and 1891 the persons living in one room fell from 30·4 per cent. to 18·0 per cent. of the total population, whereas those living in two and three-room dwellings rose exactly in the same proportion as those in the one-room had fallen—namely, from 54·7 per cent. to 67·2 per cent. of the total population.

TABLE V.—*Showing Proportion of Persons to Rooms in Glasgow from 1871 to 1891.*

Dwellings of	Census, 1871.	Difference, 1871 to 1881.	Census, 1881.	Difference, 1881 to 1891.	Census, 1891.	Difference, 1871 to 1891.
One room	30·4	- 5·7	24·7	- 6·7	18·0	- 12·4
Two rooms	41·5	+ 3·2	44·7	+ 2·8	47·5	+ 6·0
Three rooms	13·2	+ 2·8	16·0	+ 3·7	19·7	+ 6·5
Four rooms	5·8	+ 0·3	6·1	+ 1·1	7·2	+ 1·4
Five rooms and upwards	9·1	- 0·6	8·5	- 0·9	7·6	- 1·5
—	100·0	—	100·0	—	100·0	—

A Clinical Lecture

ON

THE STATISTICS OF GASTRIC ULCER, WITH SPECIAL REFERENCE TO GASTRIC HÆMORRHAGE, ITS FREQUENCY AND FATALITY.

*Delivered at the Edinburgh Royal Infirmary on
Feb. 12th, 1901.¹*

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GENTLEMEN,—On Wednesday last Mr. Mayo Robson delivered an "Address on Gastric Hæmorrhage and its Surgical Treatment" before the Medico-Chirurgical Society of Edinburgh. In that address he advanced certain conclusions with regard to the total mortality caused by gastric ulcer and the frequency of death from hæmorrhage in cases of gastric ulcer which are not in accordance with my own experience—and my experience of gastric ulcer is considerable—and which demand, I think, very serious consideration before they are accepted by the profession. The question is one of great practical importance, for if the mortality from hæmorrhage in gastric ulcer is as great as Mr. Mayo Robson supposes it to be, and if his deliberately expressed opinion that operative procedure should be adopted "after a second bleeding, even during the course of the hæmorrhage if the patient can stand it, or as soon after as his condition will permit the operation to be done," is accepted and acted upon, operations for the arrest of hæmorrhage in cases of gastric ulcer will become of everyday occurrence, with, I fear, unless the mortality from such operative procedure should in the future become very much less than it is at present, an increase rather than a decrease of the mortality. I express this opinion, however, with diffidence, for I fully recognise the fact that "gastric surgery is advancing in safety and efficiency with leaps and bounds," and I feel grave hesitation in expressing an opinion on a question which is to some extent a surgical one in opposition to Mr. Mayo Robson who is justly regarded as one of the greatest living authorities on surgical questions of this kind.

Mr. Mayo Robson's conclusions as to the frequency of gastric ulcer, the fatality of gastric ulcer, and the frequency

and fatality of hæmorrhage in cases of gastric ulcer are based on a series of statistics which have from time to time been published by leading authorities on the diseases of the stomach. The figures (percentage mortalities) given by these authorities vary very greatly. In arriving at his results Mr. Mayo Robson has taken the mean of the figures—in my opinion an unreliable method of calculation, or rather he seems to have taken the mean of the extremes, which in this case is a most unreliable method, for some of the figures (the maximum figures) which he quotes were published more than 40 years ago and certainly do not correctly represent the mortality of the disease or the frequency with which death from hæmorrhage in gastric ulcer occurs either in hospital or in private practice at the present time. No one, for example, who has an extensive clinical experience of gastric ulcer will, I fancy, agree with the following conclusions of Brinton—viz.: that the liability to ulcer of the stomach increases with the age of the patient and reaches its maximum at the extreme age of 90 years; that gastric ulcer only undergoes a spontaneous cure in 50 per cent. of the cases; and that the mortality (direct and indirect) in all cases of gastric ulcer from all causes is consequently 50 per cent.²; or with Müller's statistics, published in the year 1860, which show that 11 per cent. of all cases of ulcer of the stomach die from hæmorrhage.³

It is unnecessary to tell you, gentlemen, that statistics, unless the data on which they are compiled are absolutely reliable, are apt to lead to very erroneous conclusions; and I venture to think that there is perhaps no subject in the whole range of medicine on which the statistics are more uncertain than the subject of gastric ulcer. This is due to the circumstance that the data on which many of the statistics relating to gastric ulcer are largely based are not facts but merely deductions and conclusions from facts, and that the facts themselves on which these deductions and conclusions are founded are in some cases matters of inference rather than of certainty. Further, some of the mortality percentages were published many years ago. The statistics of gastric ulcer require, I think, careful re-investigation and re-consideration.⁴ In this lecture I propose to direct your attention to some of the fallacies connected with these statistics and to try to show that Mr. Mayo Robson has considerably over-estimated the total mortality from gastric ulcer and the mortality from hæmorrhage in gastric ulcer. And here I would ask you to note that I limit my remarks to simple (round or perforating) ulcer of the stomach. I do not refer to simple (round or perforating) ulcer of the duodenum; for although the differential diagnosis is sometimes, I believe, impossible and in many cases attended with difficulty, the two conditions seem to me to present certain differences from a clinical point of view, which, when one is considering the total fatality, the risk of fatal hæmorrhage, and the advisability or non-advisability of operative interference, make their separate consideration, probably, advisable; but I reserve my final opinion on this point.

THE FREQUENCY OF GASTRIC ULCER IN THE GENERAL POPULATION.

We have no certain knowledge as to the frequency with which gastric ulcer occurs in the general population. The usual estimate which is accepted by all authorities is that 5 per cent. of the whole population suffer at some period of their lives from simple (round or perforating) ulcer of the stomach. Consequently, on this estimate, in a city of the size of Leeds, with, say, 500 000 inhabitants, 25,000 persons may be supposed to have, or to have had, gastric ulcer. This estimate of 5 per cent. for the whole population may be

² So far as I know, Brinton does not anywhere state that the direct mortality from gastric ulcer is 50 per cent. What he does state in different parts of his treatises on Ulcer of the Stomach and Diseases of the Stomach is that "in 50 per cent. of the cases the ulcer undergoes a spontaneous cure" (p. 140), that "in 13 per cent. of the cases of gastric ulcer death is due to perforation" (p. 144), that "in 3–5 per cent. of the cases of gastric ulcer death is due to hæmorrhage" (p. 153), that "in 3, 4, or 5 per cent., even in middle-aged persons, exhaustion is evidently the chief (if not the sole) cause of death" (p. 154), and that "in about 30 per cent. of all cases of gastric ulcer it is probable the lesion gives rise to a process of marasmus or partial exhaustion which anticipates, hastens, or increases that failure of the nutritive functions which is one of the most essential elements of death in old age" (p. 155).

³ Das Corrosive Geschwür im Magen und Darmkanal, 1860, p. 91.

⁴ I propose to invite the registrars and pathologists of the large hospitals throughout the country to join me in a collective investigation of the whole subject.

¹ Some figures and calculations have been added by Dr. Bramwell.

correct; I neither affirm nor deny its correctness, although I am disposed to think, for reasons which I will presently give you, that it is probably an exaggerated estimate; but what I do say is that the statistics and deductions on which it is based are open to so many uncertainties and sources of fallacy that it can only be accepted as a rough estimate, about which there must necessarily be considerable difference of opinion and uncertainty.

The frequency of gastric ulcer in the population generally has been (approximately) arrived at in two ways—viz.: 1. By observing the frequency with which open gastric ulcers and the cicatrices of former gastric ulcers are met with in the bodies of persons examined post mortem—if, for example, in 10,000 bodies examined post mortem open ulcers are found in 150 cases and cicatrices in 350 other cases, it is concluded that 500 of the 10,000 persons examined post mortem, or 5 per cent., have at some period or other of their lives suffered from gastric ulcer. 2. The frequency with which gastric ulcers are diagnosed in a given number of patients suffering from various diseases examined during life.

A. *The post-mortem method.*—The post-mortem method is the more reliable of the two and it is the one on which the usually accepted estimate of 5 per cent. for the whole population is based. In 32,052 necropsies made in Prague, Berlin, Dresden, Erlangen, and Kiel (collated and analysed by H. W. Welch⁵), there were found 1522 cases of open ulcer or of cicatrix (presumably the result of former gastric ulcer) in the stomach. Therefore, ulcer of the stomach had occurred in 4·7 per cent. (say, roughly, 5 per cent.) of these 32,052 patients.

Objections to the post-mortem method.—In my opinion, the post-mortem method of calculation is open to the following fallacies and objections.

1. All open ulcers are not found. It is obvious that unless the stomach is carefully examined in all cases there is a serious source of error here—e.g., the number of ulcers will be under-estimated. I do not know whether in the cases analysed by Welch the stomach was systematically examined in all cases, but from the thorough way in which post-mortem examinations have for many years been conducted in Germany we may take it, I think, that this was so, at all events in the more recently examined cases.⁶ Consequently this source of error may probably be disregarded, though it is certain, I think, even granting that the stomach was examined in all cases, that in the 32,052 cases collated and analysed by Welch the total number of open ulcers was under-estimated rather than over-estimated.

2. The cicatrices of former ulceration are often missed. This is probably a serious source of error, for unless the stomach is very carefully examined cicatrices, more especially the cicatrices of small and superficial ulcers, are very apt to escape observation. That this is so is clearly shown by the observations of Grünfeld.⁷ He examined 1150 bodies of persons over 50 years of age in Copenhagen (where gastric ulcer appears to be unusually common). In these 1150 cases cicatrices of gastric ulcers were present in 124 cases, or 11 per cent. In 700 post-mortem examinations in which the cicatrices were not very particularly looked for they were found in 32 cases, or 4·8 per cent; while in 450 cases in which they were particularly looked for cicatrices were found in 92 cases, or 20 per cent. The relative proportion of cicatrices to open ulcers found by different observers varies very considerably.⁸

⁵ Pepper's System of Medicine, vol. ii., p. 482.

⁶ The Prague statistics, which include 11,888 of the 32,052 cases collated and analysed by Welch, are very old (1844, 1853, 1854); they are, however, the data on which most British authorities have based, or very largely based, their conclusions with regard to the frequency of stomach ulcer. The post-mortem statistics from hospitals in this country are, for the most part, useless for determining the frequency of gastric ulcer, for until comparatively recently, at all events, in many hospitals it was not the custom to make a careful examination of the stomach in all cases examined post mortem.

⁷ Schmidt's Jahrbuch, 1883, Band 198, p. 141.

⁸ Brinton (On Ulcer of the Stomach, p. 20) placed it at one to one. "In 11,888 cases (collated and analysed by Welch, see Pepper's System of Medicine, vol. ii., p. 482) examined in Prague by Jaksch, Dittich, Willigk, and Eppinger, there were 164, or 1·4 per cent., open ulcers, and 373, or 3·1 per cent., cicatrices." In 1658 necropsies Greiss (quoted by Quincke, Deutsche Medicinische Wochenschrift, Feb. 4th, 1882, p. 80) found ulcers or scars in 138 cases, 31 open ulcers, and 103 cicatrices (? four cases both). In 3085 necropsies Steiner (Virchow and Hirsch's Jahresbericht, 1868, p. 125) found ulcers or scars in 110 cases, open ulcers in 56 cases, and cicatrices in 64 cases (and in 10 cases both open ulcers and scars). In 1230 necropsies Wollmann (Virchow and Hirsch's Jahresbericht, 1868, p. 126) found 48 ulcers or scars, 16 open ulcers, 18 scars, 12 both ulcers and scars (two cases not explained).

In calculating the percentage with which gastric ulcer occurs in patients examined post mortem the usual estimate is to give the ratio of cicatrices to open ulcers as three to one; but because of the fact that small and superficial cicatrices are apt to be missed unless very carefully and specially looked for there is much uncertainty as to the correctness of this ratio.

3. It is, I think, open to doubt whether a superficial ulcer in the stomach, when it heals, necessarily leads to the production of a cicatrix, or at all events of a cicatrix which is easily detected after death. This is, I think, a practical point of great importance, for if it is allowed that ulcers of the stomach sometimes heal without leaving obvious or easily recognisable cicatrices it is clear that in this fact there may be a very serious source of error.

In Edinburgh ulcer of the stomach is a very common disease clinically; the majority of patients suffering from gastric ulcer admitted to the Royal Infirmary are anæmic young women; hæmatemesis occurs in a very large percentage of cases; but I think I am correct in saying that the cicatrices of ulcers are, relatively to the great clinical frequency of the disease, comparatively rarely found in the bodies of patients examined post mortem. (I have not yet had time to go over the post-mortem records and get the exact figures.) Even allowing for the fact that the attention of our pathologists may not have been particularly directed to the detection of cicatrices in the stomach, I am disposed to think, from my own observations, both clinical and pathological, that ulcer of the stomach (judging from the number of well-marked and undoubted cases which one sees in the wards of the hospital during life) is very much more frequent in the patients admitted to our infirmary than the records of our post-mortem examinations would seem to show. I doubt whether the difference can be altogether or satisfactorily explained by the fact that the scars are often missed on post-mortem examination. It seems to me extremely reasonable to suppose that a superficial ulceration of the stomach, attended with all the characteristic symptoms of gastric ulcer during life, may heal, if carefully treated for a sufficient length of time in its earlier stages, without leaving behind it any obvious or any easily recognised result in the form of a cicatrix. It is not improbable, I think, that ulceration of the stomach as we see it in young anæmic (chlorotic) women not infrequently pursues this course. This supposition seems to receive some confirmation from the following facts: (1) that a large majority of the patients who are admitted to hospital (I refer to hospitals generally and not merely to the Edinburgh Royal Infirmary) suffering from gastric ulcer are women; and (2) that in the female patients admitted to hospitals suffering from gastric ulcer the percentage mortality is considerably less than in the male patients. In other words, in hospital in-patients gastric ulcer is a more fatal disease in the male than in the female.

I am disposed to think that gastric ulcer in the young (chlorotic) female is, on the whole, a less serious and fatal disease than in men—though I, of course, admit that in a considerable percentage of cases gastric ulcer in anæmic young women leads to the production of perforation and is the cause of very profuse hæmorrhage; in other words, that in many instances in anæmic young women the ulcers are deep and not superficial. I suggest that the explanation is probably afforded by the fact that in young chlorotic females the ulceration is not infrequently superficial. I am further disposed to think that, in some cases at all events, the anæmia plays a part in the production of the ulceration, that the persistence of the anæmia interferes with the healing of the ulcer, and that the disappearance (cure) of the anæmia tends materially to promote the healing of the ulcer.

4. Another objection which has been advanced against the post-mortem method by Welch⁹ is "that it is not proven that all of the cicatrices found in the stomach are the scars of healed simple ulcers and that, in fact, it is probable that many are not." I do not myself attach any great importance to this objection; the scars in the stomach which result from other causes than simple (round or perforating) ulcer—such, for example, as syphilitic gummata, erosions and ulcerations—the result of irritant poisoning, tuberculous ulceration—are probably not sufficiently numerous to be a practical source of error or seriously to invalidate the figures.

I am disposed to think, then, for the reasons advanced

⁹ Pepper's System of Medicine, vol. ii., p. 482.

above (more especially under headings 2 and 3), that in the 32,052 persons examined post mortem in Prague, Berlin, Dresden, Erlangen, and Kiel (collated and analysed by Welch) a larger number than 5 per cent. had in all probability suffered at some period or other of their lives from gastric ulcer. But it does not necessarily follow from this statement that in my opinion a larger number than 5 per cent. of hospital patients examined post mortem in this country at the present time suffered from ulcer of the stomach.

THE FREQUENCY OF GASTRIC ULCER IN THE GENERAL COMMUNITY.

So much, then, for the post-mortem method as applied to hospital patients. Let us now see how this method has been applied to the general population. All authorities, in this country at all events, have, so far as I know without exception, concluded that because a certain percentage of persons who were examined post mortem in hospitals (usually estimated at 5 per cent.) have, at some period or other of their lives, suffered from gastric ulcer, therefore, that the same percentage (5 per cent.) of the general population will, at some period or other of their lives, suffer from gastric ulcer.

It is important to remember that the patients who are examined post mortem in hospitals are for the most part adults (or at all events over five years of age), that the post-mortem examinations on which the statistics on which the 5 per cent. estimate is based were made in German hospitals, and that a considerable proportion of these post-mortem examinations were made more than 40 years ago. Consequently, the deduction which has been drawn by, so far as I know, all authorities in this country, at all events up to the present time, is—that because 5 per cent. of persons who were examined post mortem in German hospitals, the great majority of whom were (presumably) adults, and a considerable proportion of whom lived more than 40 years ago, suffered from ulcer of the stomach, therefore 5 per cent. of the whole population of this country at the present time are suffering from, have suffered from, or will suffer from, gastric ulcer.

Such a conclusion is, I venture to think, altogether unwarranted. In the first place, it is by no means certain that the prevalence of gastric ulcer in this country at the present time is the same as the prevalence of gastric ulcer was in Germany when a considerable part of the statistics collected by Welch were compiled, or even at the present day. It seems certain that gastric ulcer is more prevalent in some countries than in others, and in some parts of the same country than in other parts. Gastric ulcer seems, for example, to be (or was when Grünfeld's observations were made) extremely prevalent in Copenhagen. It seems to be less prevalent in America than in this country. It is said to be very rare in some parts of Russia. It is certainly very common in young chlorotic women in Edinburgh. The disease (and especially the gastric ulcer of chlorotic young women) is probably more common in urban than in rural districts. Further, it is not unnatural to suppose (although so far as I know there are no recorded observations or statistics to prove this) that, owing to differences in dietary, occupation, and mode of life generally, the frequency of gastric ulcer at the present time is different to what it was 40 or 50 years ago. But this objection to the application of the hospital results to the population generally is one to which I attach comparatively little importance. I pass to other objections which are, in my opinion, of much greater weight.

The second objection is that in the class of patients who are examined post mortem in hospitals gastric ulcer is very much more prevalent than in the middle and upper ranks of society, and probably more prevalent than in the same class of persons living in the rural districts (the hospital patients are, of course, for the most part drawn from the towns). Consequently, to conclude because 5 per cent. of the persons who are examined post mortem in hospitals have suffered from ulcer of the stomach that 5 per cent. of the whole population will suffer from ulcer of the stomach seems to me altogether unjustifiable.

The third objection is that (though I speak subject to correction on this point) the post-mortem statistics on which the usual estimate of 5 per cent. is based included very few children under five years of age. Now ulcer of the stomach (I refer to the round perforating ulcer) is, practically speaking, unknown in children under five years of age; but children under five years of age form a very considerable proportion (approximately 13 per cent.) of the

whole population. Therefore, to conclude because 5 per cent. of the persons examined post mortem in hospital, the great majority of whom were (so far as I know) over five years of age, had suffered from gastric ulcer, that 5 per cent. of the whole population (a considerable proportion of whom—approximately 13 per cent.—are children under five years of age) suffer from gastric ulcer is certainly erroneous.

In the fourth place, it cannot, I think, be doubted that the percentage of patients who die from gastric ulcer is much larger in hospitals than outside hospitals. In Leeds, for example, last year 16 deaths were registered as due to gastric ulcer, one as the result of duodenal ulcer, and six from hæmatemesis, some of which (say four) were perhaps the result of gastric ulcer. Of these 20 deaths, presumably due to gastric ulcer, eight occurred in the General Hospital and one in the Fever Hospital. But of the eight patients who died in the General Hospital three came from districts outside Leeds. Now, even allowing for greater accuracy of certification in the hospital deaths, the proportion of deaths from gastric ulcer in hospital as compared with private practice is enormous if one considers the relative number of cases of gastric ulcer which were treated during the year in Leeds, in the hospitals and outside the hospitals respectively. Further, a large proportion of the patients who die from gastric ulcer in hospitals are examined post mortem. Consequently the percentage of hospital patients who are estimated to have suffered from gastric ulcer will (because of the manner in which this percentage is determined—viz., by multiplying the number of open ulcers which are found in the bodies of hospital patients examined post mortem by the number 3, which is supposed to represent the number of cicatrices which occur to every open ulcer) be unduly large, and will be very much larger than the percentage of the general public outside hospitals who are suffering from, have suffered from, or will suffer from, gastric ulcer.

I repeat that we have no certain means of saying what proportion of the *whole* population suffer from gastric ulcer. The 5 per cent. estimate, which is accepted by all authorities, may or may not be correct; but the data on which this estimate is based are very uncertain. Consequently the estimate of 5 per cent. for the whole population can only, at the best, be taken as approximately accurate and is, in my opinion, probably excessive.

B. *The clinical method.*—This method is even less satisfactory than the post-mortem method. The number of cases of gastric ulcer in a given number of clinical cases is subject to great variations in accordance with the facts—whether the patients are hospital or private patients; whether they are in-patients or out-patients; with the locality—whether gastric ulcer is common or rare in the district; with the nature of the hospital—whether the patients are chiefly medical or chiefly surgical; whether the hospital is large or small in proportion to the population from which it receives its patients; whether the patients are chiefly males or chiefly females; whether they are chiefly adults or children, &c. And in the practice of individual physicians the number of cases of gastric ulcer which are diagnosed in a given number of clinical cases will vary and depend on many of the same factors as in hospital practice (the age, sex, occupation, station in life of the patients, locality, &c.), and whether the physician who makes the observations is engaged in general or in consulting practice, whether he has a special reputation for the treatment of stomach diseases, &c. Further, the nature of the symptoms which are considered necessary to warrant a definite diagnosis of a gastric ulcer varies in the case of different observers. A physician who considers that it is, speaking generally, hazardous definitely to diagnose a gastric ulcer in the absence of hæmatemesis will meet with far fewer cases of gastric ulcer than another physician who is in the habit of frequently diagnosing gastric ulcer in the absence of hæmatemesis. Further, after a given number of cases of gastric ulcer have been diagnosed in a given number of patients, there are, so far as I know, no reliable figures for enabling us to determine the exact frequency with which gastric ulcer will occur in the population generally. As a matter of fact, different statistics regarding the frequency of gastric ulcer, in proportion to other diseases met with in clinical practice, present great variations even in the practice of the same physician—in other words, in cases in which the diagnostic difficulty (the question as to what symptoms justify a diagnosis of gastric ulcer) may be disregarded. Thus in my own case the proportion of gastric ulcers to other cases of disease differs

very materially amongst in-patients in Edinburgh and in Newcastle (this is chiefly due to the facts that in Edinburgh I had for several years no male beds and that in Newcastle the number of beds to the population which the hospital supplied was, at the time when I was associated with the Newcastle Infirmary, very much more limited than it is in Edinburgh; consequently in Newcastle we were rarely able to admit any but the most severe cases); between in-patients and out-patients in the Edinburgh Royal Infirmary; and between out-patients in the Edinburgh Royal Infirmary and patients seen in private (consultation) practice. The figures are as follows. In 17,226 cases of general medical diseases of which I have kept notes, seen either in hospital or in private practice, there were 202 cases of gastric ulcer = 1.1 per cent., or, if the Edinburgh in-patients are omitted, in 14,681 patients there were 108 cases of gastric ulcer = 0.73 per cent. Thus, in 2545 in-patients in the Edinburgh Royal Infirmary there were 94 cases, or 3.69 per cent. In 893 in-patients in the Newcastle-on-Tyne Infirmary there were five cases, or 0.55 per cent. In 7665 out-patients seen at the Edinburgh Royal Infirmary there were 76 cases, or 0.99 per cent. In 6123 cases seen in private (consulting) practice there were 27 cases, or 0.44 per cent.¹⁰

THE TOTAL FATALITY FROM GASTRIC ULCER.

It is extremely difficult to draw exact and reliable conclusions as to the total mortality which is directly due to gastric ulcer and its different complications and as to the frequency with which death from hæmorrhage occurs in cases of gastric ulcer. If hospital cases are taken as the basis of the calculation the objection at once occurs that many of the worst cases which occur in a community are sent into hospital, more especially when perforation has occurred or alarming hæmorrhage has developed. Consequently it is erroneous to estimate the mortality in all cases of gastric ulcer from the mortality which occurs amongst the in-patients of a hospital. On the other hand, it must be remembered that, provided that death does not occur within the first few days after admission, death very rarely occurs amongst medical in-patients. My experience in the Edinburgh Royal Infirmary shows that the worst cases of gastric ulcer, with very few exceptions, rapidly improve under appropriate treatment in hospital. Again, it must be remembered that one cannot take the exact percentage of cases which are discharged from hospital as cured as actually cured in all cases. Many of the cases which are discharged as cured are no doubt only greatly improved. Some of the cases discharged as cured relapse soon after their discharge; in these cases the ulcer was no doubt imperfectly cicatrised. Others relapse after a varying period of months or years. In those cases in which there were no gastric symptoms for a considerable period of time after the patient's discharge from hospital it is reasonable, I think, to conclude that the ulcer was cured at the time of the patient's discharge, and that after a time it broke out again or a new ulcer developed; and in estimating the total percentage mortality of gastric ulcer cases of this kind should probably, I think, be regarded as new cases—new ulcers.

The results obtained from the treatment of in-patients in hospital must in many cases be regarded as merely applicable to the treatment of cases of gastric ulcer during a certain, and it may be a very limited, period of their course. In those cases in which the patient is discharged before the ulcer is completely and firmly cicatrised death may, of course, occur during some subsequent period of their course. Hence to argue that because in 100 cases of gastric ulcer treated in hospital 90 were cured, seven were discharged *in statu quo*, and three died, the total mortality from gastric ulcer, in hospital in-patients, is only 3 per cent., is, of course, erroneous. But since the great majority of severe and

aggravated cases of gastric ulcer which are admitted to the medical wards of a hospital (provided that the patients do not die within the first few days after their admission) rapidly improve and are in the course of a short time discharged as "cured," it is reasonable, I think, to conclude that, if the treatment had been carried out for a sufficient length of time, many of the cases which are imperfectly cured at the time of their discharge would also have been completely cured.

The mortality percentages for gastric ulcer given by different authorities are for the most part based on hospital statistics. The percentages of different authorities differ very materially. The older percentages, such, for example, as those of Brinton, based on results obtained more than 40 years ago, cannot, and should not, be taken as representative of the results of treatment and as indicating the mortality at the present time.¹¹ Mr. Mayo Robson, after stating that, "according to Brinton, Habershon, Müller, Dreschfeld, Lebert, and others, the mortality from all causes in all cases of ulcer is from 10 to 50 per cent.," takes the mean estimate of mortality as 25 per cent. (or, rather, he seems to have taken the mean of the extremes), though he states "that this is under the mean given by the authorities named," and concludes "that in a city of the size of Leeds, say, with a population of 500,000 inhabitants, 6250 persons may be expected to die from gastric ulcer or some of its complications." In other words, in the city of Leeds, with, say, a population of 500,000 persons, one in every 80 persons will die from ulcer of the stomach or some of its complications. But since children under five years of age very rarely, if ever, die from gastric ulcer, and since in a population of 500,000 children under five years of age form (approximately) 13 per cent. of the whole population, 6250 persons in 435,000 (which represents the population of Leeds, stating it at 500,000 *minus* the 65,000 children of Leeds under five years of age) will die from gastric ulcer; or one in every 69 persons over five years of age will, according to Mr. Mayo Robson, die from ulcer of the stomach.

Again, to put the matter in another way, the annual death-rate of persons (males and females) in Leeds was last year 20.05 per 1000. Consequently, the whole of the population of Leeds (estimated at 500,000) will be exhausted by death in 49.87 years. Therefore, the average annual mortality in Leeds from gastric ulcer will, according to Mr. Mayo Robson, be 6250 divided by 49.87 = 125 per annum. Or, again, the death-rate being 20.05 per 1000 per annum, it may be assumed that the same proportion holds as regards those who die from gastric ulcer, that is, 6250 multiplied by 0.02005 = 125 deaths per annum from gastric ulcer. But the death-rate in Leeds last year was in persons over five years of age 13 per 1000,¹² therefore (taking this death-rate as the usual standard) the annual average death-rate from gastric ulcer in persons over five years of age would be $0.013 \times 6250 = 81.25$. According to Mr. Mayo Robson, therefore, 81.25 persons above five years of age will on an average die from gastric ulcer in Leeds (estimating the population at 500,000) every year (granting, of course, that the total deaths (6250) are equally spread over 49.87 years).

Now what are the actual facts? My friend Dr. J. Spottiswoode Cameron, medical officer of health of Leeds, has kindly furnished me with the exact number of deaths which were registered as occurring in Leeds last year from gastric ulcer and duodenal ulcer. The number is 17. Of these 17 deaths eight occurred in the General Hospital and one in the Fever Hospital; three of the 17 deaths which occurred in the General Hospital were deaths of persons who came from outside of Leeds (from Ilkley, from Mosley, and from Gomersal respectively). So that as a matter of actual fact 14 deaths were registered as occurring in Leeds proper last year from gastric ulcer. In addition six deaths were registered from hæmatemesis (three between 25 and 30 years of age, two

¹⁰ Lebert (Krankheiten des Magens, p. 196) found in 41,688 medical cases studied clinically 252 cases of gastric ulcer = 0.6 per cent. In 35,692 cases admitted to the medical wards of the Edinburgh Royal Infirmary (figures kindly furnished by the medical registrar, Dr. A. L. Gillespie) during eight years (from 1892 to 1899 inclusive) there were 803 cases of gastric ulcer = 2.2 per cent. In 42,219 patients admitted to the medical wards of the Charité Hospital, Berlin (Charité Annalen) during the 10 years 1888-89 to 1897-98, there were 555 cases of gastric ulcer = 1.07 per cent. In 116,323 medical and surgical cases admitted to the K. K. hospitals in Vienna and the hospitals of Lower Austria (Reports of these hospitals) during the years 1893 and 1894, there were 433 cases of gastric ulcer = 0.37 per cent. And in 455,842 medical and surgical cases admitted to the same hospitals during the years 1895, 1896, and 1897, there were 1117 cases of gastric ulcer, duodenal ulcer, and perforative peritonitis from round ulcer (the numbers for each are not specified) = 0.24 per cent.

¹¹ Brinton's statistics, too, are open to the serious objection that a considerable proportion of the cases on which they were based were individual cases ("many hundreds of scattered cases, but always verified by careful necropsy, by scarcely less numerous observers"), which he (Brinton) had collected from journals and reports (British and foreign), as well as hospital museums. Statistics as to the total mortality of cases of gastric ulcer, based on such data, do not represent the total mortality in all cases of the disease.

¹² The population of Leeds last year was 431,287, or, excluding children under five years of age, say, 375,000. The death-rate per 1000 was 20.05. The deaths in 52 weeks ending Saturday, Dec. 29th, were 8619; of these, 3746, or 43.4 per cent., occurred in children under five years of age, and 4873, or 56.6 per cent., occurred in persons over five years of age. Therefore the death-rate per 1000 in persons over five years of age was 3.

between 40 and 50 years of age, and one between 70 and 80 years of age). Some of these deaths, perhaps the three between 25 and 30, were from gastric ulcer. Supposing that four of the six deaths registered as hæmatemesis were due to gastric ulcer (round, perforating ulcer)—and this is making a very liberal allowance—the total deaths from gastric ulcer in Leeds proper last year would be 18. But the population of the Leeds district from which these 14 deaths from gastric ulcer and four from hæmatemesis (which were perhaps gastric ulcer) were derived was 431,287 instead of 500,000. Therefore, in Leeds, if the population had been 500,000, 20·8 deaths would have been registered as due to gastric ulcer last year.

I am, of course, aware that the number of deaths from gastric ulcer varies, in the same city or hospital, sometimes very materially, from year to year; that small numbers are apt to be fallacious, and that the cause of death as registered does not in many instances accurately represent the true cause of death—peritonitis, for example, is not infrequently returned as the cause of death in cases in which the death is really due to the perforation of a gastric ulcer; some of the deaths returned as due to anæmia and cancer are probably, as Dr. Cameron has pointed out to me, due to gastric ulcer; on the other hand, some of the deaths registered as gastric ulcer are, perhaps, due to cancer; some deaths due to gastric ulcer are no doubt, also, returned as due to exhaustion. But, making ample allowance for these sources of fallacy, the difference between 20·8 (the actual number of deaths registered as resulting from gastric ulcer *plus* four out of the six deaths registered as hæmatemesis and taking the population of Leeds at 500,000) and 81·25 (the number estimated by Mr. Mayo Robson), is, I think, sufficiently great to prove that Mr. Mayo Robson's conclusions regarding the total mortality in Leeds from gastric ulcer must be incorrect. Most modern authorities who have carefully investigated the total mortality from gastric ulcer place it at from 8 to 15 per cent.: Dreschfeld,¹³ for example, who gives no estimate of his own, quotes Lebert's estimate, viz., 10 per cent.; Welch,¹⁴ who thinks Lebert's 10 per cent. too low, says "perhaps 15 per cent. would be more correct;" and Riegel¹⁵ places it from 8 to 10 per cent.

THE FATALITY OF HÆMORRHAGE IN CASES OF GASTRIC ULCER.

Mr. Mayo Robson's conclusions with regard to the frequency with which fatal hæmorrhage occurs in cases of gastric ulcer also, I think, require correction. He states: "Hæmorrhage, which according to different authorities occurs in greater or less degree in 50 to 80 per cent. of all cases of gastric ulcer, and is, according to various authorities, fatal when medically treated in from 11 to 3 per cent. (Müller, 11 per cent.; Welch, from 3 to 5 per cent.; Brinton, 5 per cent.; Debove, 5 per cent.; Steiner, 6·36 per cent.; Lebert, 3 per cent.; Dreschfeld, 3½ per cent.; and Rodman, 8 per cent.). If we take the average, 7 per cent. of deaths in cases of gastrorrhagia from gastric ulcer will not be far from the truth."¹⁶ If this is worked out in the population of a city like Leeds it means that of the 25,000 persons who have or had ulcer 12,500 suffer from hæmatemesis, and of these 7 per cent., or 875, die." There is, it seems to me, a serious error here, for the percentages of death from hæmorrhage which Mr. Mayo Robson quotes from different authorities,¹⁷ with, so far as I have been able to ascertain, the exception of Rodman,¹⁸ refer not to the percentage of deaths in those cases of gastric ulcer in which hæmorrhage occurs (which Mr. Mayo Robson estimates at 50 per cent. of the whole), but in the total number of cases of gastric ulcer. If, therefore, 7 per cent. of all cases of gastric ulcer die from hæmorrhage Mr. Mayo Robson's figures will have to be doubled; in other words, in a population like Leeds, say, of 500,000, 1750 will die from hæmorrhage.

¹³ Clifford Allbutt's System of Medicine, vol. iii., p. 541.

¹⁴ Pepper's System of Medicine, vol. ii., p. 502.

¹⁵ Nothnagel's Speciell Pathologie, vol. xvi., p. 697.

¹⁶ 7 per cent. does not represent the mean of the percentages quoted but the mean of the extremes.

¹⁷ As regards Lebert and Steiner I speak subject to correction, but I have little doubt that the same statement applies also to their percentages.

¹⁸ Rodman's statement is: "Hæmatemesis occurs in at least 50 per cent. of all cases of gastric ulcer, and many authorities estimate it as present in 80 per cent. It is, too, fatal in 8 per cent. of the cases in which it occurs, according to the conservative estimate of Leube, and we cannot question that it is indirectly fatal in a much greater number of cases by anæmia and its remote consequences."—The Journal of the American Association, June 16th, 1900, p. 1509.

And if this number is spread over 49·87 years (in accordance with the estimate that 20·05 per 1000 of the population die in Leeds every year), and if children under five years of age are deducted, the deaths per annum in Leeds from hæmorrhage in gastric ulcer will, according to Mr. Mayo Robson, be on the average 1750 multiplied by 0·013 = 22·75. As a matter of fact, three deaths were registered as occurring last year in Leeds from hæmorrhage in gastric ulcer. If we add to these four of the six deaths which were returned as hæmatemesis and which were perhaps gastric ulcer we have a total of seven deaths from hæmorrhage in gastric ulcer. Consequently, after correcting the figures (since the population of Leeds last year was not 500,000 but 413,287), the number of deaths from hæmorrhage in gastric ulcer in Leeds, if the population had been 500,000, would (including the hæmatemesis cases which were perhaps gastric ulcer) have been 8·1.

Errors of registration are perhaps less likely to occur in the case of hæmorrhage than in the case of perforation. It is true that in cases of gastric ulcer death occasionally results from internal hæmorrhage without any external discharge of blood in the form of hæmatemesis or mæna, but these cases are so exceptional that for practical purposes they may be disregarded. Some deaths due to hæmorrhage in gastric ulcer are returned as hæmatemesis (I have amply allowed for these), and others perhaps as exhaustion, anæmia, &c. The disproportion between the 8·1 deaths, the actual number which were returned as due to hæmorrhage in gastric ulcer, last year in Leeds (calculating the population at 500,000), and the 22·75 deaths which, according to Mr. Mayo Robson (if I am right in thinking the percentages which he quotes, with the exception of Rodman's, refer to all cases of gastric ulcer), ought to have occurred from this cause is very considerable. Physicians who have had large experience in gastric ulcer will, I fancy, agree with me in thinking that, although the condition of the patient is often most alarming, death from hæmorrhage in cases of gastric ulcer very rarely occurs, and that even in those cases in which repeated hæmorrhages occur it is only in comparatively few cases that the patient dies from bleeding. At the meeting of the Medico-Chirurgical Society I stated that, so far as I remembered, I had never seen a case of fatal hæmorrhage in an uncomplicated case of gastric ulcer. I find that I was mistaken. One fatal case of hæmorrhage due to gastric ulcer has occurred in my hospital practice. In another case which I saw in consultation in Edinburgh the patient I now find died four days after I saw him from exhaustion following hæmorrhage. That case I regarded at the time as a case of duodenal ulcer. In going over my notes of the case I do not feel satisfied that the diagnosis of duodenal ulcer was correct; it may have been a case of gastric and not of duodenal ulcer. Consequently, in 127 cases of gastric ulcer (including the case diagnosed at the time as duodenal ulcer) which I have seen either in consultation practice or treated as in-patients in hospital, there were (so far as my present information enables me to judge) two deaths = 1·57 per cent., or if the doubtful case (of duodenal ulcer) is excluded, one death from hæmorrhage in 126 cases of gastric ulcer = 0·77 per cent. I include the 27 cases of gastric ulcer and the one doubtful case of duodenal ulcer seen in consultation practice, for in several of these the hæmorrhage was alarming; and I exclude the 76 cases seen in out-patient practice, for in very few of them was the bleeding severe, and because many of them were only seen once and I have no records of their after-history.

INFECTIOUS DISEASE IN EXETER.—During 1900 there were 176 cases of infectious disease treated at the Exeter Sanatorium, being 58 less than in 1899. The cases comprised 86 of typhoid fever, 79 of scarlet fever, nine of diphtheria, and two of measles. Of the 176 cases, 66 came from the county, reducing the number from the city to 110.

DEATHS FROM SNAKE-BITE.—Sir Joseph Fayrer, gave an interesting lecture on "Venomous Snakes" at the Falmouth High School on March 1st. He mentioned that the last annual report from the Indian Government showed that 2966 persons died in the preceding year from the attacks of wild beasts and 24,621 from snake-bites. The great mortality from snake-bites did not seem to diminish, in spite of all the efforts of the Government.