination may be normal, whereas the blood volume deficit may be as much as 1,500 to 2,000 c.c. If blood volume determinations are not available, a rough estimate as to the blood needs may be obtained by hydrating the patient, waiting for twenty-four to thirty-six hours, then doing another hemoglobin and hematocrit determination. However, as intimated previously, even in the presence of accurate hydration, there may be a very significant blood volume deficit in the presence of a normal hemoglobin and hematocrit.

Perhaps one of the most serious of the common errors made in determination of operability is the failure to realize that *bed rest is a very serious threat to operability*, primarily because bed rest is associated with a very severe negative nitrogen balance which obviously decreases operability. Accordingly, when elective operations are contemplated, one must be certain that the patient has not been confined to bed for the few days just preceding operation. Physicians and nurses are prone to ask the patient to stay in bed for the few days during examination preceding operation so that he will always be available.

Operability in the Aged Patient.

Obviously, physical reserve decreases as age progresses; however, aged people will tolerate operations remarkably well, providing no complicating diseases exist, and proper pre- and post-operative care is given.

Meticulous care must be utilized in determining operability in the aged and in correcting existing decrements because it is well known that elderly patients tolerate complications very poorly. Procrastination or delay in operation may be very serious in the aged largely because, as age increases, so also the danger of operation increases. Too often operation is denied patients who have lived to life expectancy on the basis that the patient is expected to die of old age very shortly thereafter. We must realize that if a patient reaches the age of life expectancy for that period, he should still live many more years. For example, if an individual reaches the age of 60, actuarial studies show that he should live to the age of 76; if a person lives to be 65 years of age he should live to the age of 78, and if he reaches 70 he should live to be 80 years of age. The fact that life expectancy has increased from 48 to over 68 in the past fifty years indicates that surgeons now must expect a large percentage of patients to be in the older age group. The figures given above are from data gathered in the United States, but they are similar to those existing in Great Britain.

Physiologic Differences between the Young and Aged.—We can appreciate better the differences of operability in the young and aged if we bear in mind the physiologic differences. With age, the elasticity of arteries and arterioles decreases; therefore, aged people are more susceptible to shock. This vascular impairment

likewise results in decreased renal function, and if present to an advanced degree will seriously decrease renal reserve. Lack of elasticity also explains why aged people do not tolerate heat and cold as well as young people, and likewise partially explains why hypoxia is tolerated so poorly. Cardiac reserve in aged people is lessened; accordingly even slight evidence of cardiac insufficiency should be sought for and corrected if possible before a major operation is performed. Lungs are emphysematous and therefore more susceptible to lung complications. Malnutrition is common in aged people because of bad teeth and lack of appetite.

Certain hormonal deficiencies exist in the aged. Of particular importance in men past the climacteric is the decreased formation of testosterone, because testosterone is such an effective agent in preserving nitrogen. It is possible that cortical adrenal function is impaired in the aged, although positive evidence of this is not available. Counterbalancing this deficiency in the sparing influence of testosterone on nitrogen is the fact that the body need for nitrogen is less acute in the aged. Although wounds heal about as well in the aged people as in young individuals, it is well known that the former are much more susceptible to infections. For example, Bosch and associates (1952) have noted that infections were the cause of death in 31.2 per cent. of aged patients following operation, and that 71 per cent. of all complications were caused by infections.

Preoperative Data particularly Important in the Aged.—Positive blood and urine examinations should be performed in all aged patients, as well as a complete physical examination; particularly important in the latter is the blood pressure and evidence of dependent edema which might be indicative of impaired cardiac function. All elderly people, particularly men, should have an NPN determination before a major operation is performed. If there is any doubt about the presence of prostatic hypertrophy, the bladder should be catheterized for residual urine. If a serious operation is being contemplated it is desirable to do liver function tests if there is the slightest evidence of hepatic disease. The author has found the thymol, cephalin flocculation, and bromsulfalein tests very helpful in detecting liver impairment.

Differences between Mortality Rates in the Aged and Young.—In a recent study (Cole, 1953) of mortality rates following major operations at Illinois Research Hospital we noted that the rate was two and a half times as high in the aged as it was in young patients as indicated on the table below :—

TABLE I.

Summary of Mortality Rates following Major Operations in Aged and Young Patients.

	Number of Cases.	Number of Deaths.	% Mortality.
Under 60 - -	2,557 ...	53 ...	2.07
Over 60 - -	1,009 ...	56 ...	5.1
Total - -	3,656 ...	109 ...	2.95

Important in the data revealed in this study was the fact that there was no significant difference in the mortality in the two groups in the less serious major operations such as thyroidectomy, cholecystectomy, and radical mastectomy. However, in certain operations there was a marked difference. The mortality rate following the Miles operation for carcinoma of the rectum was 0 for patients under 60, but 8 per cent. in patients over 60; it was 12.2 per cent. in patients under 60 following pneumonectomy, but 27.7 per cent. in patients over 60. The difference was even more marked in radical neck dissection for carcinoma, in so far as the rate was 1.0 per cent. for patients under 60 and 11.5 per cent. in patients over 60. The mortality rate for gastrectomy was 3 per cent. in patients under 60, but only 1.6 per cent. in patients over 60. This, of course, can not be interpreted as meaning this particular operation is tolerated better in aged people, but is explainable on the basis of a relatively small series, i.e., one death in sixty patients in the older age group. However, the series is large enough to derive the conclusion that the less serious major operations are tolerated just as well in aged patients as in young patients, providing complicating diseases are eliminated, and post-operative complications are treated adequately. Gastrectomy appears to be a borderline operation, meaning that operations of greater magnitude than this are not tolerated as well by aged patients.

Use of ACTH and Cortisone in Surgery.

In our recent experience (Cole, Grove, and Montgomery, 1953) with ACTH and cortisone we have learned that these drugs may be used to great advantage in improving operability. However, they are powerful drugs and, like all powerful drugs, are dangerous; they must not be used indiscriminately.

Physiologic Effects of ACTH and Cortisone.—Before discussing the use of these drugs, it is appropriate that their physiologic effects be summarized. In general, the effects of the two drugs are quite similar. However, it must be realized that ACTH acts largely by stimulation of the production of cortisone; when the latter is given for a period longer than five to ten days definite atrophy of the adrenals takes place.

Following administration of these drugs there is a retention of sodium, chloride and water, but an increased excretion of potassium, nitrogen, phosphorus and calcium, primarily in the urine. Eosinopenia is produced almost universally. There is a fall in the alkaline serum phosphatase with a concomitant osteoporosis. There is an anti-insulin effect. Protein formation may be impaired. There is an increased urinary excretion of eleven oxysteroids and seventeen ketosteroids. Originally, it was thought that these drugs, particularly cortisone, caused a delay in wound healing; however, it appears rather definite now that this takes place only after massive doses or after prolonged administration.

Surgical Conditions improved following ACTH and Cortisone Therapy.—In the author's opinion the beneficial effects of these drugs in the treatment of certain states of *malnutrition* are more important than the effect in any other surgical condition. Although the drugs produce an increase in nitrogen excretion, they exert such a powerful influence in improvement of appetite and a sense of well-

being that the disadvantages are more than neutralized; it is possible that the primary benefit is obtained in patients whose appetite is so completely impaired that the patient cannot even be forced to eat enough to correct an existing malnutrition. The production of a desire to be up and moving about is no doubt also extremely beneficial to the patients' physical reserve. These points are well revealed in Figures 3 and 4, illustrating a patient with a carcinoma of the rectum

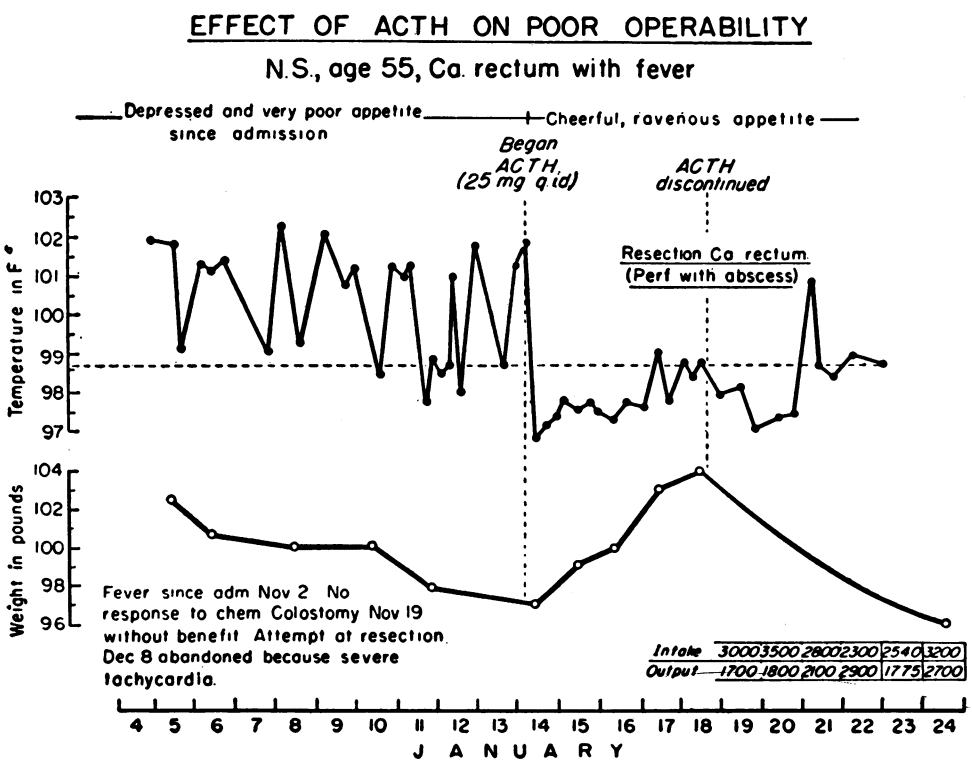

Fig. 3.—This patient had a carcinoma of the rectum but was suffering from severe malnutrition incident to fever (abscess created by perforation of the tumor), and loss of appetite of many days' duration. Penicillin exerted no influence on the fever. Colostomy was performed without benefit. Attempt was made (December 8) to resect the tumor, but patient developed such a severe tachycardia that the operation was abandoned. Five days' therapy with ACTH produced a miraculous improvement which allowed resection with average reaction.

and another with carcinoma of the bronchus who were totally inoperable until a course of ACTH (for five days) had been given.

There will obviously be an indication for the use of these drugs in *adrenal insufficiency* or *inadequate pituitary adrenocortical reserve,* but these states cannot be recognized accurately. It is probable that in most patients with malnutrition these pathologic conditions exist.

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These drugs are very helpful in the treatment of certain hematopoietic diseases, in so far as they produce a rise in the platelet count in these diseases in which there is a deficiency. For example, either drug will increase the platelet count in thrombocytopenic purpura and stop hemorrhage. However, the effect is not permanent, and likewise it becomes less marked with each successive course of treatment. Therefore the drugs have their most effective use in the preoperative treatment when operability is doubtful.

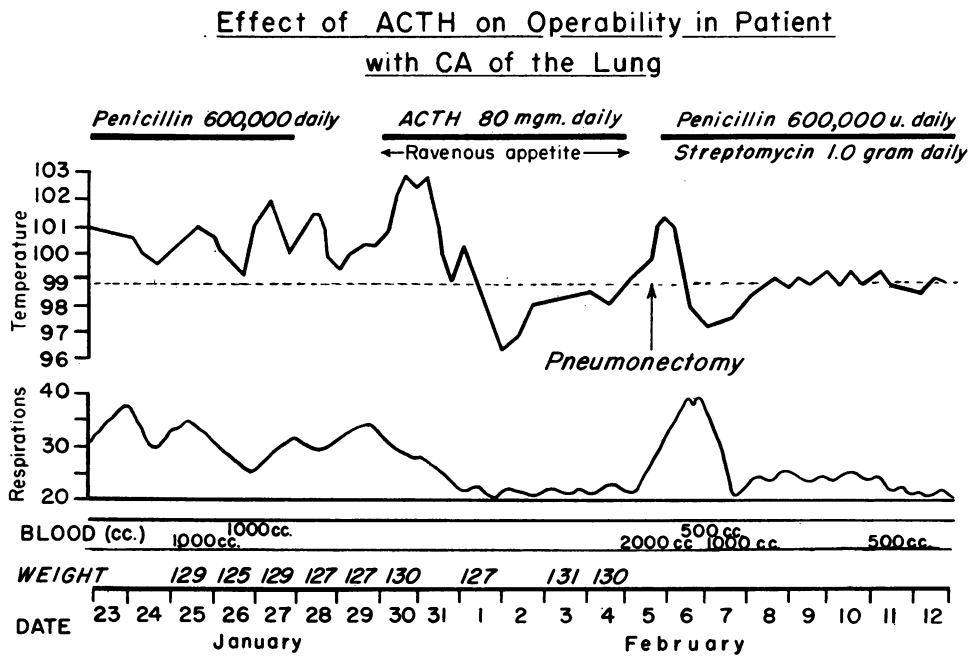

Fig. 4.—This patient had a carcinoma of the lung with a severe pneumonitis, as indicated by the fever and increased respiratory rate. Five days' therapy with ACTH produced a miraculous improvement, including restoration of the temperature and increased respiratory rate to normal. Pneumonectomy was then safely performed.

A temporary beneficial effect is noted in most patients with ulcerative colitis and regional enteritis, but is less marked in the latter. Here again the greatest use is preoperative, in improving the patient so that he will tolerate the operation. It is well known that these drugs are very beneficial in the treatment of traumatic and inflammation lesions of the eye in so far as they minimize scar formation. They are very effective in preventing allergic reactions.

They improve the morale and appetite in patients with burns, but probably exert no other beneficial effect in this condition. Their administration is remarkably effective in acute bursitis and acute non-suppurative tenosynovitis. The severity of thyroid crisis is much reduced following use of these drugs. Certain types of

febrile reactions with their unfavourable systematic reactions are completely obliterated as illustrated in Figures 3 and 4.

Contra-indications to the use of ACTH and Cortisone in Surgical Patients.— These drugs are dangerous in peptic ulcer, in so far as they increase the tendency toward perforation. They should not be used in tuberculosis or diabetes mellitus. Likewise they are contra-indicated in chronic nephritis and cardiovascular disease, pregnancy, acne vulgaris and Cushing's syndrome. Some of the deleterious physiologic effects such as retention of sodium, chloride and water, as well as the increased excretion of nitrogen, potassium, phosphorus and calcium have already been mentioned.

Factors Important in Improving Operability.

Operative technic in some of the standard operations has improved very little indeed during the past two or three decades. However, in this same period the operative mortality rate has been reduced to one-third or one-half the figure at the beginning of this period. The explanation is obviously due to an improved knowledge of surgical physiology (with better pre- and post-operative care) and the use of antibiotics. Without doubt the latter factor is much less important than the former. In the author's opinion the greatest single factor in improvement of the mortality rate is more effective treatment of malnutrition. In this category we would include the proper correction of fluid and electrolyte deficiencies.

The most important feature in correction of malnutrition is the institution of some mechanism of increasing the caloric intake whether it be by the oral or intravenous route; if an adequate amount of food cannot be ingested orally, glucose and amino acids should be given intravenously. Time does not permit discussion as to how much nutritional benefit is derived from amino acids but the author is definitely of the opinion that they are assimilated providing the hydrolyzed product and not pure amino acids are given.

In the immediate pre-operative period laboratory tests which cause the patient to go without meals should be held to a minimum. Caloric intake should be increased, if possible, far above maintenance requirements, if malnutrition is present. The need for these precautions will be much more prominent in elderly patients than in young patients for reasons already discussed. Weight loss is such an important manifestation of malnutrition that no elective operation should be performed during this period of loss, particularly if the patient is underweight. Even in the presence of carcinomas, which constitutes urgency in operation, four to six days should be utilized to have the patient regain a few pounds before operation is performed. Even though the patient has lost twenty-five to thirty pounds, it will usually be necessary to regain only a fraction of this because the body itself will put the newly gained weight where it is most needed, namely, in the important organs.

On numerous occasions it will not be feasible or even possible to regain all the weight loss. In patients with carcinoma it is not justified to spend more than a few days in correction of weight loss; in the second place it would be impossible in most of these patients with cancer to have them regain all their weight loss.

However, it is essential that a few days be utilized in pre-operative therapy to correct any existing fluid and electrolytic deficiency and to produce a positive nitrogen balance for a few days.

Another common example of malnutrition is that seen in patients with stenosing duodenal ulcer. Obstruction in these patients may be partial or complete. When partial the patients' operability can be improved markedly by delaying operation for

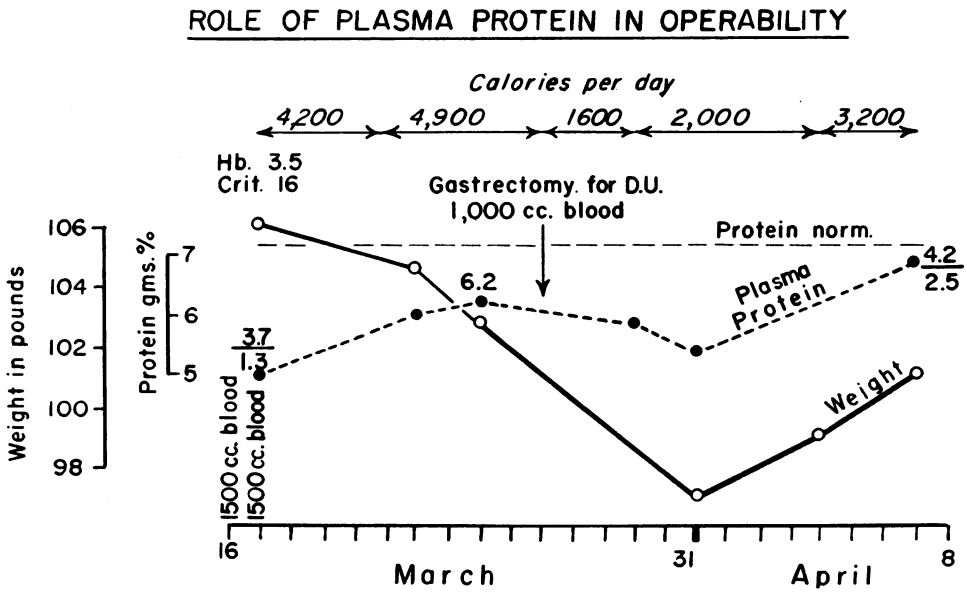

Fig. 5.—This patient had a stenosing ulcer of the duodenum with obstructive symptoms, but under strict dietary care for a few days was able to take an unusually large caloric intake (oral and intravenous). His plasma protein rose from 5.0 to 6.2 grams per cent. in slightly less than ten days. His weight actually dropped (in spite of the high caloric intake) because the low plasma protein had resulted in considerable edema not detectable clinically.

several days to allow the patient to take his maximum amount of food, perhaps no more than 1,200 to 1,800 calories by mouth, supplemented with intravenous therapy. In the absence of carcinoma we are justified in maintaining this therapy for several days, as illustrated in Figure 5. In this patient, who had a 35-pound weight loss associated with his stenosing duodenal ulcer, we improved his plasma protein from a total of 5.0 grams per cent. (albumin 3.7, globulin 1.3) to 6.2 grams per cent. In spite of a total caloric intake (oral and intravenous) of as much as 4,900 calories he lost weight during this preoperative period. This loss was obviously due to loss of edema fluid which resulted from the low protein. His operability was greatly improved by this delay utilized in correcting the malnutrition which was associated with severe hypoproteinemia.

On the other hand, if a complete duodenal obstruction is present, one can seldom give enough carbohydrate and protein intravenously to establish a positive nitrogen balance; on such occasions it is usually preferable to correct the dehydration and electrolytic imbalance, if present (utilizing as much glucose and amino acid solutions as possible), and proceed with operation. The time required for this correction is usually about forty-eight hours, and not much longer.

Blood deficits must be corrected as accurately as possible before, during and after operation. It is desirable to have an accurate estimation of the deficit by blood volume studies, but in their absence one must rely on hemoglobin and hematocrit determinations after dehydration has been corrected. Contrary to the opinion of many, it is very essential that blood transfusions be given in patients with cardiac disease. True enough, it is important that such patients not be over-transfused, but they likewise tolerate under-transfusions very poorly.

The judicious *use of ACTH and cortisone* in improving operability has already been discussed. We are convinced we have converted inoperability to operability in numerous instances, particularly in the aged patients. We use it for a short period (four to six days) and up to date have confined our therapy to ACTH because of the possibility cortisone might produce an atrophy of the adrenals. It is quite probable that the latter drug would be just as safe as ACTH if used only for a short time and therapy was continued post-operatively for a few days with a decreasing dose. In elderly males it is probable that testosterone is definitely beneficial in improving operability, although we have not observed the same dramatic improvement in the patient as is noted following ACTH and cortisone. Since testosterone spares nitrogen it is likely that it would be particularly valuable along with ACTH since the latter increases nitrogen excretion.

It is essential to *eliminate complicating diseases* as completely as possible, particularly in elderly patients who tolerate complications and complicating diseases very poorly. Likewise it is essential that *elective operations not be performed after a period of bed rest* which creates such a prominent negative nitrogen balance. It is much safer to delay operation two or three days until full ambulation is achieved.

Last, but not least, I wish to emphasize the necessity or desirability of correct operative technic. Likewise I wish to emphasize that the operation should be completed as rapidly as possible, providing safety is maintained. It is very true that, with improvements brought about with transfusions and other forms of proper therapy, we can prolong the operation greatly with reasonable assurance the patient will tolerate the procedure, but there can be no question that a prolonged operation increases morbidity and the mortality rate.

Summary.

It is well known that during the past two or three decades the post-operative mortality rate has decreased to one-third to one-half the figure at the beginning of this period. Operative technic in many of these operations has improved very little if at all during this period, yet the improvement has taken place, due

primarily to a better knowledge of surgical physiology, and the use of antibiotics. The latter is much less important than the former.

Malnutrition is one of the most important decrements in the sick patient, particularly those with gastro-intestinal disease. Anemia, dehydration and electrolytic deficiency are likewise important. Acute cardiac disease is a serious threat to survival following a major operation, but the patient with coronary thrombosis will tolerate a remarkably serious operation if four to six months have elapsed since the occlusion.

We have learned that elderly patients tolerate major operations very well, providing complications and complicating diseases are treated effectively. In our experience ACTH and cortisone have been very helpful in improving operability particularly in the aged patients with malnutrition.

Improvement in operability can be achieved by correction of malnutrition and administration of the proper amount of blood, meaning correction of the deficit pre-operatively, and replacement of that lost at the operation.

Good operative technic remains a very important item in the smooth recovery of the patient, and in maintaining a low mortality rate.

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The Sir Thomas and Lady Dixon Lecture

A generous donation has this year been given by Lady Edith Dixon, D.B.E., for the foundation of a lecture in memory of her late husband, Sir Thomas Dixon, Bart., H.M.L. The trusteeship of this lecture was invested in Mr. I. Fraser, and for perpetuity with the Chairman of the Staff of the Royal Victoria Hospital. The trustees felt that, since Lady Dixon had been associated with Sir Thomas in all his philanthropic work, that the lecture should be called "The Sir Thomas and Lady Edith Dixon Lecture," and that each year an illustrious member of the medical profession, either British or foreign, should be asked to give the lecture. In addition to the honorarium, the lecturer would receive a medallion. The subject matter was left entirely in the hands of the trustees.

Acute Intussusception:

Review of Two Hundred Cases

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This review is based on a study of the records of two hundred cases of acute intussusceptions admitted to the Royal Belfast Hospital for Sick Children during the ten-year period 1943-1952. The cases were consecutive and unselected, and occurred in 187 infants and children under 12 years of age. All cases of intussusception are normally admitted to the surgical ward, and all the cases reviewed were treated surgically, except for the only three children whose intussusceptions were unintentionally reduced by diagnostic barium enemas. During the review of some of the case histories, difficulties such as inadequate notes made during wartime were encountered. Only those findings that were actually recorded have been included in the statistics.

Age and Sex.

One-third of the cases were in girls, a finding that agrees with that of most other authors, although Morrison and Court (1948), in the north of England, found that 45 per cent. of their cases were girls. The ages ranged from three weeks to eleven years. Three-quarters of the patients were one year old or less, and 42 per cent. of the cases occurred in the first six months of life. The condition was commonest between four months and eight months, and 112 cases occurred in this age group.

Seasonal Incidence.

The difference between the number of cases occurring in the various months was not great, and did not appear to be significant. Only a very few children suffered from upper respiratory infections or gastro-enteritis at the time of the attack.

Duration of Symptoms.

Table I shows the relationship between duration of symptoms and mortality, and underlines the importance of early diagnosis and treatment.

TABLE I.

Duration of symptoms	Cases	Deaths	Per cent. fatal
0-24 hours	143	0	0
24-48 hours	28	8	28.6
Over 48 hours	19	7	41.2
Unknown	10	1	–
Total	200	16	8

Symptoms and Signs.

The classical signs and symptoms consist of colicky pain, vomiting, a palpable tumour, and the passage by the rectum of blood resembling red-currant jelly. Unfortunately, all four are not often present together in the first twenty-four hours, when it is important to make the diagnosis, and some may never appear.

In this series, vomiting was the most frequently recorded symptom, being present in 182 cases. Pain was recorded as being present in 162 cases. The findings of Morrison and Court (1948), Gibbs and Sutton (1943) are similar, but most authors mention pain as the presenting symptom, and the one most constantly present, although it may be absent in young infants.

The passage of blood and mucus per rectum, or blood on the examining finger was noted in 158 cases. These figures refer to the macroscopic blood, and in no negative cases were the fæces examined chemically for blood. The bowels opened normally in one-third of the cases after the onset of symptoms. In 132 of the patients (66 per cent.) a tumour was palpable per abdomen without an anæsthetic. However, there has never been any hesitation in giving an anæsthetic to palpate the abdomen in a doubtful case.

The apex of an intussusception was palpated per rectum in only ten cases, and in a further three cases the intussusception was presenting externally. Marked tenesmus and convulsions were each present in three cases.

About one-third of the infants in this series showed the "knees up" sign, and some of the children sat up or went into the knee-elbow position during spasms. The Signe de Dance gave negative or equivocal results and was not felt to be of much value.

Most of the patients were operated on in about one hour's time after admission, before their temperatures had stabilised. Consequently no detailed figures for pre-operative temperatures are given, although the temperatures and white cell counts were often raised.

Pre- and Post-operative Treatment.

In the whole series, only 13 per cent. of the patients received parenteral fluid therapy, though a few more had rectal saline. However, in the last year covered by this review, about one-third of the cases have had intravenous or subcutaneous fluid.

There is no doubt that careful pre-operative and post-operative care, carried out in conjunction with the anæsthetist and pædiatrician, is most important. Dehydration should be largely corrected before the child goes to the theatre. Most of the seriously ill children, and all those who have had resections, will require blood, 10 ccs. per lb. body weight, during and after the operation. Basal fluid requirements can be administered parenterally, 70 ccs. per lb. body weight, about 200 ccs. of the total being Ringer-lactate solution, and the remainder 5 per cent. dextrose in water (Hamman, 1952).

A fine stomach tube is normally passed in any case of intestinal obstruction prior to going to the theatre. Antibiotics were only given in cases where there was some infection present before operation, or when infection developed in the post-operative period.

Operation.

The abdomen was usually opened through a lower right paramedian incision, but in a few cases a gridiron, an oblique muscle-cutting or a midline incision was used. The operation notes in one-quarter of all the cases state that free fluid and enlarged mesenteric glands were present. However, the surgeons, under whose care these young patients have been, are agreed that enlarged glands are present in almost every case, no matter how early. Table II shows the number of cases in each of the different types of intussusception and the associated mortality. The ileo-colic group includes those cases described as ileo-cæcal; ileo-ileo-colic types are included in the compound group. In the ileo-ileal group there was one example of a multiple intussusception with five separate invaginations. In eleven cases the type was not stated or could not be deduced from the description given of the reduction or of the resected specimen.

TABLE II.

	Cases		Deaths	
Type	Number	Per cent.	Number	Per cent.
Ileo-colic	148	74	11	7.4
Ileo-ileal	18	9	3	16.7
Colo-colic	14	7	0	0
Compound	9	4½	0	0
Unclassified	11	5.5	2	–

The operative procedure consisted of simple reduction in 183 cases. Two infants died on the table before reduction could be attempted. The intussusception was found to be irreducible in twelve cases (6 per cent.) In one of these cases an ileo-transverse colostomy alone was performed but the child died. Resections were carried out in eleven cases. Nine of these children had end-to-end anastomoses, with three survivals; in two cases occurring early on in the series a Mickulicz type of resection was performed, but both children died. In this series of two hundred cases, three ileostomies were performed and all the patients survived. The appendix was removed in one-sixth of the cases (usually when the child was in good condition), and its removal did not appear to affect the mortality adversely.

Possible ætiological agents were found at operation on eleven occasions. They consisted of four Meckel's diverticula, two polyps, one enterogenous cyst, one adherent tuberculous gland, a gross malrotation of the gut, a fibroma and one lymphosarcoma of the ileum (this child subsequently died from his sarcoma, but his death is not included in the mortality figures for intussusception).

Post-operative Temperature and Complications.

The average maximum temperature after operation was 101.7° F.; this usually fell to normal in 48-72 hours. The average number of days in hospital for the entire series was eight.

One child (a recurrence) suffered a complete breakdown of his wound on the seventh day; he recovered. In two cases there was a partial breakdown of the wound, and another child subsequently developed an incisional hernia. In only four cases was post-operative diarrhœa troublesome.

Mortality.

There were sixteen deaths from intussusception in this series of two hundred cases, giving a mortality of 8 per cent. In the last one hundred cases there were six deaths. Of the fatal cases, five patients had been ill for forty-eight hours, and seven had had symptoms for over forty-eight hours. Resections were necessary in eight out of the sixteen cases. No child was denied the benefits of surgery even if it appeared moribund.

Recurrences.

Twelve children suffered from recurrences, the interval between attacks varying from five days to nineteen months, the average interval being six months. A one-year-old girl had three separate intussusceptions within a period of three weeks.

Discussion.

Morrison and Court (1948) have given an excellent account of the symptomatology of acute intussusception and its early diagnosis. As in the present series, they found that vomiting was present in almost 90 per cent. of cases, while pain, the more dramatic symptom, was present in 81 per cent. As almost three-quarters of the cases occur in infants aged one year or less, the presence of colicky pain must be deduced from the infant's crying, screaming or restlessness, and there are many causes of these symptoms besides intussusception. From a study of the case histories in this series, it would appear that a correct diagnosis is most likely to be missed when vomiting is the first symptom, especially if some diarrhœa is present, when a diagnosis of gastro-enteritis will suggest itself. According to Spence and Court (1950), a general practitioner (in N.E. England) will, on the average, see only six or seven intussusceptions in a professional lifetime, and when it is remembered that a third of all cases will have a normal motion after the onset of symptoms, it is easy to see how a diagnosis of intussusception may be missed. The passage of blood per rectum will, of course, result in the child being admitted to hospital, but in some cases it is a late symptom, and Morrison and Court (1948) found it was entirely absent in one-quarter of their patients. The passage of blood per rectum is commoner in infants than in older children and is more likely to be absent or delayed in the dangerous ileo-ileal type of intussusception. Early diagnosis is most important if fatalities are to be avoided, but all the three main symptoms of pain, vomiting and the passage of blood are present in the first twenty-four hours in only 40 per cent. of cases (Elliot-Smith and Ward-McQuaid, 1953).

In all cases a good history obtained from the mother or guardian is most important, and Morrison and Court send for the mother if she has not accompanied the child to hospital. A good history suggests the diagnosis in the majority of cases, and to avoid errors it is best to be "intussusception minded," and to perform an examination under an anæsthetic or by a barium enema if in any doubt.

In this series, a tumour was felt in two-thirds of the patients. Other observers have been able to feel it in a rather higher percentage of cases, and Lett (1909) reported finding a tumour in every one of twenty-four cases. Gross and Ware (1948) state that if a tumour cannot be definitely felt there may be a feeling of

fulness or resistance in the upper abdomen, and they stress the value of bimanual palpation. The costal margin, distension or muscle guarding may hide the tumour.

As mentioned previously, enlarged mesenteric glands are found in most cases. Clubbe (1921), Dennison (1948) and Elliot-Smith and Ward-McQuaid (1953) made a similar observation, but no author appears to have advanced an adequate reason for this enlargement. It can occur in cases of only a few hours' duration, before there is any evidence of strangulation or acute obstruction. Bassett states that the glands are sterile on culture, and the pathologist usually reports that they are normal or show lymphoid hyperplasia or mild inflammatory changes (which could be chemical or bacterial in origin). Perrin and Lindsay (1921) mention the possibility that enlarged glands may obstruct the lymphatic return from the bowel and increase (or cause) enlargement of the lymphoid patches in the gut wall which may then form the starting-point of an intussusception. The large amounts of lymphoid tissue in the terminal ileum during the first year of life, and the numerous glands normally present in the ileo-cæcal region, would account for the age and regional distributions of intussusceptions.

In Britain and North America most cases of intussusception are treated by operation as soon as the child has been adequately prepared, while in Australia and Scandinavia reduction by enema is favoured in many centres. Three patients in the present series had their intussusceptions reduced by barium enemas, but the reductions occurred unintentionally during diagnostic examinations. All the other cases were operated upon. Simple reduction within the abdomen is the treatment of choice, and it is usually easy to milk the intussusception back to the ileo-cæcal region, but there may be some difficulty in the final reduction there. A few minutes' compression of the mass in a warm, moist swab may lessen the œdema and render reduction possible, but in 5 to 10 per cent. of cases the intussusception is irreducible. Some cases of many days' duration are still reducible; others are irreducible after twenty-four hours (Ravitch, 1949). With a mobile right colon strangulation may be delayed, while it is likely to occur earlier in ileo-ileal intussusceptions. But sometimes a strangulated and gangrenous intussusception is still reducible, and this fact, along with the uncertainty about the state of any ileal component in the invagination, are the main disadvantages of therapeutic enema reductions. The blood supply of the ensheathing layers may be impaired, and this may not be obvious at the time of laparotomy (Jones, 1953).

There are three different ways of dealing with the problem of the irreducible intussusception—by resection and end-to-end anastomosis, by a Mickulicz type of resection, and by a short-circuiting operation. The relative values of these different procedures has recently been discussed by Hamman (1952) and Elliot-Smith and Ward-McQuaid (1953). Resection and end-to-end anastomosis is the ideal treatment, but has not given good results except in the hands of those especially skilled in intestinal surgery. Dennis (1947) reported nine cases treated in this way, with no deaths. He used a one-layer anastomosis with interrupted Halsted sutures, although, when the lumen of the bowel was small, a catgut basting stitch was inserted first, and withdrawn before tying the Halsted sutures. Gross and Ware (1948) favour the use of a Mickulicz type of resection, and with it have had a

mortality of only 9 per cent. during the last few years. The great advantages of this method are, first, that there is no chance of peritoneal soiling, the resection and possible decompression of the proximal limb being carried out after the incision is closed and sealed, and, second, that only a relatively short anæsthetic is required. As well as in irreducible cases, or when the bowel is perforated, Gross and Ware also use this procedure in very ill babies in whom attempted reduction may cause fatal toxæmia. Gibbs and Sutton (1943) state: "The Mickulicz procedure can be more rapidly executed and its use, when the patients' condition is critical, may mean the difference between a live child with an enterostomy and a dead one with an anastomosis." They point out that infants tolerate the loss of succus entericus very badly, but Gross and Ware begin crushing the spur in a few days and close the enterostomy on the sixth or seventh day.

Recently, Jones (1953) has described a modification of the Mickulicz type of resection. He reopens the abdomen in forty-eight hours and a side-to-side anastomosis is performed. Jones reports only one death in a series of nine cases treated by this method in 1951-52, and no deaths in eighty-two cases of intussusception treated by operative reduction during this period. Some form of Mickulicz resection would appear to be the best type of operation for use by those without a considerable experience in performing intestinal anastomoses.

White and Dennison (1952) have recorded their results with ileo-colostomy in cases of irreducible intussusception. When the sheath was viable, the unreduced mass was returned to the abdomen after performing the anastomosis; if the viability was doubtful, an anastomosis was rapidly carried out and the mass exteriorized. They had only four deaths in sixteen cases so treated. Elliot-Smith and Ward-McQuaid (1953) also recommend the short circuit operation.

The possible disadvantages of this method are that there may be some peritoneal contamination around the anastomosis, and that the abdomen must remain open for rather longer than with the Mickulicz resection. In all these gravely ill children gastric aspiration and intravenous fluids are essential, and nursing in an oxygen tent is most valuable.

All authors are agreed that prolonged attempts at reduction will greatly increase the mortality should resection eventually be necessary. White and Dennison have suggested that the anæsthetist should call out when five minutes (or some such predetermined interval) have elapsed since the abdomen was opened, and this idea seems worthy of general adoption.

The recurrence rate in intussusception is usually stated to be 1-2 per cent., but in this series 6 per cent. suffered recurrences, one child having three separate intussusceptions. Hipsley (quoted by Clubbe, 1921) had a child with four intussusceptions over a twenty-month period, and Fraser (1939) reported a similar case in a girl of $2\frac{1}{4}$ years. Wansbrough and Cram (1952) also mentioned a case which had three recurrences, and a further case in which the intussusception recurred on four occasions. Although a recurrence usually takes place some months after the first attack, Macfarlane and Thomas (1954) have pointed out that it may occur within a few days and may affect a different part of the bowel. Our own experience has been similar. Recurrent cases may require an ileo-cæcal resection (Gross,

1953), but in general Ladd and Gross (1941) advise against the use of preventive procedures because (a) they increase the primary mortality, (b) recurrence is rare, (c) the mortality in second intussusceptions is low because the parents will quickly recognise the symptoms, and (d) the procedures described do not prevent recurrence. Indeed, in a series of seventy cases of intussusception quoted by Aird (1949) there was only one recurrence, and that was in the only child in the series in whom a procedure to prevent this had been carried out.

Summary.

1. The symptoms, signs and treatment in two hundred cases of intussusception are reviewed.
2. There were sixteen deaths in the entire series. In the last one hundred cases the mortality was 6 per cent.
3. The importance of making an early diagnosis is emphasized, and it is pointed out that some of the classical signs and symptoms may be absent.
4. The advantages of the Mickulicz type of resection in irreducible intussusception are described.
5. A recurrence rate of 6 per cent. is reported.

I wish to thank Professor H. W. Rodgers and the surgeons of the Royal Belfast Hospital for Sick Children for allowing me to make use of their case histories, and for permission to publish the results. My thanks are especially due to Mr. Ian Fraser for much help and encouragement in the preparation of this review.

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Accidental Poisoning of Children in Belfast:

A Report of two years' experience at the Royal Belfast Hospital for Sick Children

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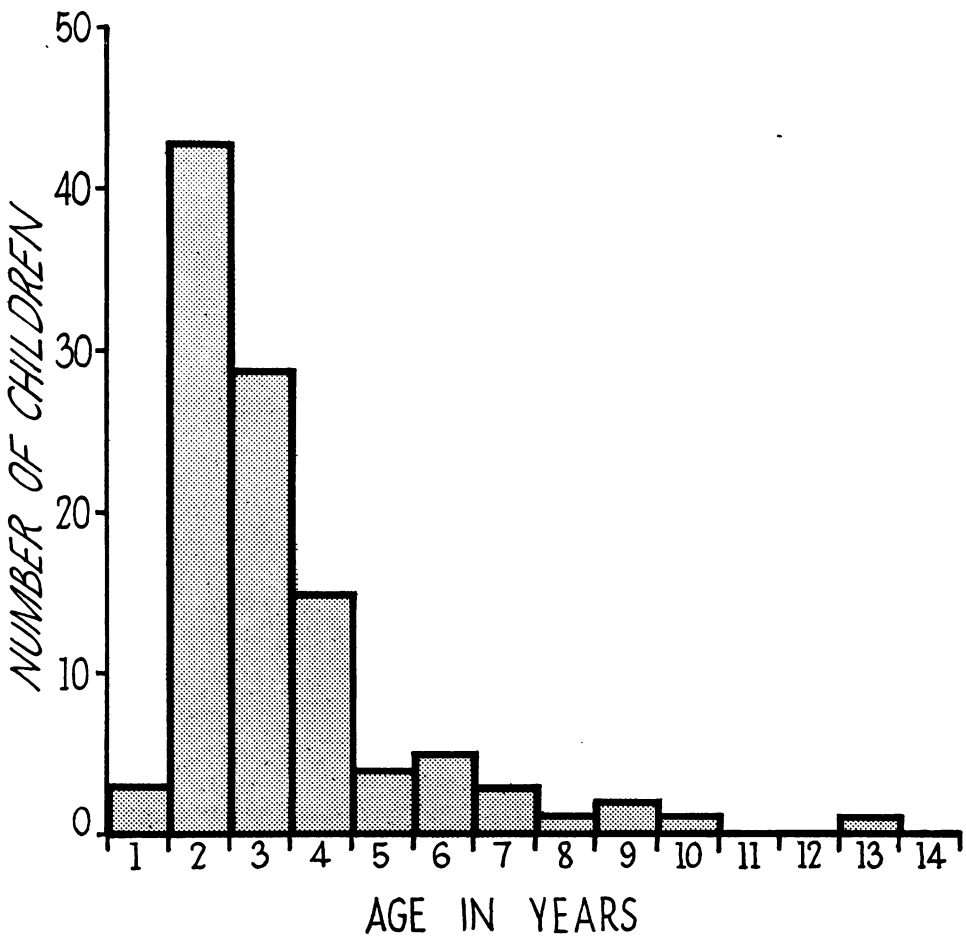
ACCIDENTAL poisoning by ingestion of toxic substances, especially medicaments, is a notable but preventable cause of death in young children. Swinscow (1953) reported that the average annual death rate per million of population was 8.7 for



children between 1 and 4 years of age for the decade 1940 to 1949. Craig and Fraser (1953) have drawn attention to the increased incidence of accidental poisoning in children since 1948 in Aberdeen and Edinburgh, and they have shown the rise to be mainly due to poisoning with medicaments.

The problem has been investigated in Belfast for the years 1952 and 1953 by recording all children who presented for treatment of accidental poisoning at the casualty department of the Royal Belfast Hospital for Sick Children. Those suffering from food poisoning or poisoning by inhalation of noxious gases such as carbon monoxide have not been included. This report probably includes the majority of children who suffered from accidental poisoning during these two years in Belfast, which has a child population under 13 years of age of 102,500.

In 1952, 74 children attended for treatment, of whom 27 were admitted and one died. In 1953, 107 children were treated and 36 were admitted; there were no deaths. The age distribution of these children (see figure) shows that the toddler between the age of 1 and 3 years is most liable to accidental poisoning. There is a significant disparity between the sexes, no doubt due to the more exploratory and adventurous nature of boys even at this age, as 113 boys and only 68 girls were treated.

Accidental poisoning can be arbitrarily classified into five main groups, as in Table I, which shows the number of children comprising this series.

TABLE I.

Number of children suffering from accidental poisoning in 1952 and 1953.

Type of poison	Treated	Admitted	Percentage of total
1. Medicaments	85	34	48
2. Disinfectants and antiseptics	23	5	13
3. Household poisons	67	19	35
4. Vegetable poisons	5	4	3
5. Unknown	1	1	1
TOTAL	181	63	

POISONING BY MEDICAMENTS.

This forms the largest group of accidental poisoning for which children are either treated at or admitted to hospital in Belfast. The common drugs to cause poisoning change with current medical fashion and practice which popularise their usage. In the decade 1931-1940 liniments such as oil of wintergreen and camphorated oil were a frequent cause of death from accidental poisoning in childhood (Swinscow, 1953). Since 1948 the incidence of fatal cases of ferrous sulphate poisoning has risen, and was the largest single cause of accidental poisoning reported by Holzel and James (1951) in Manchester.

TABLE II.

Individual medicaments causing accidental poisoning and the number of children involved.

Medicament causing accidental poisoning		Number treated
Acetyl salicyclic acid		12
Ferrous sulphate		8
Phenobarbitone		8
Laxative mixtures or pills[1]		6
Camphorated oil		4
Amylobarbitone (Sodium Amytal), digitalis, morphine, amphetamine, ephedrine, hyoscine	*three of each*	18
"Antihistamines," codeine, arsenic, mercury	*two of each*	8
A.B.C. Liniment,[2] Mist. potassium bromide and chloral, calamine, chloramphenicol, sulphonamide, trichloracetic acid, Mandl's paint,[3] penicillin, "Tyrozet lozenges,"[4] "vitamin pills," "Pernivit tablets"[5]	*one of each*	11
Unknown tablets		10
Total		85

[1]Often contains strychnine.
[2]Contains aconite, belladonna and chloroform.
[3]Contains iodine, potassium iodine and alcohol.
[4]Contains tyrothricin and benzocaine.
[5]Contains nicotinic acid and acetomenaphthone.

In this series, 85 children (48 per cent.) were treated for accidental poisoning by medicaments, as shown in Table II. Four children swallowed camphorated oil in mistake for cough medicine; the symptoms of vomiting and coughing were followed by mental confusion and subsequently by shock, with signs of bronchitis. A two-year-old boy who swallowed three ounces of liniment A.B.C. (containing aconite, belladonna and chloroform) vomited and became restless and later delirious. His pupils were dilated and fixed, his skin hot and dry, his pulse and temperature were raised. After an initial stomach washout, first quinalbarbitone (Seconal), gr. $\frac{3}{4}$, and later paraldehyde, 2 ml., intramuscularly were needed to control the intense restlessness.

The popular and valuable use of ferrous sulphate tablets in the treatment of anæmia and as a part of ante-natal care has resulted in an increased number of reports of ferrous sulphate poisoning since that of Forbes (1947). Subsequent complications such as pyloric stenosis and stricture of the stomach have been recorded by Ross (1953) after such poisoning. In this series there were eight children with poisoning by ferrous sulphate and five were sufficiently ill to require admission, but there were no deaths. Treatment as outlined by Spencer (1951) was undertaken, i.e., the stomach was washed out with sodium bicarbonate, leaving 5-10 oz. within, and bismuth carbonate, 3 gr. four-hourly, was given by mouth. Multiple vitamin mixtures, intramuscularly or orally, were given, and precautions taken against inhalation of vomit. None of the children required intravenous therapy to combat shock.

Anodynes and soporifics form the largest group of poisoning with medicaments because of their availability in the home. Ingestion of acetyl salicyclic acid necessitated the treatment of twelve children and the admission of three; of eight children who swallowed phenobarbitone tablets, five were admitted for treatment. Three children also suffered from poisoning by amylobarbitone (Sodium Amytal) and one from ingestion of a mixture of potassium bromide and chloral. None of these cases was severe enough to need stimulants such as picrotoxin, nikethamide or amphetamine, and after an unusually sound sleep they were subsequently discharged.

Two children suffered from poisoning with codeine and three with morphine; none, however, were severe enough to warrant the use of nalorphine hydrobromide (Lethidrone), which is an effective antagonist to drugs with a morphine-like action.

Poisoning by digitalis or by digoxin occurred in three children, one of whom died.

Report of a Fatal Case of Poisoning by Digoxin.

William C., aged 1 year, was said to have swallowed four of his grandfather's "heart" tablets, later found to contain digoxin, 0.25 mgm. per tablet. The child was admitted to hospital four hours later with slight bradycardia, and twenty hours after ingestion this became more marked and coupled beats were noted. An electrocardiograph showed a pulse rate of thirty-four beats per minute with ST depression in Leads 1 and 2, a flat P wave and prolonged PR interval. A 2-1 heart block was present. Four hours later the child suddenly collapsed and died.

Two children required treatment after the ingestion of one of the antihistamine group of drugs, diphenhydramine hydrochloride (Benadryl), and mepyramine maleate (Anthisan). The symptoms of drowsiness, with a catarrhal nasal discharge and muscular twitching followed by convulsions, are danger signs and preceded death in the case reported by Miller and Pedley (1950). A fatal dose of only two or three tablets, each containing 0.1 G of mepyramine maleate, has been recorded (Medico-legal note, 1951).

Poisoning by Disinfectants and Antiseptics.

Awareness of the dangerous properties of most disinfectants and antiseptics, particularly those with warning labels, has resulted in the cautious use and careful disposal of them. This is reflected in this series by the relatively small number of accidents involving this group of poisons. Also the taste and smell is usually unpleasant, so the child seldom ingests much of the substance, which is quickly expelled.

Of the twenty-three children (13 per cent.) attending for treatment for this type of poisoning, only five required admission, the usual symptoms being mild excoriations of the face, mouth or lips. The preparations involved were:—Iodine (five cases), Jeyes' Fluid[1] (two), carbolic acid, Condy's Fluid,[2] Dettol,[3] Lysol,[4] and Cetavlon[5] (one) and unknown or unstated disinfectant (eleven).

[1]Contains mainly cresols and phenols.

[2]Contains a mixture of sulphate and permanganate of soda.

[3]Contains chloroxylenol and terpinol.

[4]Contains cresols.

[5]Contains a mixture of alkyl ammonium bromide.

Household Poisons.

These are unfortunately a common source of accidental poisoning due to their accessibility and to ignorance of their dangerous constituents. In this series sixty-eight children (35 per cent.) required treatment after ingestion of a household poison, as shown in Table III.

TABLE III.

Household substances causing accidental poisoning and the number of children involved.

Household poison		Number treated
Bleaching fluid		20
Paraffin oil (kerosene)		12
Turpentine		10
D.D.T.		4
"Shampoo," ammonia	*three of each*	6
Petrol, "perfume," carbon tetrachloride	*two of each*	6
"Rat poison," lead, "carpet cleaner," "shoe cleaner," "nail polish remover," "paint thinner," "Flit," methylated spirits, "phosphorus matches"	*one of each*	9
Total		67

In the decade 1940-1949 the commonest fatal poisons of this group were phosphorus and caustic soda and potash. In this Belfast series the most frequent poison was household bleach : twenty children were affected and four were admitted to hospital. Fortunately the liquid is usually vomited immediately and the quantity ingested is seldom sufficient to cause acute symptoms other than local excoriation of the face and mouth.

In Belfast street hawkers often sell bleaching fluid in bottles which formerly contained orangeade or lemonade and without any warning label. In some cases the original label has not been removed, and children finding such bottles frequently swallow the bleaching fluid in mistake for fruit cordial.

Paraffin oil or kerosene poisoning occurred in twelve children, six of whom were admitted to hospital. It gives rise to vomiting, fever and lethargy, and is reported to be a common accident among coloured children. Convulsions may develop and pneumonia is a frequent complication. This pneumonia may be the result of inhalation during swallowing or subsequent vomiting of the paraffin oil. According to the experimental studies of Deichmann, Kitzmiller, Witherup and Johannsman (1944), it is the result of absorption of paraffin oil from the gastro-intestinal tract which is excreted through the lungs. Emetics should therefore be avoided to prevent inhalation during vomiting, and if large or unknown quantities of paraffin oil have been ingested then careful stomach washout should be undertaken. Olstad and Lord (1952) consider that gastric lavage reduces the incidence of pneumonia and that an antibiotic agent or chemotherapy should be given prophylactically.

Turpentine poisoning gives a similar clinical picture with symptoms of vomiting and choking, which may be followed by drowsiness or convulsions. Later cough and fever are accompanied by signs of bronchitis or of pneumonia.

Immediate gastric lavage is essential, as Harbeson (1936) reported the death of a child of 11 months after ingestion of only two teaspoonfuls of turpentine. Ten children were treated for this condition, and five of them were admitted to hospital, all developed respiratory signs or had radiological evidence of consolidation. A short course of sulphonamide or penicillin was given and secondary pulmonary infection was successfully prevented.

Vegetable Poisons.

The best recognised and commonest fatal vegetable poisons are deadly nightshade and woody nightshade, but no such cases occurred in this series. Two children were treated for ingestion of laburnum seeds, one for elderberries, and two for "red berries" which were unidentified. Owing to the prevalence of laburnum in local gardens and parks this form of poisoning is not uncommon. All parts of the plant are poisonous, but it is the seeds, which are mistaken for peas, that are usually eaten. As few as two or three will produce symptoms of vomiting, drowsiness, inco-ordination and convulsions, due, according to Mitchell (1951), to the active principle cystisine, an alkaloid similar in action to nicotine. Treatment consisted of gastric lavage, and stimulants such as nikethamide were not required.

The Problem of Accidental Poisoning, Its Prevention and Management.

Accidental poisoning accounts for about one out of every hundred children treated at the Casualty Department or admitted to the Royal Belfast Hospital for Sick Children. It is therefore of considerable clinical and social importance, and the need to counter this danger to young children, with its attendant suffering and parental distress, is obvious.

The problem must be tackled firstly by taking the following precautions, which may prevent such accidents, and secondly, by recognising that immediate treatment may be life-saving.

Protection in the Home.—Since it is the toddler who is mainly at risk, protection in the home is the most essential form of prevention, and it is a parental duty to ensure that the common household poisons and disinfectants are kept in cupboards or on shelves which are beyond the reach of inquisitive youngsters. Likewise, all drugs should be kept in an inaccessible or locked cupboard to prevent the toddler being attracted by the bright colour, unusual shape or sugar coating of tablets and capsules.

Education of the Parents.—The parents may be ignorant of the poisonous content of many common household commodities and drugs. Such education could be achieved through the Press, radio and television services, while warning placards and statistics should be posted in hospitals, antenatal and infant welfare clinics, chemists' shops and doctors' waiting-rooms. In a recent Safety Week Campaign against Accidents, organised by the Junior Chamber of Commerce in Belfast, there was an excellent example of how publicity can be used to illustrate that accidents can be avoided. One lorry tableau illustrated the need to keep poisons under lock and key safely out of reach of children.

Verbal reminders and written warning should be given when drugs of particular danger are prescribed. The medical profession must acknowledge its share of responsibility for the recent increase in accidental poisoning which is partly the result of liberal prescribing under the National Health Service, especially of the more attractive and palatable proprietary preparations.

Availibility of Poisons.—Accessibility of tablets can be greatly reduced if they are packed in screw-capped containers or if dispensed in individual plastic or cellophane wrappings. The manufacture of tablets and pills with sugar coating which disguises the unpleasant or bitter taste of the contents should be discouraged, as such tablets may be eaten as sweets. Certain manufacturers add a bitter flavour to dangerous capsules or tablets and enclose an appropriate warning.

Manufacturers and vendors of household fuels, cleaning liquids and specially bleaching fluids should be encouraged or forced by legislation to label poisonous products with a warning of the danger to children. Old lemonade or orangeade bottles, open vessels, and glass jars should not be used to store kerosene, turpentine, bleaching fluid and similar substances.

Management of Accidental Poisoning.

Immediate treatment of accidental poisoning by the family doctor may save life. As soon as possible the poison should be removed by the usual household emetics; failing this, apomorphine gr. 1/24-1/60 may be given to a child, but must not be repeated if unsuccessful. Gastric lavage may need to be undertaken as well, if necessary in hospital, except in cases of corrosive poisoning. Conversion of the poison into less toxic forms may be achieved with substances such as dimercaprol (B.A.L.) for arsenic poisoning, lethidrone for morphine, etc. Elimination of toxic substances can be hastened by the administration of ample fluids and glucose. A poison kit as suggested by Glaister (1953), containing a small and large stomach tube, filter funnel, lubricating jelly and the more common antidotes, may be life-saving in such an emergency, and may well be carried by the family doctor.

From the casualty officer's viewpoint there are two main problems. First, the parents are often ignorant of the actual substance or drug which has been taken or they cannot identify the tablet or capsule. In this series, Table II shows that in ten children the medicament in tablet form was not known. At Professor Allen's direction a display cabinet, containing the more common capsules and tablets which cause accidental poisoning, is available in the Royal Belfast Hospital for Sick Children to aid the casualty officer and the parents to identify the poisonous substance. Secondly, the parents seldom know the amount of fluid or number of tablets which the child has ingested. In most cases an initial stomach washout is essential, and it is often a wise precaution when the poison is not identified to admit the child subsequently for a short period of observation—especially is these days of increasing litigation.

However, since many poisons have no effective antidote, as illustrated by the fatal case of poisoning with digoxin, the emphasis must be placed on prevention of accidental poisoning rather than its treatment.

SUMMARY.

In 1952 and 1953, 181 children were treated at the Royal Belfast Hospital for Sick Children for accidental poisoning, of whom 63 were admitted and one died.

One-half of cases was due to medicaments, one-third to household poisons, and the remainder to disinfectants, antiseptics and vegetable poisons.

Measures to prevent accidental poisoning by protection of children in the home, education of the parents, means of reducing the availability of drugs and the danger of household poisons are discussed.

The need for immediate treatment is stressed.

I wish to thank the members of the resident medical and nursing staff who helped in the treatment of these children.

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REVIEW

SPINAL EPIDURAL ANALGESIA. By P. R. Bromage, M.B., B.S.(Lond.), F.F.A.R.C.S., D.A. (Pp. vii + 123; illustrations 41. 15s.) London and Edinburgh: E. & S. Livingstone, 1954.

THIS book presents in clear, concise language a summary of the literature on epidural analgesia and an honest account of the author's experience of one thousand personal administrations.

If this book had been published before the advent of the muscle relaxants it would certainly have been a best seller, but the ease with which an intravenous injection of relaxant can be given will tend to push the more difficult epidural injection into the background. The author prefers to give soluble thiopentone, nitrous oxide and oxygen before performing the epidural injection.

The only printing error I could find is in the second example of dosage calculation (page 82), where the minus signs should be plus signs.

One might critcise testing for subarachnoid block by asking the patient to move his legs when using 1/600 Nupercaine, which, as the author points out (page 19), does not affect the heavily myelinated motor fibres. The pitfalls and complications of the technique are courageously discussed.

The work is thoroughly documented and there are numerous references at the end of each chapter. It can be thoroughly recommended to anyone wishing to study the technique afresh. W. M. B.

SUMMARY.

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I wish to thank the members of the resident medical and nursing staff who helped in the treatment of these children.

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REVIEW

SPINAL EPIDURAL ANALGESIA. By P. R. Bromage, M.B., B.S.(Lond.), F.F.A.R.C.S., D.A. (Pp. vii + 123; illustrations 41. 15s.) London and Edinburgh: E. & S. Livingstone, 1954.

THIS book presents in clear, concise language a summary of the literature on epidural analgesia and an honest account of the author's experience of one thousand personal administrations.

If this book had been published before the advent of the muscle relaxants it would certainly have been a best seller, but the ease with which an intravenous injection of relaxant can be given will tend to push the more difficult epidural injection into the background. The author prefers to give soluble thiopentone, nitrous oxide and oxygen before performing the epidural injection.

The only printing error I could find is in the second example of dosage calculation (page 82), where the minus signs should be plus signs.

One might critcise testing for subarachnoid block by asking the patient to move his legs when using 1/600 Nupercaine, which, as the author points out (page 19), does not affect the heavily myelinated motor fibres. The pitfalls and complications of the technique are courageously discussed.

The work is thoroughly documented and there are numerous references at the end of each chapter. It can be thoroughly recommended to anyone wishing to study the technique afresh. W. M. B.

An Investigation of the Results of Gastric Resection for Peptic Ulceration in One Hundred Consecutive Cases

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INTRODUCTION.

IN recent years there has been considerable interest in the results of gastric resection for peptic ulceration, and many papers have been published reporting the recurrence rate and the incidence of various syndromes following operation. Some of the series have been large and the investigations have often been detailed. Many, however, have suffered from being incomplete. It was thought that valuable information would be gained by following a series which was comparatively small, but which, for this reason, could be followed completely and in a detailed manner. This object was achieved, and one hundred consecutive cases were traced and investigated.

The investigation was designed to discover the incidence of—

(1) Post-operative complications.
(2) Recurrence of ulceration.
(3) Deficiency states.
(4) Post-prandial syndromes.

An attempt was made to determine—

(1) The relation of these to the type of resection performed.
(2) The effect of the passage of time after operation on the incidence and severity of post-prandial syndromes.
(3) The effect of sex on the incidence of deficiency states.
(4) The relation of stomal mobility to post-prandial syndromes (Butler and Capper, 1951).

In this series the incidence of stomal ulceration was 1 per cent. and the symptoms of peptic ulceration were completely relieved in the rest. The observation of Capper and Butler (1951), that stomal mobility was greatest in those with definite post-prandial syndromes, was confirmed. Unremitting intolerance to cooked fat and to sugar was noted post-operatively in a considerable number of cases.

CLINICAL MATERIAL AND METHODS.

The cases were grouped as follows :—

(A) Five cases of stomal ulceration following gastrojejunostomy for gastric (1 case) or duodenal (4 cases) ulceration performed elsewhere.
(B) Ninety-five cases of gastric or duodenal ulcer, comprising—
  (a) Fifteen cases of pyloric stenosis,

(b) Ten cases of severe and repeated gastroduodenal hæmorrhage treated by emergency gastrectomy,

(c) Seventy cases in which disabling symptoms had continued after adequate medical treatment.

Analysis of Group B (95 Cases).

In 54 cases perforation and/or gastroduodenal hæmorrhage had occurred. Repeated hæmorrhage alone occurred in 28 cases. Perforation had occurred in 26 cases, 16 without recorded hæmorrhage and 10 with hæmorrhage at some other time. In no case had simultaneous hæmorrhage and perforation occurred.

The ulcers were sited as follows :—

Gastric	37	...	(38.5 per cent.).
Duodenal	57	...	(60.4 per cent.).
Gastric and duodenal	1	...	(1.1 per cent.).

The average duration of symptoms in this group was 10 years. The average age of all patients in groups A and B was 46 years.

The resections performed were :—

(a) Balfour type two-thirds to three-fourths partial gastrectomy in 76 cases,

(b) Balfour type with an added Hoffmeister Valve in 15 cases, and

(c) Billroth 1 type partial gastrectomy in 9 cases.

Methods of Investigation.

The cases were examined clinically on several occasions and were divided into four groups :—

Group 1.—1-2 years from operation until completion of follow-up.
Group 2.—2-3 ,, ,, ,, ,, ,, ,, ,,
Group 3.—3-4 ,, ,, ,, ,, ,, ,, ,,
Group 4.—4-4⅓ ,, ,, ,, ,, ,, ,, ,,

Special investigations comprised hæmatological studies, radiological studies of the stomal mobility in changing from the supine to the erect position, and estimations of the plasma protein levels.

Results—General.

The immediate post-operative complications in 100 cases were :—

Post-operative pulmonary collapse	18
Wound infection	10
Vomiting and diarrhœa	3
Paralytic ileus	2
Abdominal abscess	1

There was one fatality. This was a man of 61, who died of myocardial failure on the third post-operative day. Autopsy showed an intact anastomosis. The heart was dilated and flabby and an organised thrombus was adherent in the right atrium. The kidneys were the site of an interstitial nephritis.

Two patients died during the follow-up period, one of pulmonary tuberculosis two years after operation, the other of his own hand three and a half years after operation. He had been seen one year before and was gaining weight, had no

post-prandial symptoms, was doing his full work and had been regarded as a complete recovery. Stomal ulceration was seen in one case and developed one year after a Billroth 1 operation for duodenal ulcer. He was subsequently cured by a higher resection of the Balfour type.

Nutritional Status.

Vitamin B.—In this series hypo-vitaminosis B was seen in 3 per cent. of cases. Angular stomatitis, superficial glossitis and paræsthesiæ of fingers and toes were present, but in no case did neurological signs develop.

Weight.—(a) In 48 there was a definite gain in weight,

(b) In 47 the weight remained stationary or within 1-2 lb. of the pre-operative weight.

(c) In 5 there was a persistent weight loss.

Hæmatology.—The hæmoglobin concentration was estimated in 73 cases (63 males and 10 females), which were selected at random from the whole group. The results are expressed as a percentage on the Haldane Scale (100 per cent. = 14.8 gm. per 100 ml.) and are shown in Table I and Fig. 1. The mean levels were 94 for the men and 86 for the women, and this difference was statistically significant. These levels were about 8 per cent. lower than those which were found for the general population in 1943 (M.R.C., 1945). This suggests that there was considerable anæmia after gastrectomy, but the comparison is not exact because the accuracy of the method which was used in this investigation was not checked.

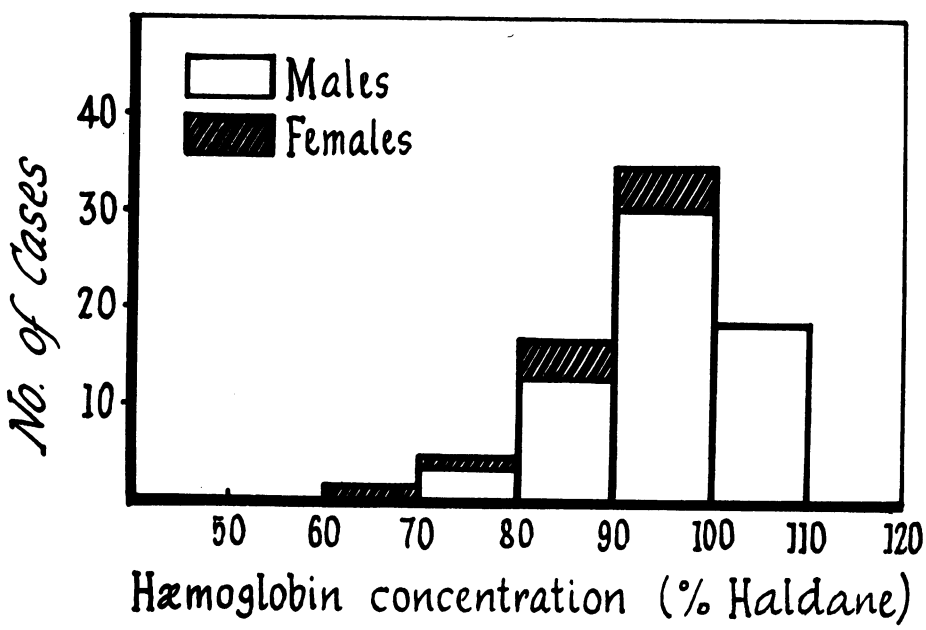

Figure 1.

A histogram showing the distribution of hæmoglobin concentration in males and females following gastrectomy.

TABLE I.

Hæmoglobin concentrations in patients after gastrectomy compared with those in the general population.

	Males (Haldane %)		Females (Haldane %)
General Population - -	102.2 ± 0.13*	...	93.7 ± 0.11*
Patients after gastrectomy -	94.2 ± 1.2*	...	86.2 ± 3.2*

Statistical Analysis: Comparing the concentration in the males with that in the females after gastrectomy, $t = 7.98$, $P < 0.001$. Comparing the concentration in the males after gastrectomy with those in the general population, $t = 7.2$, $P < 0.001$. Comparing the concentration in the females after gastrectomy with those in the general population, $t = 7.2$, $P < 0.001$.

Plasma Protein Concentration.—Plasma protein concentrations were estimated in 59 cases selected at random (52 males, 7 females). These are shown diagrammatically in Fig. 2. The mean plasma total protein concentration was 7.62 ± 0.08 gm. per 100 ml. No significant difference was found between the mean levels in the two sexes. The plasma total protein concentration was within the normal range

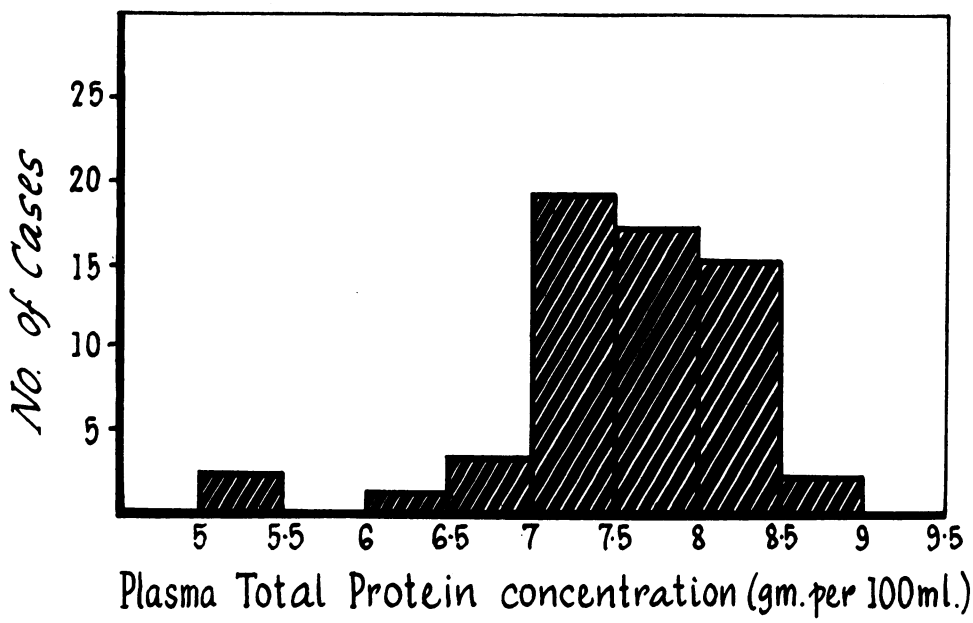

Figure 2.

A histogram showing the distribution of plasma total protein concentration in patients following gastrectomy.

in all cases, and in two only was it below 6.0 gm. per 100 ml. (5.1 and 5.5). Both cases were gaining weight, had no clinical evidence of nutritional deficiency and were regarded as completely successful results. The mean albumin globulin ratio was 2.2/1 and in no case was the ratio abnormal.

*Here, and throughout this paper, figures following a ± sign refer to the standard error of the mean.

Post-Prandial Syndromes.

The incidence of individual symptoms which occurred after meals is shown in order of frequency in Table II. The incidence and severity of these symptoms decreased with the passage of time up to about eighteen months after operation, but tended to persist unchanged after this time.

TABLE II.

An analysis of the incidence of individual symptoms occurring at intervals after gastrectomy (expressed as percentages).

	Fullness	Dizziness	Nausea	Sweating	Bile Regurgitation	Vomiting	Diarrhœa
Shortly after operation	49	26	25	23	21	9	7
At final follow-up	34	13	14	13	10	4	3

Fullness, indicating decreased capacity, was more persistent than the other symptoms. Palpitations after meals occurred rarely. These individual symptoms were recognised as falling into three main syndromes :—

(1) The early post-prandial syndrome (Adlersberg and Hammerschlag, 1947).

(2) The afferent loop stasis syndrome with bile regurgitation (Wells and Welbourn, 1951).

(3) Post-prandial diarrhœa.

The incidence of these syndromes was recorded at intervals after gastrectomy. Particular attention was paid (1) to the total incidence of these at *some* time during the follow-up, (2) to their incidence at the *end* of the follow-up but without relation to severity, frequency or the size of the meal which could be taken without symptoms, and (3) to the incidence of *disabling* syndromes at the end of follow-up. These incidences are shown in Table III.

TABLE III.

An analysis of the incidence of post-prandial syndromes at intervals after gastrectomy (expressed as percentages).

	Cases	Early post-prandial syndrome	Afferent loop stasis syndrome	Post-prandial diarrhœa
Maximum incidence	99	32	15	6
Incidence at end of follow-up	97	15	10	2
Incidence of *disabling* syndromes at any time	97	3	1	2

One case showed all three syndromes. In another the early post-prandial syndrome and the afferent loop stasis syndrome (bile regurgitation) were relieved by entero-anastomosis. The incidence of these syndromes, like that of the individual symptoms, decreased with the passage of time. If the early syndrome passed off, it did so usually within eighteen months. In one case, however, it persisted for more than four years after operation. If the afferent loop stasis syndrome passed

off it did so usually within one year. Four cases only had syndromes which seriously affected their ordinary lives.* The rest could, without symptoms, take a meal consisting of soup, two potatoes, meat, vegetables and a sweet or a cup of tea. Post-prandial diarrhœa was still present in two cases and, although mild, did occur after each meal.

Post-operative Food Intolerances.—It was noted that meals containing cooked fats or sugar frequently caused the post-prandial syndromes. Marked intolerance to cooked fats (as opposed to natural uncooked fats) occurred post-operatively in 32 per cent. of cases. This persisted from the time of its appearance, and in no case did it disappear up to the end of this follow-up. In a minority of cases this intolerance had been present pre-operatively. Following a fatty meal (e.g., fried eggs, bacon or fried potatoes), nausea, sweating and often bilious vomiting occurred. Sugar intolerance was observed in 18 per cent. of cases. It was never present pre-operatively and in all cases persisted up to the end of this follow-up. In two cases the early post-prandial syndrome and bilious vomiting were completely relieved following reduction of the sugar content of the morning tea.

The Effect of the Type of Operation on the Incidence of Post-Prandial Syndromes.—No significant difference was found in the incidence of the early post-prandial syndrome or of the afferent loop stasis syndrome after the three types of anastomosis (Table IV). The numbers involved, however, are small and no firm conclusions can be drawn. The occurrence of the early syndrome is recognised as extremely rare (Butler and Capper, 1951) after the Billroth 1 resection. It does, however, occur occasionally, and in this small series (nine cases) the high incidence, 11.1 per cent. (representing one case only), is not significant.

TABLE IV.

Relation of the type of operation to the incidence of post-prandial syndromes.

Syndrome	Balfour (76 cases)	Balfour with Hoffmeister Valve (15 cases)	Billroth 1 (9 cases)
Early post-prandial syndrome -	28 cases (36.8%)	3 cases (20.0%)	1 case (11.1%)
Afferent loop stasis syndrome	11 cases (14.5%)	4 cases (26.7%)	0 cases (0%)

Stomal Movement.—Butler and Capper (1951) have reported that there is a greater descent of the gastric stoma, in changing from the supine to the erect position, in cases with the early post-prandial syndrome than in those without. The results of a radiological study of thirty-one cases is recorded in Table V, which also shows the observations of Butler and Capper.

TABLE V.

The relation of the degree of descent of the gastro-jejunal stoma (measured radiologically) to the presence or absence of post-prandial syndromes after

*One of these was completely relieved of bilious vomiting by jejunoplasty after completion of the investigation.

gastrectomy. The results of the present investigation are compared with those of Butler and Capper (1951).

Degree of Descent (cm.)	This Series.		Butler and Capper's Series.	
	With Symptoms No. (per cent.)	Without Symptoms No. (per cent.)	With Symptoms No. (per cent.)	Without Symptoms No. (per cent.)
0-5	0	7 (33)	21 (34)	95 (100)
5-7	4 (40)	8 (38)	11 (18)	0
7-12	6 (60)	6 (29)	29 (48)	0
Total	10 (100)	21 (100)	61 (100)	95 (100)

In this investigation the mean degree of descent of the stoma was 7.9 cm. for those with symptoms and 6.1 cm. for those without. Corresponding figures in Butler and Capper's series were approximately 6.2 cm. for those with symptoms and 2.2 cm. for those without. The difference between the means in the present series (1.8 cm.) is significant, but is not so striking as that of Butler and Capper, where the difference was 4.0 cm. approximately.

Clinical Results.

The condition of the ninety-seven cases alive at the end of this follow-up is indicated in Table VI. Ninety-two cases (95 per cent.) were for all practical purposes quite cured and fit for work. Five cases still had symptoms, related to the operation, which curtailed their activities. All cases but one stated that they were glad to have had the operation.

TABLE VI.

A Summary of Clinical Results.

No. of Cases.	Result.
67 (69%)	Full symptomless recovery.
25 (26%)	Almost complete recovery but with occasional mild symptoms. These patients are very satisfied.
4 (4 %)	These patients now have no pain but are unable to eat full meals without symptoms.
1 (1 %)	This patient has no pain but has marked loss of working ability and frequent post-prandial symptoms.

Total 97 cases.

Discussion.

Stomal Ulceration.—The outstanding problem in ulcer surgery is to find a means of controlling peptic ulceration without producing severe post-operative symptoms. It is generally assumed that the recurrence rate following gastrectomy for duodenal ulcer is inversely proportional to the extent of the resection. Ivy, Grossman and Bachrach (1950), after reviewing the literature, conclude that the recurrence rate after a two-thirds resection is 5.8 per cent. and after a three-fourths or more resection is 3.5 per cent. The difference is significant. In this country the figures

of Visick (1948) and of Wells and Brewer (1948) are even more striking. After three-fourths or greater resection these authors found no recurrences in large series. The one recurrence in this series followed a gastro-duodenal anastomosis and there was no case of recurrence following a two-thirds to three-fourths resection with a gastro-jejunal anastomosis in fifty-five cases of duodenal ulcer. This observation is of interest but cannot be regarded as significant in view of the small size of the series.

Post-Prandial Syndromes.

There is a widespread impression that radical resections cause more severe post-prandial symptoms and deficiency syndromes than more conservative operations, but the evidence for this view is inconclusive. The many widely differing figures which have been given for the incidence of post-prandial syndromes (Lake, 1948, 3 per cent., and Muir, 1949, 75 per cent.) make comparison between different series almost impossible. Most patients are so well and grateful for the relief which the operation has given them that they are unwilling to mention symptoms which appear to them trivial when compared with their former suffering. Much of the confusion is due to the fact that those authors who have reported a low incidence have clearly included only patients who have complained spontaneously of symptoms, while those who have reported a high incidence have included all those from whom symptoms have been elicited on close questioning. Such close questioning is essential if accurate information is to be obtained and if reliable comparisons are to be made between different types of operation. At the same time it is important to distinguish between disabling symptoms and those which are of little account.

One factor in determining the incidence of post-prandial syndromes is the type of operation performed. These syndromes are fairly common after a Polya type anastomosis and the presence or absence of a Hoffmeister valve has not been shown to have any effect on their incidence (Hosford, 1949, Ivy, *et al.*, 1950). It was believed that the early syndrome did not occur following the Billroth 1 resection and Butler and Capper (1951) did not see a case in their series. It does, however, occur rarely. In this series one case was seen and a further example has been encountered more recently.

In this study the afferent loop stasis syndrome and the early post-prandial syndrome were seen to pass off in twelve to eighteen months if they did so at all. It appears to be the general view that these syndromes pass off in one to two years. In this series, however, the early post-prandial syndrome had persisted for four years in 15 per cent. and the afferent loop stasis syndrome for the same period in 10 per cent. of cases. The early syndrome disappeared in about half of the cases in which it had been present and the afferent loop stasis syndrome in one-third. Butler and Capper found that, in three-quarters of cases with these syndromes, symptoms persisted for two to eleven years.

This investigation has confirmed the relation of syndromes to the degree of stomal mobility in changing from the supine to the erect position and lends support to the rationale of Butler's and Capper's "hitching" operation.

The late post-prandial (hypoglycæmic) syndrome was present in 5 per cent. of the series reported by Muir (1949) and Butler and Capper (1951). It was not recognised in any patient in this series.

Post-operative Food Intolerances.—These may be for one or more foods. In this series carbohydrate (in the form of desserts or sweets) and cooked fat intolerance were seen. The incidences were 18 per cent. and 32 per cent. respectively. These intolerances did not disappear in any case up to the end of the investigation. Gaviser (1948) reported intolerance to carbohydrates (in 16.7 per cent. of cases) and to milk (in 11 per cent. of cases) after gastrectomy. The symptoms (nausea, vomiting and distress) were reproduced in three cases only by tube feeding these patients with $3\frac{1}{2}$ per cent. butter fat milk or 50 gm. of glucose in 200 ml. of water. Gaviser concluded that a considerable psychological factor was responsible for the production of symptoms by these foods. It is difficult to understand why these foods should be singled out so constantly by patients if the main factor were psychological; moreover, objective tests have shown that hypertonic glucose stimulates contraction and peristalsis in the jejunum while the symptoms of the early post-prandial syndrome are present (Glazebrook and Welbourn, 1952). Intolerance to uncooked fatty foods (butter, cream, milk, etc.) was not seen in this investigation.

Nutritional Status.

Iron Deficiency Anæmia.—Whitby and Britton (1950) state that anæmia is as common in males as in females after gastrectomy. This was not found to be so in this series. Not only was the mean hæmoglobin concentration lower in gastrectomised subjects than in the general population, but it was lower in females than in males; and both differences are highly significant. This was also noted by Wells and Welbourn (1951), who found iron deficiency anæmia in 15 per cent. of males and 30 per cent. of females in their series.

Macrocytic anæmia was not seen. Ivy, Grossman and Bachrach record the incidence of pernicious anæmia in 1,851 cases as 0.2 per cent.

Weight.—In this series 95 of the cases remained within 1-2 lb. of their pre-operative weight (47) or gained weight (48). Five per cent. showed a persistent weight loss post-operatively. These figures do not, however, give a true picture since it was not known accurately how much weight had been lost pre-operatively as a result of diminished intake and vomiting (Wells and Welbourn, 1951).

Hypo-Vitaminosis.

The only deficiency seen was of vitamin B and the incidence was 3 per cent. Welbourn, Hughes and Wells (1951) found some evidence of hypo-vitaminosis B in about 10 per cent. of their series of subotal gastrectomies.

Plasma Protein Concentration.—Several studies of plasma protein levels have been made in the immediate post-operative period following gastrectomy (Chauncey and Gray, 1943, Seaman and Ponder, 1943), and plasma protein estimations have been made in small groups of patients some time after operation (Lambling and Conte, 1949; Lambling, *et al.*, 1949; Rekers, *et al.*, 1943). There are not, however, many reports of plasma protein levels in large series of cases in the late post-

operative period. In this series the plasma protein levels were essentially normal and no sex difference was found.

Summary.

1. One hundred consecutive cases of partial two-thirds to three-fourths gastrectomy for peptic ulceration have been followed up.
2. The operative mortality was one.
3. One case of stomal ulceration occurred.
4. Hypo-vitaminosis B was seen in three cases.
5. Ninety-five of the cases gained weight or remained within 1·2 lb. of the pre-operative weight. In five there was a persistent weight loss.
6. The mean hæmoglobin concentration was below that of the general population. The mean value for females was lower than that for males.
7. Plasma protein concentrations some time after operation were within normal limits. There was no sex difference.
8. The early post-prandial syndrome was present at some time in 32 per cent. of cases and passed off within twelve to eighteen months in half of these. The afferent loop stasis syndrome was present at some time in 15 per cent. of cases and passed off within twelve months in one-third of these. Disabling syndromes were present in four of the cases.
9. Intolerance to cooked fats and to carbohydrates was present in a large number of cases and in no case passed off during the period of this investigation.
10. The observation of Capper and Butler, that the range of stomal mobility is greatest in those having the early post-prandial syndrome, was confirmed.
11. Ninety-five per cent. of cases were for all practical purposes quite cured and fit for work. All cases but one were glad to have had the operation.

I wish to thank Professor H. W. Rodgers, Mr. R. B. Welbourn, and other members of the Department of Surgery, Queen's University, for their assistance.

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Diverticulitis and Rectal Bleeding

By H. W. GALLAGHER, M.B., F.R.C.S.(ED.).

Banbridge Hospital, Co. Down

FRAENKEL (1954) has recently drawn attention to the massive bleeding which sometimes occurs as a primary symptom in cases of diverticulitis of the colon. He quotes Mr. D. C. Corry: "If a middle-aged or elderly patient, apparently in fair health, has a sudden, unexpected, and alarmingly profuse rectal hæmorrhage of perhaps several pints, full examination is likely to reveal diverticulosis of the colon and the bleeding is unlikely to continue." Fraenkel illustrates the syndrome with two case histories and, on examining the case records of the Radcliffe Infirmary for the years 1947/51, found fifteen similar cases. In an incomplete review of the literature since 1938 he found reference to bleeding, sometimes severe, in ninety-nine cases of diverticulitis. In spite of this large number of cases, Fraenkel points out that the syndrome is not mentioned in numerous popular text-books which he consulted. It is, however, mentioned by Edwards (1948) in *British Surgical Practice*.

In addition to the cases quoted by Fraenkel there are three others reported by Greig (1950). In two of these bleeding was severe and the only symptom. Thus, with the two cases briefly reported below, there are now at least 121 on record, and it is time that text-books took cognizance of the condition. A practitioner confronted with such a case will be much too gloomy in his prognosis unless he is aware of the condition.

Case 1.—R. O., male, aged 86, had been taking liquid paraffin for some years for constipation and for six months had noticed some slime in his motions. For four days in March, 1951, he passed large quantities of unaltered blood per rectum. Two days after admission he had a further small hæmorrhage. Full investigation revealed only diverticulitis of the pelvic colon. He is now 90 years of age and has had no further bleeding.

Case 2.—W. J. McC., male, aged 78, had been taking 'health salts' and 'All Bran' daily for six months for constipation. In January, 1954, for four days he passed large quantities of bright red blood per rectum. Full investigation revealed only diverticulitis of the pelvic colon. He has had no further bleeding.

In both cases, after the acute episode, repeated examinations of the stools for the presence of occult blood were consistently negative.

DISCUSSION.

These two cases differ from those presented by Fraenkel (1954) and Greig (1950) in that constipation preceded the attack of bleeding. The initial diagnosis in each case was carcinoma of the colon, and this, of course, must be excluded before the diagnosis of diverticulitis is made.

There seems to be no doubt that diverticulitis of the colon can cause catastrophic rectal hæmorrhage which rarely recurs.

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The Practice of an Early Nineteenth-Century Physician:

Illnesses Occurring in Belfast during the year 1808-1810

By J C. C. CRAWFORD, M.D.

THE Belfast Monthly Magazine appeared during the period between September, 1808, and December, 1814, under the editorship of Dr. William Drennan. The articles are of a varied nature, literary and scientific, and many hold the interest of the casual reader, especially those of a local nature. The slightly stilted writing of the times adds to their charm. After agricultural and commercial sections the reader will find a "Medical Report—List of Diseases occurring in the practice of a Physician in Belfast." These reports, sixteen in all, appeared from the opening number until that of January, 1810. Thereafter they are omitted without any reason being given, and in December, 1814, the magazine, like so many others, came to an early end.

This physician, with the instincts of a compiler and statistician, is unknown. It cannot have been the editor himself, Dr. William Drennan, famous for his literary work and as a leader of the United Irishmen, for when, in 1807, Drennan returned from Dublin to Belfast he had inherited property in the latter town which relieved him of the necessity of practising medicine. His medical interests, however, may well have induced him to publish the monthly morbidity records which must have been for many of his readers of little interest.

In 1810 Belfast was rather larger than Bangor to-day, with a population of about 25,000. There were about twenty doctors practising in the town, and it may well have been Dr. James McDonnell, then the most distinguished medical man in Belfast, who contributed the records. He, more than any of his contemporaries, contributed the inspiration and driving force which led to the founding of Frederick Street Hospital, and the Medical School which grew out of it. He is described as driving on his own rounds in an old-fashioned gig, reading a book through a large magnifying glass, and dressed in white stockings and knee-breeches.

In all, 1,287 cases are noted in these reports during the sixteen months, or on an average rather less than three cases a day. Most of them must have needed many visits, however, for about six cases in every seven mentioned are of a serious nature, for which medical science had then little to offer. The practice thus may well have been a very busy one, extending, as it no doubt did, into the surrounding countryside. The figures may be compared with those of the writer's practice, in which, during the period of a year, 2,067 separate illnesses were recorded, but for which antibiotics and other modern treatment have now usually provided a speedy cure. It should also be noted that "cases purely surgical have been omitted from the list."

After the lists of diseases there is usually a short comment on the health of the community, or an account of an interesting case. Occasionally the reader is

Diseases occurring in the practice of a Belfast Physician from September, 1808, to January, 1810.

Present-day Grouping.	Physician's Diagnosis.	Number of Cases.	Total for Group.
Ill-defined Fevers	Typhus (putrid, or common contageous fever)	40	
	Typhus mitior	9	
	Synochus	31	
	Hectic fever	1	81
Specific Fevers	Variola (small-pox)	76	
	Rubeola (measles)	68	
	Scarlatina	14	
	Erysepelas (rose, St. Anthony's fire)	11	
	Varicella (chicken-pox)	3	
	Pertussis (hooping cough)	2	
	Cynanche parotidea (mumps)	1	175
Acute Respiratory Infections	Catarrhus (common cold)	30	
	Pneumonia (pleurisy)	10	
	Cynanche trachealis (croup)	2	42
Tuberculosis	Phthysis pulmonalis (consumption of lungs)	25	
	Scrophula (evil)	73	
	Hæmoptysis	7	
	Tabes mesenterica (fever and wasting from diseased glands in the belly)	1	106
Venereal Diseases	Venereal disease		131
Ill-defined Diseases of children	Morbi infantiles (febrile and bowel complaints of children)		324
Asthma and Cardiac conditions	Asthma (shortness of breath)	37	
	Palpitatio cordis (irregular and quick beating of heart)	2	
	Hydrothorax (dropsy of chest)	2	
	Ascites (dropsy)	3	
	Anasarca (general dropsy)	1	45
Diseases of Central Nervous system	Epilepsia (falling sickness)	8	
	Hydrocephalus (dropsy of brain)	3	
	Fatuitas post-ebrietatem (idiocy following excessive drunkenness)	1	
	Erysipilas phlyclænodes (shingles)	1	13

Psycho-neuroses, etc. -	Asthenia (nervous debility) -	23	
	Hysteria - - -	14	
	Hypochondriasis (hips) - -	2	
	Oneirodynia gravans (nightmare)	1	
	Mania (madness) - -	2	42
Rheumatism - -	Arthrodynia - - - (chronic rheumatismus)	27	
	Rheumatismus acutus - -	27	
	Podagra (gout) - - -	2	56
Gastro-intestinal infections - -	Dysenteria (bloody flux) - -	12	
	Cholera morbus (excessive vomiting and purging) - -	7	
	Diarrhœa (looseness) - -	3	
	Colica spasmodica - -	5	27
Dyspeptic conditions -	Dyspepsia (indigestion) - -	26	
	Icterus and hepatites - -	8	
	Ptyalismus - - -	1	
	Water brash - - -	1	36
Skin conditions - -	Psora (itch) - - -	44	
	Herpes (ringworm or tetter) -	56	
	Perniones (kibes, or chilblains) -	7	107
Eye conditions - -	Opthalmia (inflammation of eyes)	50	
	Cataracta - - -	2	
	Blindness - - -	8	60
Ear, Nose and Throat conditions - -	Cynanche tonsillaris (quinsey) -	11	
	Epistaxis, anosmia, and aphonia (one each)	3	14
Miscellaneous - -	Abortion - - -	7	
	Hæmorrhois (piles) - -	7	
	Aphtha (thrush) - - -	4	
	Dysuria mucosa (gravel) -	2	
	Sphacelus (mortification) - -	2	
	Rickets - - - -	2	
	Tapeworm, ranula, nephritis and hydrocœle (one of each) -	4	28
	TOTAL - - -		1,287

admonished, as when the writer "would most anxiously recommend the use of flannel next the skin to both sexes, but particularly to the female, who is obliged too often to sacrifice both comfort and health on the shrine of fashion." In February, 1809, he notes that "contageous fever, that terrible scourge both of

poverty and wealth, is advancing with gigantic strides, while small-pox, scarlet fever and measles have practically disappeared." When a man who had been cleaning the fermenting vat in a brewery fell unconscious, overcome by the fumes, he advised inflating the lungs with a common pair of bellows!

The table summarises the illnesses recorded and the differences from present-day experience are at once obvious. The conditions have been grouped by the present writer in the first column, using modern terminology. In the next columns the entries as they appear in the monthly lists have been collected, using the exact terms employed by the recording physician. Where of interest, his alternative names are given in brackets and in all cases his spelling is reproduced. The same term is, however, sometimes spelt in a different way in two different lists. It may be of interest to comment on some of the groups.

The group of ill-defined fevers is perhaps impossible to disentangle to-day. They formed a subject about which much was written and for want of a firm basis theories and classifications multiplied. The classifications of nephritis in recent years are few in comparison! It was only in 1837 that the distinction between typhus and typhoid was made. The table shows typhus (often referred to simply as "fever") as predominant, but there were thirty-one cases of "synochus," which is described as "of a mixed nature between inflammatory and typhus fever." These two conditions occurred irregularly throughout the period of record.

It was in 1817, only a few years later, that a severe epidemic of fever burst upon the town. Frederick Street Hospital was in the course of erection. With all speed it was completed. While the walls were still wet and the staircase scarcely secure patients were hurried in, and filled it to overflowing. During the epidemic 3,527 cases were treated within its walls, and it was calculated that nearly a quarter of the population of Belfast suffered.

With the specific infectious fevers we are on firmer ground. Small-pox was widespread, with seventy-six cases. There were two epidemic periods, one in the latter half of 1808 and the second from May to December, 1809. In the intervening months no cases were recorded. Jenner's work on vaccination had been published in 1798 and the procedure was being extensively practised in Belfast. Our recorder describes in May, 1809, a case from the country and noted with satisfaction that it had not spread to others in the street who had been previously vaccinated. Nevertheless, the second epidemic may well have originated from this case.

Measles (rubeola) was also widespread in the two periods when small-pox was active. Cases of rubella may have been included, as this condition was not differentiated until 1828. Nor was diphtheria distinguished from scarlet fever until 1826.

We are fortunate to-day in that scarlet fever and measles are milder diseases than they were. Our recorder says that they "scatter death and deformity among the rising generation and nip our hopes and fairest prospects in the bud." In July, 1809, it is recorded that "the hoopingcough, so long a stranger to us, has

again made its appearance, and as it is generally mild in proportion as the subject whom it attacks is advanced in years, it will be prudent in parents to prevent their children, if very young, from being exposed to its influence." Infectious diseases are not so common today, but they still comprised 6 per cent. of the illnesses recorded in the writer's study of general practice morbidity.

Respiratory conditions are remarkably few, and one wonders if the figures give a true impression of the prevalence of respiratory infections. In the investigation into morbidity in his practice the present writer found that 25 per cent. of all illnesses in males, and 20 per cent. in females, were associated with the respiratory tract. Bronchial infections are not mentioned. One can only assume that they are included under the heading of catarrh. Though ten cases of pneumonia are recorded, its diagnosis was doubtless unsatisfactory, for percussion was only just becoming generally known in 1808. Auscultation had still to await the advent of Laennec's discoveries.

It will be seen that phthisis was very prevalent and scrophula (tubercular glands) more so. In 1810 the connection between the two was only beginning to be understood. The synonym for scrophula, evil, or the King's Evil, refers to the idea, then still perhaps prevalent among the uneducated, that the King's touch had the power of curing it. To the sovereign who owed his position to divine right were attributed God-like powers of healing. Only four cases of tubercular infection (all of phthisis) were recorded by the writer during his two years' morbidity study.

The numbers for venereal disease are striking. For three of the months only are the figures for syphilis and gonorrhœa kept separate. Eleven cases of syphilis and fifteen of gonorrhœa were then recorded. In contrast, no cases of venereal infection were recorded during the present-day investigation.

The numbers under the heading of "Morbi Infantiles" tell their story of lack of hygiene and ignorance. They are spread fairly evenly throughout the period.

"Asthma or shortness of breath" is a large group. Many of these cases may have been cardiac, for the next group contains all the few others which could be attributed to heart disease. Here again diagnosis was still groping in the dark. It was only on the advent of auscultation with Laennec's work in 1819 that cardiology could develop into an exact study. Though angina had been recognised by Heberden, no case is recorded here.

It is striking that diseases of the central nervous system are also so few and that apoplexy, though well known, is unrepresented. Asthenia (nervous debility), hysteria and hypochondriasis form a fairly large group, and no doubt they presented many problems as they do to-day.

The rheumatic group shows a remarkable prevalence of acute rheumatism. The figure may have included cases of rheumatoid arthritis, which, however, was not differentiated from osteo-arthritis till long afterwards. Those who feel a sense of inadequacy in the treatment of rheumatic conditions may like to know that "very large doses of oil of turpentine have seldom failed to procure relief, but in one case, after all the usual remedies had been tried in vain, the happiest effects were produced by the internal use of cajeput oil."

A group of conditions in which precise diagnosis is impossible is that of gastro-intestinal infections. No reliance can be placed on the diagnosis of cholera, the condition being described in the table merely as excessive vomiting and purging. In 1832 and 1849, on the other hand, devastating epidemics swept across Europe and struck heavily in Belfast. Considering the unhygienic conditions of the time the gastro-intestinal group is a small one, as indeed is that of dyspeptic conditions, wholly undifferentiated at that time.

Only two types of skin disease proper are distinguished, psora, or the itch (scabies), and herpes (ringworm or tetter), and both are common.

The figures in these groups are naturally not strictly comparable with those of present-day morbidity records. For comparison, however, some further figures from the writer's study of morbidity during the years 1951 to 1953 may be given. Cases of cardio-vascular disease, chronic rheumatism, diseases of the alimentary tract and skin diseases, expressed as percentages of total illnesses, were 5.7 per cent., 5.8 per cent., 7.1 per cent., and 9.0 per cent. respectively.

No cases of anæmia or of goitre are noted. Toxic goitre was not recognised till about the year 1835. Nor are any tumours recorded, presumably because, as surgical conditions, they are omitted. Injuries of all kinds are unfortunately excluded, presumably for the same reason.

With the help of these records we may attempt to picture the life of a Belfast practitioner nearly 150 years ago. His professional life was punctuated by epidemics of typhus, small-pox and cholera, more widespread and deadly than any we know to-day. His calling was then no doubt a dangerous one. He faced poverty, dirt and ignorance, and he must have felt his knowledge of diseases and the resources of treatment pitiably inadequate. Yet his sense of vocation was strong. Malcolm says of Dr. McDonnell that "so long as health permitted he was to be seen, night and day, working in the Districts like a very slave, or toiling in the Wards for hours." Where such men led, our generation can be proud to follow.

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Damage to the Nervous System from Gas Poisoning*

By R. S. Allison, M.D., F R.C.P.(LOND.)

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Many gases employed in industry, if accidentally inhaled in toxic proportions, may cause damage to the nervous system. Examples are:—carbon dioxide; the cyanides used in hardening metals; methyl bromide and chloride—employed in fumigating and refrigerating processes; cleansing agents and fat solvents such as carbon tetrachloride, ethylene chloride and amyl acetate—liquids which vapourize easily. The last two are used extensively in modern aircraft construction and possess anæsthetic properties. They are potentially dangerous when sprayed by operators working in a confined space, as in sealing off the interior of a main-plane to adapt it as a fuel storage tank (Smiley, 1954). Other aliphatic compounds include carbon disulphide, a fat solvent used in the manufacture of rayons which is reported to have caused sudden visual failure due to acute retrobulbar neuritis and polyneuritis with a Korsakow type of mental picture.

Recently a case of hydrogen sulphide poisoning in a sewer worker was reported (Hurwitz and Taylor, 1954), and another writer draws attention to the danger of anoxia from men entering sewers without preliminary testing of the oxygen content of their atmospheres (*Lancet*, 1954). The character of the nearby soil and changes in barometric pressure may influence the rate of absorption of oxygen so that the content of a sewer may be as low as 6 per cent. Similar risks may be encountered in ship repairing, where men are required to open up and inspect the interior of deep tanks. The bitumastic paint, with which they may be painted, facilitates the absorption of oxygen, or water may have gained access so that rusting occurs. One would think some considerable time would have to elapse for a significant reduction of oxygen to occur, but, recently, a fatal accident from asphyxia resulted when two men entered a deep tank in which pig iron had been stored as ballast, the tank only having been sealed some four weeks previously. Analysis of the gas in the compartment revealed traces of carbon monoxide and unsaturated hydrocarbons, 96.2 per cent. of nitrogen, and only 3.8 per cent. of oxygen (Fletcher, 1954).

However, of gases the most widely accepted as an industrial hazard is carbon monoxide. Some years ago, over a period, I investigated all the cases of acute coal-gas poisoning admitted to the Royal Victoria Hospital, Belfast (Allison, 1950). Many of them had been suicidal attempts, but a number were accidental, and such cases occur from time to time. Thus, early this year, a sheet-metal worker was overcome by fumes from a diesel-driven air compressor which was situated in the yard outside the shop in which he was working. The exhaust gases, rich in carbon

*Communication to Section of Neurology, British Medical Association Annual Meeting, Glasgow, July, 1954.

monoxide, were drawn in accidentally through a shaft normally used for ventilation. Employees in gas and coke works and foundry workers are the chief victims. Bonnevie (1948) found that, after a day's work, the blood of foundry workers contained hæmoglobin levels of 7 to 20 per cent. carbon monoxide. The majority of those he tested showed some symptoms of acute intoxication, and, on moulding days, blood levels of 20 per cent. were not uncommon after an hour's hard work. The carbon monoxide is evolved, of course, from slow combustion of organic material contained in the sand used for moulding. It is probable, however, that the risk of ill-effects ensuing from working in modern foundries is small, for, visiting one recently and talking to men who had been working there for many years, I found no evidence suggesting that their health had deteriorated as a result.

The changes seen in the nervous system after carbon monoxide poisoning are due to anoxia, and are similar to those that result from lowering the atmospheric pressure, temporary cardiac arrest, exsanguination and hypoglycæmia. With carbon monoxide, the age and state of health of the patient have to be taken into account—pre-existing anæmia and reduction in the cardiac reserve are of especial importance—but the chief factors determining the chances of survival are the duration and severity of the period of exposure. The most vulnerable parts of the nervous system are the cortical neurones, especially those of the parieto-occipital regions, the corpus striatum, dorsal nucleus of the vagus and dorsal sensory area of the medulla. The red nucleus, oculomotor nuclei and the large polygonal cells in the reticular formation are less susceptible to damage, and in many cases where death has resulted the spinal neurones may be intact: changes also occur in the Purkinje cells of the cerebellar cortex and in Ammon's horn. The longer the period of survival after lethal exposure, the greater are the pathological changes seen. Thus, when death occurs within 24-48 hours there may be little more than chromatolysis of the neurones with scattered petechial and perivascular hæmorrhages, capillary dilatation and swelling of the capillary endothelium. The increased permeability of the walls is very pronounced and both fibrin and blood elements may be seen in the tissues around dilated vessels.

When death occurs some time after exposure, post-mortem studies show, in addition to cellular loss, a neuroglial response with hyaline changes in the astrocytes, some proliferation of capillaries, patchy demyelination and softening of the basal nuclei.

Clinical Aspects of Co Poisoning.

The clinical aspects of carbon monoxide poisoning or anoxia may be discussed under three heads:—

Asphyxia from Momentary Exposure.—Carbon monoxide is rarely found in such high concentrations in the atmosphere as to produce instantaneous effects: usually time must elapse for its concentration in the blood. Thus, in one of my cases—a man who had been engaged in sinking a well—asphyxia was due to an internal combustion engine which had been placed some way down the shaft to pump away excess water. He was overcome after working two hours at the bottom of the shaft. Provided the victim is promptly resuscitated and full consciousness regained

within a few minutes, no harmful effects ensue. There may be transitory epileptiform convulsions, behaviour may be odd, and I have often found bilateral extensor plantar reflexes, but these quickly revert to normal. Aggressive behaviour is described, but, when this occurs, it is probably related more to the influence of a previous mood of tension. Indeed, there seems no reason to suppose that the behaviour after momentary asphyxia differs in any essential respect from that seen after a fit in an epileptic subject.

Recurring Hypoxic Effects from Repeated Exposure to Carbon Monoxide.—From time to time the expression "chronic carbon monoxide poisoning" is heard, but it must be emphasized that there has never been any proof, either clinical or experimental, that such occurs. Repeated exposure to atmospheres containing 0.02 to 0.04 per cent. of the gas, however, gives rise to recurring symptoms, chief among which is headache. This has a characteristic, throbbing or bursting quality, and may resemble migraine because of its accompanying visual symptoms. This was well illustrated in one patient, a motor mechanic, who was working in a badly ventilated garage. During the late war chauffeurs in Denmark, driving cars fuelled by gas, were subject to hypoxic effects. The mental symptoms include drowsiness, inattention, difficulty in registration and grasp. Especially dangerous is perseveration, because of the mistakes it may give rise to whilst the subject is working at a bench or operating machinery. Of somatic neurological symptoms, muscular weakness is often pronounced, and its extent depends on the degree of physical activity at the time : extra effort frequently leads to sudden collapse. Ataxia can be so marked that the subject has to crawl on his hands and knees, being unable to walk (Byrd, 1939). Muscle cramps are common, and may resemble root or lightning pains. Vision is usually affected, reading being slow and associated with defective fixation and increase in the normal scanning movements required in reading print. The visual fields for colours may be contracted and xanthopsia has been described. Hearing, on the contrary, is little affected.

Coma resulting from Prolonged Exposure to Carbon Monoxide.—When there is no accurate history it is difficult to forecast the chances of survival. Thus, one patient aged 60, when admitted to hospital, was unresponsive to painful stimuli, breathing stertorously and showing conjugate deviation of the eyeballs, tonic flexion of the upper limbs and a bilateral extensor plantar response. Yet, within eight hours, full consciousness was regained, whereas in another patient, aged 25, whose condition was very similar, coma persisted, and he died on the third day. Coma persisting for 24-48 hours usually indicates a fatal termination, but even when it lasts only for a few hours some cerebral damage may be inferred, and this is often expressed in rowdy delirium for 2-3 days. Most patients recover more quietly, although a few may linger for weeks on end in an amnesia state with disorientation, loss of insight and facile euphoria. In one accidental case of coal-gas poisoning in my series full consciousness was not regained for thirty-nine days.

So-called "Latent Period" : Sequelæ.

Such patients usually insist that they are well and demand to be allowed to go home : if they succeed, they may even try to resume work, when their unfitness to

do so will become at once apparent. Too great emphasis cannot be laid on the necessity for careful examination of the physical and mental state, both in the interests of the patient and of his fellows. This is especially important because the literature on carbon monoxide poisoning conveys the impression that it is not unusual to have a clear or "latent period," during which it is assumed after recovery from coma, the patient is well for a time and then relapses, usually with fairly acute symptoms. It is doubtful if this conception of a so-called "latent period" is either justified on clinical or pathological grounds. The patients who display it may appear outwardly to be well, but careful day-to-day examination will detect that they are still not fully orientated, cannot register fresh information, have faulty insight, and that their memory for recent events is defective.

As regards the underlying basis for these late symptoms and for other sequelæ such as hemiplegia, polyneuritis, visual agnosia, dysphasia, it seems probable that the explanation is to be sought in a vascular basis. These symptoms and signs are not the direct consequence of the original anoxia but are due to further disturbance of neural function brought about by the vasomotor paralysis and capillary dilatation, the slowing of the blood stream which results tending to set up a secondary stagnant anoxia. Permanent ill effects or sequelæ of any kind are extremely rare, but they do occasionally occur, and I have followed up three such examples with post-anoxic dementia, two of which also showed Parkinsonism. In two of the three there was reported to have been a so-called "latent period," and it is suggested that it is among such cases, displaying apparently delayed reactions, that we should expect to find the rare permanent sequelæ of post-anoxic dementia, striatal rigidity and tremor.

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COLLEGE OF GENERAL PRACTITIONERS.

In November, 1952, the College of General Practitioners was founded. It provides for general practitioners an organisation of their own, to watch over their academic interests and in many different ways to promote good general practice. The enthusiasm with which it has been supported indicates how much such a body was needed, and local faculties have been formed in every part of the British Isles and in some parts of the Commonwealth. Some of its organisation is still being hammered out, including the final criteria which will govern membership. Those qualified for less than five years may become Associates of the College.

Among matters of major concern to the College are the teaching of general practice to medical students, the improvement of post-graduate education facilities, and research in general practice.

In the faculty in Northern Ireland there are about ninety members under the chairmanship of Dr. Campbell Young, a member of the Foundation Council of the College; the secretary is Dr. J. M. Hunter, Helen's Bay, Co. Down. During the last session there were seven meetings, all well attended, with a readiness to speak on everybody's part which was most refreshing. In April it was a pleasure to welcome Professor Bull, who spoke on Research in General Practice. Other meetings were addressed by members themselves. In May a most enjoyable visit was paid to Ballymena on the invitation of members there. Dr. John Armstrong gave a talk on "Fifty Years in General Practice," which was followed by a very pleasant dinner. For general practitioners who for too long have been working largely in isolation the opportunity to meet their fellows has been one of the most valuable benefits of College membership.

General practitioner research is likely to be one of the chief activities of the College. Until now the vast opportunities for clinical investigation open to the general practitioner have been too little cultivated, owing mainly to lack of advice and help for the practitioner, whose observations, though of interest and importance, too often have never reached a wider public. The Research Committee of the College is working in three ways. First, in supervising from time to time large-scale studies, designed after much time and thought, and with expert assistance, and undertaken by a large number of general practitioner volunteers. This year various aspects of measles and the value of sulphonamides and penicillin in that condition are the subject of study. Secondly, in the field of group research a number of practitioners with a common interest join to study a subject again after discussion and expert help. At present these include acute respiratory diseases, the indications for tonsillectomy, psychosomatic disorders, hereditary diseases and asthma in childhood. Finally, the advice of experts is available to the doctor working on his own. A "Research News-Letter" is published, with information for members and contributions by them. This, in time, will probably develop into the Transactions of the College.

Research in the Northern Ireland Faculty is the responsibility of a small committee. There are ten research members, most of whom have undertaken one of the group enquiries. A local investigation has also begun, a study of the asymmetry in the heads of infants at about three months, and its possible correlation with right- or left-handedness later in life. The professors of medicine, surgery, midwifery and social and preventive medicine have agreed to act as an advisory panel and give their suggestions and advice.

The Postgraduate Education Committee has suggested minor changes in refresher courses and hopes to encourage close liaison between general practitioners and hospitals.

The Undergraduate Education Committee welcomes the lectures, recently given by a general practitioner to medical students at Queen's University, Belfast, and has discussed ways and means of enabling senior students to receive practical instruction in the work of general practice.

REVIEWS

EMERGENCIES IN MEDICAL PRACTICE. Edited by C. Allan Birch, M.D., F.R.C.P. Fourth edition. (Pp. xii + 610; illustrations 143, nine in colour. 32s. 6d.) London: E. and S. Livingstone, 1954.

THE fact that this volume has now reached a fourth edition since it was first published in 1948 is alone convincing evidence of its popularity and usefulness.

Emergencies are absolute or relative, and fortunately the list of the former group is short. A well-known surgeon of a bygone generation used to teach that there were only two emergencies, hæmorrhage and obstruction of the upper air passages. If that dictum be accepted as correct by the reader he will not be surprised to find that the bulk of this book deals with the relative emergencies, in fact, with the treatment of much that he would class as acute illness and of complications arising in the course of illness.

The work is divided into sections, each written by an expert on his subject. The editor himself has written several sections, including those on acute poisoning, the hazards of medical procedures, respiratory emergencies, medico-legal and non-clinical emergencies. He also contributes an excellent section, with numerous illustrations, on practical procedures.

Other sections deal with medical emergencies in each of the body systems, with emergencies at sea, in the air, in industry and in the post-operative state. This arrangement makes for easy reference, and in addition there is a good index.

Though concerned mainly with treatment, there are many useful hints in differential diagnosis and not a few sound aphorisms.

This book should prove a "very present help in trouble" to every doctor having direct care of patients, whether consulting physician or surgeon, resident medical officer or general practitioner.

W. G. F.

AIDS TO HISTOLOGY. By Geoffrey H. Bourne, D.Phil., D.Sc. Sixth edition. (Pp. viii + 162; figs. 59. 6s.) London: Ballière, Tindall & Cox, 1954.

IT is especially difficult to present such a subject as histology in the confines of a small volume and with only a few simple line diagrams. This is not an adequate text-book of histology even for the medical student, but the student using it throughout his course will probably have clearer ideas on the basic facts of histology than if he attempts to find his way through some of the larger text-books often recommended to him. However, he should supplement it by the study of selected portions of a larger text as well as his practical study.

The new style of binding now adopted for this series is an undoubted improvement and the type is clear and easily read.

J. E. M.

MAY AND WORTH'S MANUAL OF DISEASES OF THE EYE. By T. Keith Luca , C.B.E., M.A., M.D., M.Chir.(Cantab.), and A. G. Cross, M.A., M.D. Cantab.), F.R.C.S. Eleventh edition. (Pp. xii + 724; figs. 305, plates 32. 35s.) London: Ballière, Tindall & Cox, 1954.

THIS has been a very popular book for undergraduates for over half a century. T. Keith Lyle and A. G. Cross are the editors of this eleventh edition.

Extensive alterations have been made, new chapters written and methods of treatment brought up to date. The book is very well illustrated and excellent coloured pictures are an important feature. For general practitioners this edition will be an excellent reference work, but for undergraduate students it is too large. It is a pity that when so much valuable new information was added, severe pruning of old ideas and methods was not carried out at the same time. This could be done comparatively easily and the book would then be better balanced, and of a more readable size for undergraduates.

J. R. W.

REVIEWS

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Throughout the book the theme is "the treatment of hernia is early surgical repair," and both authors have applied an enthusiasm which is infective and which should lead to better results from those who read and think about it. S. A. V.

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In this small book, which fits the pocket easily, Dr. Neville Irvine has provided a compact, eminently readable and concise guide to the history, principles and practice of B.C.G. vaccination with up-to-date information on the progress of vaccination with Wells' vole vaccine (*Myco. tuberculosis, var. muris*).

The book is divided into eight chapters, with a foreword by Professor F. Heaf. The different vaccines are described, and their safety and effectiveness discussed. The techniques of tuberculin testing and vaccination, the reading of results and the complications of vaccination are detailed and commented on.

Perhaps more stress might have been laid on the importance of keeping separate syringes and needles earmarked for different strengths of tuberculin for the Mantoux test. The difficulty of ridding a syringe completely from antitoxic serum is well known, and tuberculin is an even more tenacious fluid. For mass testing at clinics and schools the changing of the needle between each injection, while somewhat laborious, is to be strongly recommended (vide M.R.C. Memorandum, No. 15—'The Sterilization, Use and Care of Syringes'). Spare heads are provided for the multiple-puncture vaccination apparatus, so that a fresh sterile head can be used while the others are being sterilised. It would be an advantage to have the same provision for the Heaf multiple-puncture tuberculin test apparatus.

Dr. Irvine discusses the question of the necessity for conversion testing and follow-up, especially in schoolchildren who are likely to be exposed only to casual infection. The experience of many years and trial of many antigens were necessary before the routine use of the post-Schick test was omitted in diphtheria immunization. It is, perhaps, premature to recommend a similar procedure for B.C.G. vaccination till fuller information is available, especially as the vole vaccine is still on trial, but the first step towards omission of the conversion test would, as mentioned by Dr. Irvine, be the carrying out of conversion tests on selected samples of the vaccinated population.

The author's style is lucid, and the coloured plates are excellent. The book is well produced and can be strongly recommended to all doctors and nursing personnel engaged in the struggle against tuberculosis. V. D. A.

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The authors put first things first by devoting the first section of the book to a discussion of the advantages of breast-feeding and the ways in which the doctor can help the mother to establish this. They introduce this section by stating that in the western world breast-feeding is in danger of extinction, and stress that this is in no way due to any inherent inability to suckle. If the simple methods advised in this book were applied by all doctors dealing with mothers and babies, the incidence of successful feeding could be raised far above the present figure of some 20 per cent. of mothers in Northern Ireland.

The sections on artificial feeding are also very sound. One might raise some slight practical objection to the use of the metric system in calculating feeds for different weights of baby, since very few mothers will be conversant with this system, and a double conversion will be necessary for the doctor using it. The recommended intake of vitamin D is possibly on the high side, in view of the recent suggestions that hypercalcæmia of infancy may result from overdosage with this vitamin.

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THIS volume, costing £4, is said to cover the surgical problems of the 1939-45 war. It now appears eight years after that time. The editorial committee is made up of representatives of the Admiralty, War Office, Air Ministry, Departments of Health, Education, Pensions, and is composed of men, none of whom saw any active service in this war. It has the fault of most books with multiple authors, the chapters are unbalanced, each author tending to overstress the value of his own speciality. One chapter has three separate editors dealing with anæsthesia in the Navy, Army and Air Force. One author would have been adequate, with mention made for the modifications for each branch of the service. On the other hand, in this book of 750 pages no mention is made of the surgical problems of the Burmah campaign and the 14th Army, with the improvisation of operating theatres, evacuation, supplies, etc.

The chapters, on the whole, are well arranged, although towards the end some seem rather unnecessary. The early chapters on wounds, transfusion, shock, blood, abdominal, thoracic injuries, orthopædic surgery, burns and plastic surgery are excellent. The chapter on neurosurgery is written by Sir Zachary Cope, as also is blast and the atomic bomb, which is rather unexpected.

In some cases it was felt that some chapters could have been written by men who had actually seen the problems in the forward area. For instance, the chapter on blood vessel surgery is written by Sir James Learmonth; the chapter of life in the prison camp written by Julian Taylor, on the other hand, gives the stamp of first-class practical knowledge.

It will be an excellent reference book, and subjects such as the crushed syndrome, immersion foot, amputation, etc., are well done, though whether physiotherapy, non-pulmonary tuberculosis, etc., are worth including is doubtful. Many feel that the intimate problems of improvisation and organisation of front-line surgery by the men who actually did the work would be more valuable than the appraisal of their work by men who only know the subject second or third hand. Perhaps those who went through the campaign are too critical, and for posterity and for reference and for future organisation the book in this form may be more valuable. It is a well-produced book, and should be in every surgeon's library for ready reference. I. F.

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The chapters, on the whole, are well arranged, although towards the end some seem rather unnecessary. The early chapters on wounds, transfusion, shock, blood, abdominal, thoracic injuries, orthopædic surgery, burns and plastic surgery are excellent. The chapter on neurosurgery is written by Sir Zachary Cope, as also is blast and the atomic bomb, which is rather unexpected.

In some cases it was felt that some chapters could have been written by men who had actually seen the problems in the forward area. For instance, the chapter on blood vessel surgery is written by Sir James Learmonth; the chapter of life in the prison camp written by Julian Taylor, on the other hand, gives the stamp of first-class practical knowledge.

It will be an excellent reference book, and subjects such as the crushed syndrome, immersion foot, amputation, etc., are well done, though whether physiotherapy, non-pulmonary tuberculosis, etc., are worth including is doubtful. Many feel that the intimate problems of improvisation and organisation of front-line surgery by the men who actually did the work would be more valuable than the appraisal of their work by men who only know the subject second or third hand. Perhaps those who went through the campaign are too critical, and for posterity and for reference and for future organisation the book in this form may be more valuable. It is a well-produced book, and should be in every surgeon's library for ready reference. I. F.

ORAL AND DENTAL DISEASES (a Text-book for Dental Students and a Reference Book for Dental and Medical Practitioners). By Hubert H. Stones, M.D., M.D.S., F.D.S.R.C.S.(Eng.). Third edition. (Pp. xiv + 1,019; figs. 959. 100s.) Edinburgh: E. & S. Livingstone, 1954.

THAT three editions of this book have been published in six years is a testimony to its popularity with the dental profession; its claim to be a reference book to the medical practitioner needs justification.

The mouth not only exhibits the ravages of dental and parodontal diseases but also acts as a mirror of general health. Many systemic illnesses have marked oral manifestations; sometimes these lesions are the first indication of illness. In this volume the physician will find clear, concise, and profusely illustrated descriptions of such lesions—for example, those associated with the osteodystrophies and the hypovitaminoses, the anæmias, purpura and the leukæmias, the various exanthemata, tuberculosis, and syphilis. A number of rarer conditions like vanadium poisoning and Sjögren's syndrome, to mention but two, are also dealt with. In addition, there are sections on tumours of the oral cavity, and on focal infection of dental origin. Even the chapters that appear to be of mainly dental interest can be dipped into with profit for a knowledge of the etiology of caries or the possibilities of treatment of simple parodontal disease may help to reduce misunderstanding between doctor and dentist.

The whole text of the second edition has been revised and many recent references added. By pruning anything that has become obsolescent much new material has been incorporated with the addition of only a few pages; in fact, the new volume is somewhat slimmer and weighs ¾ lb. less than its predecessor—a matter of some importance to the peripatetic student if not to the practitioner. Once again the publishers have produced a handsome volume with clear type and close on one thousand illustrations. P. F. S.

INTRODUCTION TO MEDICINE FOR DENTAL STUDENTS. By R. W. M. Strain, B.Sc., M.D., F.R.C.P.I. (Pp. 224. 15s.) Bristol: John Wright.

FOR several years Dr. Strain has had practical experience in preparing dental students for examination in medicine at Queen's University, Belfast. It was at the late Sir William Thomson's suggestion that he accepted the onerous task of writing this book.

No one knows better than the reviewer, who, about fifteen years ago, gave the first series of systematic lectures in medicine to dental students at Queen's University, Belfast, how perplexing it is to know just how much to divulge and how much to withhold. Examining physicians vary like the four winds in their approach to the dental candidate, who feels like a fish out of water in this part of his curriculum anyway. Some expect him to be proficient in percussion and auscultation; others are less exacting in their demands.

Dr. Strain has performed his work admirably. If he errs, it is on the side of generosity, and it is looking a gift horse in the mouth to complain of that. Indeed, after a careful perusal of the text, one knows that, in addition to its being an excellent text-book and reference book for dental students, every medical student would benefit substantially from reading it early in his hospital years. The sections on the respiratory, cardio-vascular and alimentary systems are particularly valuable. It is pleasant to see references to axioms and aphorisms of such well-known teachers of the Belfast Medical School as Lindsay and Fielden.

Knowing Dr. Strain's distinction in the arts of drawing and photography, it is regrettable to find so few diagrams and no photographs. It is to be hoped that he will thus embellish subsequent editions.

The style is clear and dramatic; a mine of accurate information is attractively and coherently subdivided, paraphrased and tabulated. There is a useful index. The book is well printed and bound, and is a bargain at fifteen shillings. It can be favourably recommended to medical as well as dental students. J. C. D.

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PROCEEDINGS OF THE FIRST WORLD CONFERENCE ON MEDICAL EDUCATION. Edited by Hugh Clegg, with a foreword by Sir Lionel Whitby. (Pp. xvi + 804. 60s.) London: Oxford University Press, 1954.

THIS volume contains the papers which were given at the First World Conference on Medical Education in London in August, 1953. English, French and Spanish were the official languages, and each paper is followed by summaries in each of these languages. Apart from the opening addresses by Sir Lionel Whitby on "The Challenge to Medical Education," by Sir Richard Livingstone on "What is Education?", by John F. Fulton on "The History of Medical Education," and by S. M. K. Mallick on "Medicine—a Technology or a Profession?", the conference was divided into four sections.

The first of these dealt with the requirements for entry into medical schools. This section considers the essentials of pre-medical education and methods of selection of entrants. Most speakers are in agreement that the demands of the university have resulted in a narrowing of the general educational background of potential aspirants to the medical school, and have initiated vocational training as early as 14-15 years of age, before the student has had the opportunity to develop a philosophy of life or has more than scratched the surface of the humanities. Can it be that physics and chemistry, useful tools though they are to the scientific doctor, are exercising a disproportionate influence on the choice of members of the profession?

With the number of applicants for admission some selection is necessary, but there is much variety in the methods used, and no consensus of opinion that a standard one, suitable for all schools, has yet been involved. There is even the question as to whether the selected candidates of to-day are better, or indeed as good as, those of twenty years ago when a student entered the faculty because he wished to become a doctor.

The second section deals with the aims and contents of the medical curriculum. In general, the speakers deplore too great a fragmentation of the course, which, after all, deals with only one subject—the sick patient—though this subject must be viewed through many different windows. Following the development of so many specialities, there is need for a reintegration and the creation of a balanced curriculum which will give the student such medical knowledge and techniques as to constitute a sound basis for his professional life. The complete doctor, however, needs still more, for he must be adept not only in the science, but also proficient in the art, sincere in the ethic and embellished with the culture of medicine.

The third section is concerned with the techniques and methods of medical education, and includes a description of the new teaching experiment introduced at the School of Medicine, Western Reserve University.

The final section develops ideas on our most recent speciality—social medicine. As yet, there appears to be no generally agreed definition of the subject—quot homines, tot sententiæ. With the growing number of full-time teachers, this subject will have an increasing importance, always provided that it is correctly orientated to the needs of the medicai student, and that theoretical abstractions do not replace the study of mankind and man.

Such a conference does not, of course, solve the problems of medical education. It is of interest in that it emphasises the unity of the problem in all the countries of the world. Is there any other profession which has discussed the problem of its own education so frequently? Though the medical schools of Great Britain and Ireland are largely guided by the recommendations of the General Medical Council, it must be remembered that these are only recommendations, and that within their framework experiment is possible. Yet in the ultimate analysis, however well-balanced the curriculum, the final quality of a school is the quality of its teachers. Medical education does not end with the attainment of a degree, and it is those teachers who can plant the seeds of desire for a lifelong education who are the pillars of our schools.

For all who are interested in medical education this volume contains much valuable information and many stimulating ideas. The editor, Dr. Hugh Clegg, is to be complimented on the accuracy of the record, the format of the publication, and the speed of its production. J. H. B.

SURGERY OF TRAUMA. Edited by Warner F. Bowers, Colonel, M.C., U.S.A., formerly Chief Surgical Consultant, Office of the Surgeon-General. (Pp. xxv + 605; figs. 284. 120s.) London: Lippincott, 1953.

In two world wars the American surgeons have entered the field with enthusiasm but with little experience. At first they have shown themselves to suffer from a failure of transfer from civilian practice to the stress and urgency of war. This stress and urgency is not so continuous that it does not allow time for thought and learning, and it is at this that the American surgeons have excelled in both these conflicts.

In the Second World War they arrived in many theatres of action unprepared surgically for what they were going to find, but with commendable rapidity they adjusted themselves to the new conditions and learnt, and recorded their learning in a very admirable way. This process is shown excellently in this volume of the Surgery of Trauma, which is produced by over forty authorities working in many various zones of action. Contributions are given by those who worked in Europe, both in the Northern Force and also in the Mediterranean. There are numerous reports from the Pacific and the Far East, and finally, there is the experience more recently gained in Korea. All these have been most admirably brought together under the editorship of Colonel Bowers. The book consists of four sections; the first one is on the physiological aspects of the management of trauma and contains several articles on the basic concepts of the pathology and surgery of trauma. On the whole, more emphasis is given to the morbid anatomy and morbid physiology than to detailed instructions for treatment, or even to known results of treatment during the recent war. Articles such as those on anærobic cellulitis and clostridial myositis are given in general terms and not supported by figures. True it is that figures are very difficult to be sure of even in peace time, and in war even more so, but no attempt has been made to assess the changing prognosis that the antibiotics produced.

The next section is on regional wound surgery, and is contributed by some men of quite outstanding experience and powers of expression. All the sections are clear and good, and it would be difficult to single out any for special mention. The section, however, on peripheral nerves by Barnes Woodall is a most authoritative and careful article. Unfortunately it is not supported by the beautiful illustrations which have delighted us in his other publications on the subject. Zollinger and Firak's article on the abdominal wound is, unfortunately, very short, but what there is of it is well done. The short article by Gray on chest wounds deals with the basic principles in a very succinct and helpful way. On fractures occurring in war wounds again there are short and undetailed accounts; and the opportunity is not adequately taken to describe at length the peculiar wounds of the hand produced by explosion. In all this section on regional wound surgery, while admiring the clear and precise way the information is arranged, one is somewhat disappointed to find that the articles do not contain any clear and crisp account of how a wound should be treated in such a way that it would be easy for future generations to refer for information and instruction to these pages.

Section 3 on the military consideration in wound management is a mixture of clear instructions and discussion of the basic principles underlying them.

Colonel Bowers and his team have done posterity a service which we hope posterity will be saved from the necessity of using by the courageous, wise and open-hearted activities of the post-war America.

H. W. R.

A CATALOGUE OF MEDICAL BOOKS. Published by E. & S. Livingstone. (Free from 16-17 Teviot Place, Edinburgh, 1.)

Readers of reviews in this Journal must be aware of the large part the firm of Livingstone play in medical publication in Great Britain to-day, and of the care and discrimination they display in the format of their books. They may be interested in this catalogue, which includes so many standard works in all branches of medicine.

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MICROBIOLOGY: An Introduction. By Ernest A. Gray, M.Sc., M.R.V.S. (Pp. xii + 175; figs. 25. 10s. 6d.) London: Crosby Lockwood, 1954.

THIS book may help to inform medical students and practitioners, whose knowledge of bacteriology is of necessity restricted in breadth as well as in depth, with the general aspects of the wider, but cognate, science now fashionably recognised as microbiology. This science assimilates what is still known as bacteriology, and invades the territory of the botanist and zoologist. It considers not only those bacteria and viruses important to man, but all micro-organisms, including at least protozoa and algæ, which occur throughout nature. This book is, perhaps, overloaded with detail for its length for those who would read for interest only, but with careful reading it does succeed in giving a relatively clear picture of the inter-relation of the more minute forms of life. Chapters, such as those on the micro-organisms of soil and water, will introduce many medical men to aspects of microbiology they have largely ignored.

TEXTBOOK OF MEDICINE. By Sir John Conybeare, K.B.E., M.C., D.M. (Oxon.), F.R.C.P., and W. N. Mann, M.D.(Lond.), F.R.C.P. Eleventh edition. (Pp. 925; figs. 80. 37s. 6d.) Edinburgh: E. & S. Livingstone, 1954.

THE eleventh edition of Conybeare and Mann has been published two years after its predecessor. Many of the sections have been extensively revised and brought up to date, and the textbook remains a reliable guide for student and practising doctor.

So much has been written about this textbook in the past that there is very little new that need be said. There is no doubt that it is still in the forefront of medical literature and represents one of the best books available for the student. Certain sections are outstandingly good, and among these are the sections on diseases of the kidney and endocrine glands.

It is a pleasure once again to recommend this textbook both to student and practitioner as a thoroughly reliable and up-to-date guide for the practice of medicine. D. A. D. M.

THE FOUNDATIONS OF SURGERY. By George Perkins, M.C., M.Ch., F.R.C.S. (Pp. 244. 10s.) Edinburgh: E. & S. Livingstone, 1954.

IN this delightfully written little book Professor George Perkins has set out to help the student through his first difficult months in the surgical wards. The tone is set in the preface, in which he says: "The title is intentionally grandiose in order that a first-year student need not be ashamed to be seen reading it in a train. It should, of course, be called 'Surgery for Toddlers.' "

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TEXTBOOK OF CHIROPODY. By Margaret J. McKenzie Swanson, B.Litt., F.Ch.S. Second edition. (Pp. viii + 268; figs. 160. 22s. 6d.) Edinburgh: E. & S. Livingstone, 1954.

PRACTITIONERS of medicine may be interested in the work undertaken by chiropodists, and this book, written for chiropody students, will indicate in what conditions the assistance of a chiropodist is likely to be of most value. The book is well produced, with a wealth of excellent photographs.

SURGERY OF THE CÆCUM AND COLON. By Stanley Aylett, M.B.E., M.B., B.Sc., F.R.C.S. (Pp. vii + 295; figs. 142. 45s.) Edinburgh: E. & S. Livingstone, 1954.

THIS is a most interesting and informative book, and it is one which will fill a genuine gap on the over-burdened bookshelves of medical literature. It covers all the surgical diseases of the colon. The descriptions of the signs, symptoms and diagnosis, the pre- and post-operative treatment are lucid and written in a fluent style. On reading the book one gets the impression that the main attention is being paid to operative technique, and the step-by-step descriptions of the various operations will make it an invaluable work for the young surgeon about to embark on the mysteries of the abdomen.

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