to check the hæmorrhage by administering medicines through the mouth; as the profuse bleeding is always from an eroded artery, frequently from one of considerable size, it is doubtful if acetate of lead, tannic and gallic acids, and the usual remedies have the slightest influence. The essential point is to give rest, which is best obtained by opium. Ergotin may be administered hypodermically in two-grain doses. Nothing should be given by the mouth except small quantities of ice. In profuse bleeding a ligature may be applied around a leg, or a leg and arm. Not infrequently the loss of blood is so great that the patient faints. A fatal result is not, however, very common from hæmorrhage. Transfusion may be necessary, or, still better, the subcutaneous infusion of saline solution.

The patients usually recover rapidly from the hæmorrhage and require iron in full doses, which may, if necessary, be given hypodermically.

VII. CANCER OF THE STOMACH.

Etiology.—The stomach comes next to the uterus as the most frequent seat of primary cancer, amounting, as shown by the statistics of Welch,* to 21·4 per cent in a total of over 30,000 cases. The ratio of males to females affected is about five to four. Age has an important bearing. Of 2,038 cases tabulated by this author three fourths occurred between the fortieth and the seventieth year, 24·5 per cent between the ages of forty and fifty, and 30·4 between the ages of fifty and sixty. In childhood it is extremely rare. Cancer of the stomach is a very common disease in this country, though statistics would indicate that it is rather less frequent than in Europe. With reference to heredity, Welch analyzed 1,744 cases and found that a family history was present in 243. Local conditions, such as chronic gastritis and traumatism, have been thought by some to be important factors. Cancer may develop in a simple ulcer of the stomach, but this sequence is extremely rare. It is not probable that depressing emotions, mode of life, or previous disease have any influence whatever in the causation of cancer.

Morbid Anatomy.—The most common varieties of gastric cancer are the cylindrical-celled epithelioma and the encephaloid; next in frequency is scirrhous, and then colloid cancer. With reference to the situation of the tumor, Welch analyzed 1,300 cases, in which the distribution was as follows: Pyloric region, 791; lesser curvature, 148; cardia, 104; posterior wall, 68; the whole or greater part of the stomach, 61; multiple tumors, 45; greater curvature, 34; anterior wall, 30; fundus, 19.

The medullary cancer occurs in soft masses, which involve all the coats of the stomach and usually ulcerate early. The tumor may form villous projections or cauliflower-like outgrowths. It is soft, grayish white in color,

* System of Medicine, vol. ii, Philadelphia, 1886.

and contains much blood. Microscopically it shows a scanty stroma, enclosing alveoli which contain irregular polyhedral and cylindrical cells. The cylindrical-celled epithelioma may also form large irregular masses, but the consistence is usually firmer, particularly at the edges of the cancerous ulcers. Microscopically the section shows elongated tubular spaces filled with columnar epithelium, and the intervening stroma is abundant. Cysts are not uncommon in this form. The scirrhous variety is characterized by great hardness, due to the abundance of the stroma and the limited amount of alveolar structures. It is seen most frequently at the pylorus, where it is a common cause of stenosis. It may be combined with the medullary form. The colloid cancer is peculiar in its wide-spread invasion of all the coats. It also spreads with greater frequency to the neighboring parts, and it occasionally causes extensive secondary growths of the same nature in other organs. The appearance on section is very distinctive, and even with the naked eye large alveoli can be seen filled with the translucent colloid material. The term alveolar cancer is often applied to this form. Ulceration is not constantly present, and there are instances in which, with most extensive disease, digestion has been very slightly disturbed. There is a specimen in the Warren Museum, at the Harvard Medical School, of the most wide-spread colloid cancer, in which the stomach contained after death large portions of undigested beef-steak.

Secondary cancer may also occur in the stomach. Welch has collected 37 cases, 17 of which were secondary to cancer of the breast. The cancer may produce important changes in the position and shape of the organ, particularly when the orifices are involved; thus, a cancer at the cardia may be associated with wasting of the organ and reduction in its size. The œsophagus above the obstruction may be greatly distended. On the other hand, annular cancer at the pylorus may cause stenosis and great dilatation of the organ; not necessarily, however, as there are instances on record in which the pylorus has been extremely narrowed without any increase in the size of the stomach. In scirrhous cancer the organ may be very greatly thickened and contracted. The stomach may be displaced or altered in shape by the weight of the tumor, particularly in cancer of the pylorus, which has been found in every region of the abdomen, and even in the true pelvis. The mobility of the tumors is at times extraordinary and very deceptive. There was in the Philadelphia Hospital an old man with a tumor at the pylorus the size of a cricket ball, which was usually in the epigastric region, but could be pushed into the right hypochondria or into the splenic region entirely beneath the ribs. Adhesions very frequently occur, particularly to the colon, the liver, and the anterior abdominal wall.

Secondary cancerous growths are very frequent, as shown by the following analysis by Welch of 1,574 cases: Metastasis occurred in the lymphatic glands in 551; in the liver in 475; in the peritonæum, omentum, and intestine in 357; in the pancreas in 122; in the pleura and lung in

98; in the spleen in 26; in the brain and meninges in 9; in other parts in 92. The lymph glands affected are usually those of the abdomen, but the cervical and inguinal glands are not infrequently attacked, and give an important clew in diagnosis. Occasionally, a secondary metastatic growth occurs subcutaneously, either at the navel or beneath the skin in the vicinity. In an instance recently under observation in a patient with jaundice, which developed somewhat suddenly and was believed to be catarrhal, there were no signs of enlargement of the liver or tumor of the stomach, but a nodular body developed at the navel, which on removal proved to be typical scirrhus. A second case in the ward at the same time, with an obscure doubtful tumor in the left hypochondria, developed a painful nodular subcutaneous growth midway between the navel and the left margin of the ribs.

In the extensive ulceration which occurs perforation of the stomach is not uncommon. It occurred into the peritonæum in 17 of the 507 cases of cancer of the stomach collected by Brinton. When adhesions form, the most extensive destruction of the walls may take place without perforation into the peritoneal cavity. In one instance which came under my observation a large portion of the left lobe of the liver lay within the stomach. Occasionally a gastro-cutaneous fistula is established. Perforation may occur into the colon, the small bowel, the pleura, the lung, or into the pericardium.

Symptoms.—Cancer of the stomach may not produce symptoms other than gradual failure of health, and death may take place from asthenia without any suspicion of the existence of malignant disease. These cases are not uncommon, particularly in elderly persons in institutions. In a great majority of all cases there are very definite symptoms, but the disease presents a very diverse clinical picture. Certain general features stand out with special prominence. The onset is insidious, sometimes with gastric disturbance, but more commonly with impairment of health and strength. A dyspepsia which may have been troublesome for years becomes aggravated. Ewald, however, states that dyspeptic symptoms are rare prior to the onset of gastric cancer. There are attacks of nausea and vomiting, and there is pain in the region of the stomach, which is aggravated by taking food. The patient emaciates, the anæmia becomes pronounced, and the prostration may be extreme. With slight intermissions the course is progressively downward, and from month to month the loss is striking. The face has a sallow cachectic appearance, the anæmia becomes more intense, and there may be œdema of the ankles. Blood may be present in the vomited matter. If with these general features a tumor can be felt in the region of the stomach the diagnosis is rendered certain. The course, in rapid cases, may be from three to six months, but as a rule the disease extends from eighteen months to two years.

Dyspepsia is common at the outset, but in so many cases the patients have had indigestion for years that the trouble is supposed at first to be only an aggravation of the chronic complaint. Loss of the desire for food is a very frequent symptom. There are exceptional instances, however, in which the appetite is retained throughout, and the functions of the stomach very slightly disturbed. Nausea is a striking feature in many cases, and is much more common than in ulcer. There may even be a sudden repulsion at the sight of food.

Vomiting, which is one of the most constant symptoms of cancer of the stomach, may come on early, or only after the dyspepsia has persisted for some time. At first it is at long intervals, but subsequently it is more frequent, and may recur several times in the day. There are cases in which it comes on in paroxysms and then subsides; in other cases, it sets in early, persists with great violence, and may cause a fatal termination within a few weeks. Vomiting is more frequent when the cancer involves the orifices, particularly the pylorus, in which case it is usually delayed for an hour or more after taking the food. When the cardiac orifice is involved it may follow at a shorter interval. Extensive disease of the fundus or of the anterior or posterior wall may be present without the occurrence of vomiting. The vomited matters consist of food and mucus in a grayish or dark sour-smelling fluid. The food is sometimes very little changed, even after it has remained in the stomach for twenty-four hours.

Hæmorrhage is a frequent symptom, but the bleeding is rarely profuse; more commonly there is slight oozing, and the blood is mixed with, or altered by the secretions, and when vomited the material is dark brown or black, the so-called "coffee-ground" vomit. This is present in a considerable proportion of all cases of cancer, and is an important indication. The blood can be recognized by the microscope as shells of the red blood-corpuscles and irregular masses of altered blood pigment. In cases of doubt the spectroscope may be employed or hæmin crystals obtained.

Fragments of the tumor are rarely found in the vomit, and of the numerous specimens which I have had occasion to examine I have never been able to satisfy myself of the existence of cancerous tissue. As Rosenbach states, in the material washed out with the stomach-tube undoubted fragments may be found. The yeast fungus, various bacteria, and the sarcina ventriculi may be present, the latter not so often in cancer as in dilatation.

Great stress has been laid of late years upon the absence of free hydrochloric acid in the secretions. As an outcome of the enormous number of observations which have recently been made it may be said that free hydrochloric acid is absent in a majority of cases of cancer of the stomach. This defect is associated with impairment of the secreting function of the organ. The examination should be made repeatedly, by the methods already referred to, and with our present knowledge the persistent absence of free HCl in the stomach contents, taken in conjunc-

tion with other symptoms, may be regarded as highly suggestive of cancer. Unfortunately, the free acid may be absent in certain other conditions, such as atrophy, and occasionally in chronic gastritis, so that it is of greater value from the negative standpoint. As Kinnicutt expresses it, "the presence of free HCl in the stomach contents in repeated examinations in doubtful cases is of the greatest diagnostic value, and points very certainly to absence of cancer." Rosenheim has recently shown that in cases in which cancer develops in the base of an old ulcer HCl may be present throughout the course.

Pain is an early and important symptom. It is very variable in situation, and while most common in the epigastrium, it may be referred to the shoulders, the back, or the loins. The pain is described as dragging, burning, or gnawing in character, and very rarely occurs in severe paroxysms of gastralgia, as in gastric ulcer. As a rule, the pain is aggravated by taking food. There is usually marked tenderness on pressure in the epigastric region. It is, however, remarkable how many cases run a painless course.

The *physical examination* of the abdomen reveals in many instances the presence of a tumor. Inspection may show a nodular mass in the epigastrium, or the outlines of a dilated stomach, with peristaltic action. In the palpation of the stomach it is important to bear in mind certain anatomical points. At least two thirds of the organ lie in the left hypochondrium beneath the ribs, and so are practically out of reach. The pyloric orifice lies to the right of the median line, particularly when the stomach is full, in which case it may be reached. It is about on a level with the inner extremity of the eighth right costal cartilage. The pylorus is movable and changes considerably in position with the distention of the stomach. Practically, in health there is available for palpation only a part of the anterior surface of the stomach and the pylorus, which is sometimes, but not always, overlapped by the liver. Tumors limited to the cardia, even when extensive, cannot be felt at all. Tumors involving the fundus, the posterior wall, and the greater part of the lesser curvature cannot be detected unless very large. Tumors of the pylorus, of the anterior wall, and of a large part of the greater curvature are in accessible situations. In the examination the knees should be drawn up, and the patient asked to relax the abdominal walls as much as possible. Sometimes, when nothing can be felt on quiet breathing, a deep inspiration will force down the stomach and bring a tumor mass within reach. Examination should also be made in the knee-elbow position. Cancerous tumors of the stomach are usually felt in the epigastric region, but a mass at the pylorus may be felt in the umbilical region, or, in cases of extreme mobility, in a hypochondriac region, or, very exceptionally, low down in the iliac region. The tumor is usually firm, hard, nodular, and painful on pressure. At the pylorus the mass may be rounded, ball-like, and readily grasped. Gas may sometimes be felt

bubbling through it. Communicated pulsation from the aorta is not at all uncommon. Inflation of the stomach with gas is often a valuable aid in diagnosis. A teaspoonful of bicarbonate of soda is first given in water, followed by the same amount of tartaric acid. The distention of the stomach which follows may suffice to bring tumor masses into reach.

Careful examination should be made to determine the presence of secondary cancer of the liver or involvement of the lymph glands in the groins or in the supraclavicular spaces. As already mentioned, the development of nodules about the navel may give an important hint, or there may be signs of secondary involvement of the peritonæum.

Intestinal symptoms are not very common. Constipation is more frequently present than diarrhœa, which may, however, set in and prove obstinate toward the end. When there is much bleeding the stools may be dark in color.

A progressive *anæmia* is one of the most striking features of gastric cancer. As a rule the blood-count does not fall below fifty per cent. A leucocytosis is almost constantly present, and Welch has noted an instance in which the ratio of white to red corpuscles was one to twenty. There are instances in which the clinical picture is rather that of a pernicious anæmia, with reduction of the red blood-corpuscles to twenty-five per cent and marked poikilocytosis. When any degree of anæmia is present nucleated red corpuscles may be found in dried and stained specimens, and this method of examination may be of much service when an actual blood-count is impossible. The condition is, however, an anæmia with wasting, and the layer of panniculus is not retained as in the ordinary forms of pernicious anæmia. Ultimately the patient develops an aspect to which the term cachectic is applied, and which is perhaps more marked in gastric cancer than in any other disease. There may be a slight yellowish tint to the skin, and it is not uncommon to see brownish stains, the cachectic chloasma.

Associated with the anæmia and directly dependent upon it are the dropsical symptoms so common in this affection. Œdema of the ankles and of the legs is present and may progress to a general anasarca; the cases may be mistaken for heart-disease or dropsy. There are no special cardiac symptoms; the pulse becomes rapid and feeble toward the end. The anæmia may, however, produce such palpitation and dyspnœa that the case may be regarded as cardiac. Thrombosis of a femoral vein may occur.

The urine may contain a trace of albumen and, toward the close, tube-casts. Indican is often present in increased quantity, and occasionally acetone and diacetic acid.

The temperature is usually normal, and toward the end, when cachexia is well marked, subnormal. There are, however, interesting paroxysmal elevations of temperature, definite chills with fever, in which the thermometer registers 103° or 104°, followed by profuse sweating. The rigors

may recur at intervals for weeks, and, if no tumor is felt, may complicate the diagnosis. In a case at the Philadelphia Hospital the paroxysms recurred for more than six weeks. The autopsy showed a cancer of the stomach with adhesions to the colon and extensive suppuration at the base of the cancer and in a pocket between the stomach and omentum.

The mind usually remains clear to the close. Naturally the patient has attacks of despondency. Toward the close delirium is common. A form of coma resembling that which occurs in diabetes is occasionally met with in gastric cancer. The patient becomes restless or excited, and gradually unconsciousness supervenes, with or without dyspnœa. It is due to the presence of some toxic agent in the blood, possibly the diacetic acid.

Among symptoms referable to the development of secondary growths those pertaining to the liver are most important. Jaundice is not uncommon, and there may be signs of great enlargement of the liver. Many instances which are clinically recorded as primary cancer of this organ are in reality secondary to latent cancer of the stomach. The importance of enlargement of the supra-clavicular and inguinal glands in gastric cancer has already been emphasized. The new growths may extend to the peritonæum and, if there is much effusion, produce ascites. Reference has been made to the perforations liable to occur in gastric cancer. The course of the disease is progressively downward. In the majority of all cases death occurs within two years, and the average duration is not more than eighteen months. In cases of scirrhus the progress is slower.

Diagnosis.—When a tumor is present there is not much difficulty in determining the nature of the trouble; even in its absence the progressive emaciation, the loss of energy and strength, the anæmia and cachexia, when associated with marked gastric symptoms, are almost pathognomonic. There are many instances, however, in which a positive diagnosis is impossible. The diseases with which cancer is most liable to be confounded are ulcer and chronic gastric catarrh, and the differential features are so well drawn in the elaborate article by my colleague Welch that I here append them: *

GASTRIC CANCER.	GASTRIC ULCER.	CHRONIC CATARRHAL GASTRITIS.
1. Tumor is present in three fourths of the cases.	1. Tumor rare.	1. No tumor.
2. Rare under forty years of age.	2. May occur at any age after childhood. Over one half of the cases under forty years of age.	2. May occur at any age.

* *Op. cit.*, vol. ii, p. 570.

GASTRIC CANCER.	GASTRIC ULCER.	CHRONIC CATARRHAL GASTRITIS.
3. Average duration about one year, rarely over two years.	3. Duration indefinite; may be for several years.	3. Duration indefinite.
4. Gastric hæmorrhage frequent, but rarely profuse; most common in the cachectic stage.	4. Gastric hæmorrhage less frequent than in cancer, but oftener profuse; not uncommon when the general health is but little impaired.	4. Gastric hæmorrhage rare.
5. Vomiting often has the peculiarities of that of dilatation of the stomach.	5. Vomiting rarely referable to dilatation of the stomach, and then only in a late stage of the disease.	5. Vomiting may or may not be present.
6. Free hydrochloric acid usually absent from the gastric contents in cancerous dilatation of the stomach.	6. Free hydrochloric acid usually present in the gastric contents.	6. Free hydrochloric acid may be present or absent.
7. Cancerous fragments may be found in the washings from the stomach or in the vomit (rare).	7. Absent.	7. Absent.
8. Secondary cancers may be recognized in the liver, the peritonæum, the lymphatic glands, and rarely in other parts of the body.	8. Absent.	8. Absent.
9. Loss of flesh and strength and development of cachexia usually more marked and more rapid than in ulcer or in gastritis, and less explicable by the gastric symptoms.	9. Cachectic appearance usually less marked and of later occurrence than in cancer, and more manifestly dependent upon the gastric disorders.	9. When uncomplicated, usually no appearance of cachexia.
10. Epigastric pain is often more continuous, less dependent upon taking food, less re	10. Pain is often more paroxysmal, more influenced by taking food, oftener relieved	10. The pain or distress induced by taking food is usually less severe than in cancer or

GASTRIC CANCER.	GASTRIC ULCER.	CHRONIC CATARRHAL GASTRITIS.
lieved by vomiting, and less localized than in ulcer.	by vomiting, and more sharply localized than in cancer.	ulcer. Fixed point of tenderness usually absent.
11. Causation not known.	11. Causation not known.	11. Often referable to some known cause, such as abuse of alcohol, gormandizing, and certain diseases, as phthisis, Bright's disease, cirrhosis of the liver, etc.
12. No improvement, or only temporary improvement, in the course of the disease.	12. Sometimes a history of one or more previous similar attacks. The course may be irregular and intermittent. Usually marked improvement by regulation of diet.	12. May be a history of previous similar attacks. More amenable to regulation of diet than is cancer.

Treatment.—The disease is incurable and palliative measures are alone indicated. The diet should consist of readily digested substances of all sorts. Many patients do best on milk alone. Washing out of the stomach, which may be done with a soft tube without any risk, is particularly advantageous when there is obstruction at the pylorus, and is by far the most satisfactory means of combatting the vomiting. The excessive fermentation is also best treated by lavage. When the pain becomes severe, particularly if it disturbs the rest at night, morphia must be given. One eighth of a grain, combined with carbonate of soda (gr. v), bismuth (gr. v–x), usually gives prompt relief, and the dose does not always require to be increased. Creosote (♏ j–ij) and carbolic acid are very useful. The bleeding in gastric cancer is rarely amenable to treatment. Operative measures have been advised and practised, and in exceptional instances there are cases in which the limited cancer could be resected with reasonable hope of recovery.

Non-cancerous tumors of the stomach rarely cause inconvenience. *Polypi* are common and they may be numerous; as many as one hundred and fifty have been reported in one case. *Sarcomata* are very rare. *Fibromata* and *lipomata* have been described.

Foreign bodies occasionally produce remarkable tumors of the stomach. The most extraordinary is the hair tumor, of which a number of instances have been reported in hysterical women who have been in the habit of eating their own hair. A specimen in the medical museum of

McGill University is in two sections, which form an exact mould of the stomach. The tumors which they form are large and very puzzling and have been mistaken for cancer. In one instance the ball of hair was removed by a surgical operation. The tumor was thought to be a movable kidney.

VIII. HÆMORRHAGE FROM THE STOMACH (*Hæmatemesis*).

Etiology.—Gastrorrhagia, as this symptom is called, may result from many conditions, some of which are local, others general.

1. In local disease in the stomach itself: (*a*) Cancer; (*b*) ulcer; (*c*) disease of the blood-vessels, such as miliary aneurisms of the smaller arteries, and occasionally varicose veins; (*d*) acute congestion, as in gastritis, and possibly in vicarious hæmorrhage, but both of these are extremely rare causes.

2. Passive congestion due to obstruction in the portal system. This may be either (*a*) hepatic, as in cirrhosis of the liver, thrombosis of the portal vein, or pressure upon the portal vein by tumor, and secondarily in cases of chronic disease of the heart and lungs; (*b*) splenic. Gastrorrhagia is by no means an uncommon symptom in enlarged spleen, and is explained by the intimate relations which exist between the vasa brevia and the splenic circulation.

3. Toxic: (*a*) The poisons of the specific fevers, small-pox, measles, yellow fever; (*b*) poisons of unknown origin, as in acute yellow atrophy and in purpura; (*c*) phosphorus.

4. Traumatism: (*a*) Mechanical injuries, such as blows and wounds, and occasionally by the stomach-tube; (*b*) the result of severe corrosive poisons.

5. Certain constitutional diseases: (*a*) Hæmophilia; (*b*) profound anæmias, whether idiopathic or due to splenic enlargements or to malaria; (*c*) cholæmia.

6. In certain nervous affections, particularly hysteria, and occasionally in progressive paralysis of the insane and epilepsy.

7. The blood may not come from the stomach, but flow into it. Thus it may pass from the nose or the pharynx. In hæmoptysis some of the blood may find its way into the stomach. The bleeding may take place from the œsophagus and trickle into the stomach, from which it is ejected. This occurs in the case of rupture of aneurism and of the œsophageal varices. A child may draw blood with the milk from the mother's breast even in considerable quantities and then vomit it.

8. Miscellaneous causes: Aneurism of the aorta or of its branches may rupture into the stomach. There are instances in which a patient has a single attack of hæmorrhage without even having a recurrence or without symptoms pointing to disease of the stomach.