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Introduction.

The increasing prevalence of diphtheria in Great Britain, the large annual mortality from this disease renders the question of its treatment one of great importance to the general practitioners. The introduction of serum treatment has unfortunately lessened, to some extent, clinical interest in its treatment. The knowledge that this sheet anchor is at hand to check the drift to destruction, too often dulls the doctor into a feeling of false security. Thinking only of the bacteriological report and perhaps forgetting, or untrained in, the clinical aspects, he loses too often the question of diagnosis to laboratory officials. He loses an all important twenty-four hours before applying serum, a day's delay that costs, it may be, the patient his life.

The practice of a large fever hospital impresses most vividly upon the mind the importance of the early diagnosis of, and the early serum treatment in,
diphtheria. In fatal cases too often is it gathered from the parents or friends of the sufferer that a doctor has been attending for two or three days without making a correct diagnosis and without using serum.

The question though much discussed is perhaps not too hackneyed. It is at least an exceedingly interesting one from a practical point of view.

It is my intention to divide the paper into three parts, the first upon some aspects of the historical side of the subject; the second upon one hundred cases of diphtheria treated during the summer and autumn of 1905, in the Edinburgh City Hospital; the third upon some conclusions arrived at after treating these cases. Attention being merely given to the actual treatment of the cases, no attempt will be made to approach the preventive side of the treatment.

My best thanks are due to Dr. Ker, Superintendent of the City Hospital, for allowing me to make use of the cases
which were under my care as a resident medical officer in the hospital.

Part I. - Historical Retrospect.

In 1821 Bretonneau invented the name diphtheritis to denote a certain specific inflammation. Previous to the work of this distinguished Frenchman, there was great confusion between the various forms of farinal inflammations. Thus Dr. Buchan M.D. F.R.C.P.; Edin, in his Domestic Medicine published 1820, described under quinsy, what appears to be various forms of farinalis, true diphtheria and scarletina. It is impossible to mistake the "swelling of the tongue, foaming of the mouth, palpit and ghastliness of the face, coldness of the extremities, the laboured breathing, the swelling of the neck spreading to the chest" of this malignant quinsies for anything but diphtheria. His treatment, crude and barbarous in some respects, was on the whole very sensible. For malignant quinsies he recommended rest in bed to avoid the risk of fainting,
a nourishing diet with liberal beverages of the nature of white wine whey, red wine negus and such like, to keep up the strength of the sufferer. The use of purges and bleeding he deprecated, as being likely to weaken the patient and yet he recommended mild emetics as pulse, espec. for nausea. Perucaín bath, taken as such or in the form of a decoction with virginian snake root, water and extract of vitriol, he considered useful in severe cases. Locally he advised several mild soothing gargles and sprays, the latter to be used for children. Externally he advocated fomentations, plasters, setons, poultices of bread, the application of swallow's nests and of various fungi. He related how he saved the life of one child, suffering from malignant quinsy with great dysphagia, by feeding it through an ice's skin passed into the oesophagus. In dropsy he recommended bleeding, the application of cold to the feet, of hot fomentations to the neck, the breathing
of steam and the use of sedative medicines internally. Tracheotomy is considered a last resort.

Pervading his methods of treatment can be seen two main guiding rules: general support and local soothing. He had no specific remedy.

In 1826 Bretonneau laid the foundation stone of the scientific study of diphtheria by describing the disease fully in its various forms and by pointing out the relationship of the various forms. He demonstrated that the disease was not new, but had been described in a manner by Aretaeus in the 1st century, by Rhetius in the 15th, by the Spaniards in the 16th, who referred to it under the name of garotilla, a most suggestive title, by the Italiensis in the 17th, by Dr. Francis Home of Edinburgh, who invented the name croup, in the 18th. Still to Bretonneau must be given the honour of being the first great pioneer in the accurate study and complete classification of the disorders.
Hippocrates wrote vaguely about ulcers of the pharynx assuming an acute form by bringing on dyspnea. Whether he was referring to diphtheria or not is uncertain.

Since Bretonneau's time local applications as pure HCl, CuSO₄, or AgNO₃ have been much used and were regarded as indispensable by this authority. His second memoir in 1826 devoted most attention to the prevention of the spread of the disease to the bronchi and smaller air passages. "Sessilian diphtheria," he wrote, "by its vicinity, threatening the air passages with imminent danger of extension, requires the most expeditious and complete local treatment." Following out this idea he believed, when the disease was accessible, in the application to the whole membranous surface of hydrochloric acid, one part to three parts of honey, once daily. He also found calomel and alum, applied locally once daily, useful, but the similar application of sulphuric acid and f
ammonia of very doubtful advantage.
Sulphuret of potash and powdered
cayenne he tried, but found useless
as local applications. He was a believer
in an internal course of mercury. Blood
letting, emetics and blisters he
considered harmful. For laryngeal
cases he tried irrigations of hydrochloric
acid and the application of silver nitrate
solution to the glottis, but admitted
the danger of pneumonia in consequence.
Throatotomy he resorted to as a palliative
measure in extreme cases. Nasal
diphtheria he treated with syringings
of silver nitrate solution into each
 nostril. In support of his views he
described fully numerous illustrative
cases and poor mortuems!

The outstanding feature in his
methods of treatment was the
vigorously local attack upon the
disease with strong caustic applications.

Jenner, writing in 1835 upon
croup, followed out the same idea. He
believed in the local application, by
means of a sponge on whale bone, of weak
hydrochloric acid, of almost pure citric acid or of silver nitrate solution, grains from to the ounce of water, but suggested that the operator, in applying the medicaments, should not struggle too much with the patient. Mercury by injection or as calomel he used with considerable success, except in patients of feeble constitution, in whom the lowering effect of the salivaion and purging was too apparent. Strong purges and blood letting he used only in the cases of vigorous patients, early in the disease and exhibiting symptoms of suffocation from pneumonia or other complicating inflammations. Tonics, expectorants and tonics such as sulphuret of antimony tartrate of antimony, squills and ipecacuanha he was in the habit of employing. Tracheotomy, as a palliative agent, he recommended for impending asphyxia.

Trousseau was one of the most important of the earlier writers on diphtheria. Usually a most sanguine
advocate of methods of treatment, he struck a note of disappointment in recommending various measures for combating this disease. In 1835 in the Dictionnaire de médecine, although he modified his views somewhat later, he placed most faith in topical remedies, and more particularly in caustics, such as silver nitrate, copper sulphate, hydrochloric acid or acid nitrate of mercury. Alum, mercuric sublimate, potassium chloride, sodium chloride or calcium chloride is considered less useful. Colonel dusting, he favoured, especially in nasal diphtheria. The system, he thought, should be supported by tonics and bitters, such as iron and quinine, by succulent foods and by alcohol. Blood letting and emollients were useless. His terribly vivid description of the death agonies of a child suffocating from Croup is classical. Tracheotomy he believed should always be attempted when the dyspnoea became urgent. He recommended after the operation local treatment to the trachea.
by cleaning and cauterizing the part with silver nitrate and by the
instillation of water. The cannula should be removed in four or six days, and
the patient fed in the meantime on milk and soups. He admitted the
danger of pneumonia following the operation. Thus in the most part
he followed out the principles and ideas indicated by Bretonneau.

Daroit writing in 1845 on an
epidemic, in the years 1841 to 1844, in the
Department de Saone et Loire et de la Nièvre, expressed very decided
views. Bleeding was a feature in his
methods of treatment. In all cases of
plethoric individuals above the age of
12 years and not very weak, he was
inclined to think venesection did good.
He strongly advocated in cases of
severe gulletal inflammation local
bleeding, every six hours until the
symptoms ameliorated, by means of
leeches. This is encouraged by means
of diluent arsenics, emollients or
laxative injections, poultices to the
neck, gargles or by low diet. General weakness he thought a contraindication to this form of treatment. Stimulants he reserved until signs of collapse were apparent. Emetics in the very young, suffering from laryngeal disease, and in all cases of "primitive group" he favoured. He condemned strongly purgatives, calomel, internally or locally, which, he said, augmented the malady by exciting the mucous membranes, and blisters because they formed local surfaces for the spread of the disease. Gargles of salt solution and scarification of the tonsils he discarded as useless. Tracheotomy he never tried. Silver nitrate, applied as the "lapic infernalis" and repeated three to four times daily, he thought the best local application. Hydrochloric acid and alum similarly applied also received his support. Finally mustard poultices and irritant foot baths he considered to be excellent counter-irritants.

Empis in 1850 judging from an
epidemic at the Hôpital Bichat in 1848, described in the Archives Générales de Médecine, his form of treatment. He endeavoured to modify the morbid secretion by means of such caustics as silver nitrate or hydrochloric acid. Cabanel, he was evidently disappointed in, and he shielded himself behind the safe statement, that it might be useful, but its influence on the general morbid secretion could not be regarded as infallible. Alum insufflated he thought had a slight degree of efficacy. Blood letting he abandoned as useless. He placed much reliance in the continual use of tonic remedies to sustain the general strength.

Bouchut's opinions regarding the treatment of croup, which in 1852 appeared in the Traité Pratique des Maladies des Nouveaux Mâts et des Enfants à la Manuelle, are most original and important. He favoured alteratives such as mercury, sulphate of potash, copper sulphate, believing
that they promoted the expectoration and rejection of membranes. In
recency he had especial faith. He
applied it either by intubation or as
calomel internally, and discontinued
its use as soon as the bowels were
free and expectoration had commenced.
The expulsion of membrane was also
aided by the use of emetics, the best
spur which was ipecacuana, and of
enfuturaries. Remoulages such as
blisters he did not employ. Early in
the disease he was inclined to favour
local cauterization by acids, such as
weak nitric or hydrochloric acids,
by silver nitrate to v. 37, to
applied twice daily by the sponge and
whale bone method. Finally when
suffocation was imminent he tried
in vigorous children bleeding, failing
which he performed a dissection
tracheotomy as opposed to the plunging
method. He preferred tracheotomy to
"laryngo-tracheotomy", thus avoiding
necrosis of cartilages and opening
below the membrane. He applied no
local intratracheal medicaments. It is interesting to note that at this
time the great authority Lousseau had also given up intratracheal
medication. Bouchut fed his
patients after tracheotomy upon thick
soups, avoiding thin fluids owing
to the danger of such passing
into the larynx. He removed the tube
as soon as possible. Wishing to
avoid the operation of tracheotomy, he
devised that of intubation and
experimented largely, without success,
on his new theory.

From the year 1855 onward
diphtheria has been more or less con-
tinuously present in Great Britain.
After this year therefore we find
British authorities figuring more
prominently in the literature of
diphtheria.

In 1859 the Medical Officer of the
Privy Council, England, whilst admitting
that there was no specific remedy
for diphtheria, published a summary
of its best treatment. He advised
hydrochloric acid or silver nitrate for local application, tracheotomy for dangerous dyspnoea, alcoholic stimulants throughout the disease and tonics for the various sequelae.

The work of Dr. Greenhow in 1860 on the treatment of diphtheria introduced several new ideas. He was of the opinion that caustics should be avoided, as the disease was too deeply situated to be reached by such agents. He favoured the use of mild local applications, such as gargles of borax or alum in water, salini solution which might be sweetened with honey and, in the case of young children, injected with a syringe. A chlorinated water gargle was one of his favourite remedies. He discontinued local treatment as soon as the throat was clean. Internally, unless there was much depression, he began with an emetic followed by such mixtures as chloruni, for foetor of the breath, chlorate of potash, dilute hydrochloric acid in syrup and water or Tinct. Ars.
Picrochlor. Where there was a tendency to bleeding, he maintained a general stimulating treatment by means of regular food, egg flips, wine. Alcohol he considered exceedingly useful in depression, combined with absolute rest in bed. For groups he favoured emetics or enemas and as a last, and almost hopeless, resort laechoting. Strypnum in small doses he thought very useful for paraplegia. As a general tonic during convalescence he employed the citrate of iron and guinie.

Sir William Jenner in his lecture on diphtheria in 1863 gave an excellent and minute account of the treatment of this disease. He stated that there was no specific remedy and the trouble must run its course. He confined his patients to bed in a room at a temperature of 68°F, with the air moistened by means of a steam kettle. The diet prescribed was mild and light. If the skin were hot and the pulse firm, he evacuated the bowels with enemas. A saline, gave simple
fibringes as acetate of ammonia, or nitrate of potash. He moistened the
throat, gave inhalations of acetic acid
in water and gargled with acetate of lead 51 to rose water 2 viii. In the
early stages he avoided alcohol. For
a patient with feeble pulse, dusky
red throat and general prostration
he ordered wine in full quantities, for
an adult 3 to viii in the twenty
four hours. He stated that a child
of three years could take one to two
drachms of brandy every hour. Drugs
such as arseniochloride of iron, calomel
or arsenio carbonate of ammonia he
thought of very doubtful advantage.
Locally he directed that the membrane
should on no account be torn off.
that cavities, when the parts were
swollen, red and covered with mucus
were useless, but that early in the
disease a single application of silver
nitrate, one scrupule to one drachm of
water, or of silver nitrate and hydrochloric
acid, in equal parts with water, might
check the spread of the disease.
Regarding tracheotomy for laryngeal disease he observed that the operation had been more successful in France than in England, probably owing to the greater prevalence of rheumatism in the latter country. He thought patients should be given the chance of life offered by the operation, even if that chance were a small one. For adults he preferred laryngotomy, in children tracheotomy. He dreaded the danger of ulceration of the trachea and of spread of inflammation to the anterior mediastinum. For marked adenitis and very fetid throats he used gargles of arachis fluid and even applied silver nitrate freely to prevent septicemia. For vomiting he gave ice by the mouth and applied hot fomentations to the epigastrium. Sleeplessness and delirium he treated with opiates. Most interesting of all perhaps were his statements regarding the various paralytics. He considered that strychnine in small doses should be given a fair trial in cardiac paralyses,
that blisters to the spine might be useful and that a nourishing and stimulating diet with fresh air and iron and quinine tonic should be persisted in.

Begg's experience of the disease can be seen in a paper he read before the medico chirurgical Society Edinburgh, in 1862. Diphtheria, he said, was in 1826 prevalent and very fatal in Edinburgh. In that year he treated three cases all fatal. For more than a quarter of a century he saw no further cases. In 1858 the disease reappeared and by 1862 he had seen 25 cases, 14 proving fatal. According to his experience, the best method of treatment was by means of a sustaining diet with wine or brandy in full doses. Infused tincture of iron in the early and in the convalescent stages he thought useful. Condy's fluid and chloroform water mouth washes were useful as well as comforting to the patient. Quinine he considered might be of service but was neglected. He
disliked caustics, had almost abandoned calomel and had quite given up acetate of lead. He remarked that he had but little experience in tracheotomy, but considered that patients should have the chance of life, even though small, offered by this procedure.

In 1870 Amossat, to obviate the troublesome bleeding sometimes met with in tracheotomies, invented the thermic method of performing the operation. It is not surprising that his invention was not attended with success.

O'Dwyer in 1880 at the New York Foundling Hospital began his celebrated experiments regarding intubation. When Bouchut had failed, he succeeded in devising an excellent instrument and method of procedure and a good deal of success followed the new departure.

In 1883, the year in which Klebs discovered the bacillus of diptheria, and in which Döfflin grew the
organisms in separate media and by innoculating animals produced in them diphtheritic lesions, Dr Eade described under three headings: local, general and the treatment of paralyses; the methods of treatment in vogue at that time. Locally he advised the use of mild applications such as salt solution, glycerine and carbolic acid, borax and boracic acid, tincture of iodine, tincture of the perchloride of iron. Whilst advocating the use of these drugs, he stated that in his opinion nothing could really prevent the reformation of membrane, and at best the measures adopted were comforting to the sufferer. Under general treatment, he deplored the want of a specific remedy, and advised as tonics quinine and the tincture of the perchloride of iron. He also recommended chloride mixture, a dilute hydrochloric acid and quinine combination, liquor chlorurae and the free application of food and wine, feeding by the rectum if necessary. The calomel treatment of this date had been abandoned.
supposed to act by detaching the false membrane through augmenting the buccal secretion, he considered dangerously depressing. Paralyses in his opinion were best treated by giving preparations of zinc. He also recommended salts of iron, arsenic strychnine and faradic electricity for this purpose. Tracheotomy was imperative in bad laryngeal cases and should be performed under chloroform, unless the patient were moribund, in which case the rapid operation without an anaesthetic should be attempted.

Colli wrote most pessimistically in 1887 regarding the treatment of diphtheria. "The one certain fact about treatment in this disease in its severe forms is that hitherto it has been mostly useless." He depended chiefly on stimulating food and alcohol given in small quantities at frequent intervals. Rather than force food upon an unwilling child, he favoured the use of nutrient enemata. He violated his patients in
well ventilated rooms, at a temperature of about 55°F. Emetics and blister
he never used. For sleeplessness he tried opium or alcohol. He considered
that no medicinal agent had any
good effect upon the various paralyses.
Tracheotomy was merely a relieving
agent, but as such should never
be performed until the sufferer was
in extremis.

A long and minute account of
the treatment of diphtheria appeared in
Fill's Samnè on Diphtheria Group in
1887. There it was stated that
intubation of the larynx, though not
established as a substitute for tracheotomy
was nevertheless rapidly gaining favour.
Regarding tracheotomy the high rapid
operation was preferable, as being less
difficult and less dangerous than the
low operation. There were fewer veins
in the way and the trachea was
near the surface. The cannula was
also more easily introduced in this method.
The disadvantages of the high operation
were the closer proximity of the larynx,
the speaking organs and the seat of the disease, and of the stiffness of the thyroid. Haemorrhage, traumatic emphysema and wounds of the oesophagus were the accidents most commonly met with. After the operation it was recommended, that the inspired air should be warmed by passing through a cravat of carlatan and another of woollen fastened around the neck. The canula should be changed in twenty four hours and removed as soon as possible, the child in the meantime being kept in a freely ventilated room at a temperature of 65° to 70° F and fed on a supporting light diet. No steam was necessary at any time. As soon as the false membrane and pyrexia had disappeared, the patient might be allowed up. Complications such as haemorrhage were treated with applications of the perchloride of iron, ice or other cold applications, adenitis with cataplasma, oily emboctions, wool to the neck, or if necessary by operation.
pulmonary inflammations with free alcoholic stimulation, paralyses with thick soups, porridge and such like, if they were any difficultly in swallowing, with tones, sea bathing, cauterity to the spine or electricity. Colonel, mercurial injections, alkalies, tartar emetic, sulphuret of potash, bromide, iodine and the balzams were all more or less condemned as being dangerous, weakening or at least of doubtful advantage. Expectorants might be of use in assisting in the expulsion of mucus. Blood letting and revulsions should be avoided. Internal antiseptics such as perchloride of iron, bichloric acid, sulphur, iodine, salicylic acid, permanganate of potash might be tried but were of doubtful advantage. Alcohol was considered the best of all internal antiseptics. Locally cauteryization and tonsillectomy were abandoned as being dangerous. Astringents might be useful but had the great disadvantage of disgusting the patient, thereby proving an obstacle to the
inception of food. Mild local antiseptics and frequent irrigations were very useful and comforting. Solvents found beneficial were sodium bicarbonate, lonic water, chlorate of potash, iodate of potassium, lemon juice, lactic and acetic acids. Whatever the case food, tonics and alcohol formed the basis of all treatment. Mild infections would do well on gargles of milk and water, alcoholic stimulation and good liquid food. Severe cases were similarly treated and in addition chlorate of potash, as a solvate and disinfectant, given internally. Alum might be uninflected with benefit and it was advisable to employ irrigations of 1 per cent. carbolic acid, six times daily or more frequently, in nasal or evil smelling cases. Malignant types required the freest stimulation with alcohol and tonics. Inhalations of iodine, of hydrochloric acid, of ammonia and intra-tracheal injections of lonic water in group were highly dangerous procedures. Inhalation of
steam were useless. Atomizers of live water, anti-spasmodics, stimulants and emetics might be useful. Intubation or tracheotomy offered temporary relief and the latter should be tried as a last resort.

Pepsin, trypsin and papayotin appeared as new membrane solvents in Lewis Smith's article on diphtheria, written for Keating's Encyclopaedia of Diseases of Children 1889. Otherwise no new expedients were introduced. In this article the most favoured drugs were perchloride of iron, quinine alcohol, turpentine and corrosive sublimate. Potassium chlorate internally was considered dangerous, owing to its liability to produce nephritis. Strychnine was considered of very doubtful advantage in paralytics. For sudden cardiac failure hypodermic injections of brandy were recommended. Regarding general treatment, much stress was laid upon frequent sparging of the patient, who was on no account to be moved from his bed. A warning
was offered to the unwaried not to allow the slumber of torpor to interfere with the introduction of nutritious food, peptonized if necessary, by the mouth or by the rectum.

1890 will always be a triumphant year in the history of the treatment of diphtheria. In that year Behring and Kitasato published the first clear demonstration of the principles of serotherapy. Behring applied the idea that the blood serum of an artificially protected animal if injected into another still susceptible has a protective power in the treatment of diphtheria and after much experimentation succeeded in producing a serum strong enough to be of use to man. Already in 1891 in von Bergmann's clinic, Berlin, anti-diphtheritic serum was tried. The serum was too weak and gave unsatisfactory results. Not till 1894, when Ehrlich, Kossel and Wassermann reported favourably upon it, did much success attend the new departure. Roux...
of Paris was able to confirm the favourable reports of the German physicians. In 1894, using a serum furnished by Bronson, Katz first applied horse serum. After that date the antitoxin serum treatment rapidly spread, soon becoming world wide. Its success has been undoubted and marked especially in early cases, a fact which emphasises most forcibly the great importance of early diagnosis.

Neither Tagge and Jull Smith nor Adler in their works published in the years 1891 and 1892 respectively made any mention of the then newly suggested form of treatment. This form suggested few new expedients. Digitalis was recommended for cardiac failure and tracheotomy was preferred to intubation. Adler's treatment at that time was a stimulating and supporting one. As a tonic he preferred tincture of the perchloride of iron to other drugs. For laryngeal suffocation he advocated either intubation or tracheotomy. Like
Fagge and Pye Smith be advised frequent local swabbing or syringing with mild antiseptics and the use of such solvents as trypanin or peptic in tonic water.

In mention of the proposed serum treatment was made in Whith's Dictionary of Treatment published 1892. In that work a good diet with free alcohol stimulation was emphasised as of vital importance. Reptorised food might be used when digestion was weak. In which Ferri Perchlorid was favoured as a tonic remedy. The work also contained a long list of the antiseptics that might be employed. Amongst these hydrogen peroxide, eucalyptus, creosote salicy and the sulphiocarbolic were innovations. Mild local applications and inhalations were considered useful, caustics and solvents useless. The injection of chloric water into the tonsil, at the seat of the disease, was suggested as being of possible advantage. For laryngeal diphtheria intubation, though difficult to perform,
was considered useful in the cases of children under five years of age. Otherwise, tracheotomy should be performed, preferably under chloroform. After such an operation, the patients were recommended to be kept under steam.

By the end of the year 1895, Baginski had brought forward most cogent proof of the efficacy of the serum treatment. Between the 15th March 1895 and the 15th March 1896 he treated with antitoxin 525 children of whom 15.6% died. During August and September, the supply of antitoxin failing, he treated 126 by the old methods with a fatality of 48.4%. The old results.

In 1897 Halstead in the New York Medical Journal stated, that antitoxin had reduced the mortality in his cases of intubation for laryngeal disease from 76% to 25%. He recommended the early use of antitoxin, followed, if necessary, by intubation in preference to tracheotomy, however desperate the case.
appeared to be.

In the same year Clubbe in the British Medical Journal reported on the good results of this treatment in the Sydney Children's Hospital. Berlin, in the ['Munch Med

woch'] 1897, pointed out that the mortality was not lowered so much as had been expected, that antitoxin was apt to produce albuminuria and that relapses and paralyses were more common under its use.

In the 1898 edition of other's medical antitoxin was recommended in all severe cases over two years of age in 1500 to 2000 unit doses, repeated if necessary in 24 hours. Rarely did the dose require to be repeated three. The immunizing period of antitoxin was considered to be three weeks. Stieffler's antiseptic solution, consisting of menthol grammas [X], boric acid x cm.xxxvi, [x] ferris picrathrate cc. iv and absolute alcohol cc. lx. was also recommended for local application.
Chapin in 1898, in the New York Medical Recorder, recommended strychnine, nitro-glycerine and digitalis, given hypodermically if vomiting should be present, as useful drugs in cases of cardiac failure. Jordon Norrell, after experimenting extensively with the serum, concluded (1898 in Carolina Medical Journal) that 100 to 200 units given 24 hours before injection would confer immunity for 10 days, a larger dose, 250 units for a child of two years or 500 to 800 units for an older patient, would confer immunity for 20 days. He also considered that no harm could result from the careful use of the serum. Church in 1898 (Medical Press and Circular) confirmed the good reports of the results of this treatment and was of the opinion, that the greater prevalence of paralyzis was rather a good sign, proving as it did, that more patients lived to suffer from these nerve lesions.

Wasson in the same paper and
year remarked that he could find no encouragement in antitoxin and put down the changes in mortality to changes in the severity of the disease.

With few exceptions, however, observers reported well of the new form of treatment.

Herrington's article, in Albott's System of Medicine 1901, may be taken as embodying the treatment in vogue in Great Britain at that date. Locally he preferred carbolic solution swabbed on, care being taken in so doing not to exhaust the patient. Careful feeding, nasally should the patient refuse food by the mouth, two hourly by day and three hourly by night was essential. In heart failure he advised strychnine and alcohol, in laryngeal suffocation tracheotomy in preference to intubation. Lastly serum, concentrated and pushed if necessary, must be used.

In 1901, Ohle, quoting M'Cullum of Boston recommended the giving of
antitoxin till the characteristic effects as shrinking of the membrane, loss of fever, diminution of nasal discharge and general improvement were produced even if, to effect this, 70,000 units had to be administered.

Dr. Louis Carris, in the Lancet 1902, judging from 20 cases so treated in the Glasgow Belvidere Hospital, recommended the intravenous injection of the serum in doses of 20,000 to 25,000 units repeated in 24 hours if necessary in all malignant, moribund, profoundly toxic cases and in cases with involvement of the lungs. He was the first to advocate this method of applying the serum.

Northrup's article, in Northagel's Encyclopedia 1902, gave a full and up to date account of the treatment of diphtheria. Locally a careful and frequent toilet with mild antiseptics was strongly advised and contraindicated only by haemorrhage and cardiac weakness. By this means loose membrane
products of decomposition, mucus and
germus were removed. The general
treatment described was the usual
stimulating and supporting one. The specific
serum had taken the place of the old
called specifics, such as calomel
fumigation, though even at this time
Jacobi still believed in this treatment
for laryngeal cases, pilocarpin, quassia,
citric acid, tincture of myrrh and
dilorme. Regarding indications for
serum treatment, Korthunp considered,
that
in mild cases over one year, the bacteriological
report might be waited for. In cases,
it should be given without delay
and repeated in clinical cases which
the Klebs-Leffler bacillus were not
discoverable. Urgent symptoms, due to
diphtheria, were no contra indication to its
use. The dose advocated varied between
1500 to 8000 units, repeated if necessary
and the material should be as
concentrated as possible. Unfortunately
various sequelae such as slight and
usually transient albuminuria, pains
muscular or neuralgie, arthropathies,
menorrhagia, vomiting, diarrhea, fever, or rashes were apt to follow the introduction even of concentrated horse serum. Skin rashes occurred in 25% of cases, about the second to the eighteenth day, and were erythematous, urticarial, mixed, or petechial in type. The erythematous variety was sometimes difficult to diagnose from scarletinal rashes. Filtering or heating the serum had little if any effect on the above sequelae. Intubation, if preferred to tracheotomy, the indications for either being progressive dyspnoea, exhaustion, and a failing pulse. If in doubt it was safer to operate. In tracheotomy the high operation was commonly performed and was usually followed by a slight rise of temperature for two or three days and by a free expectoration of mucus and membrane. A dry tube was of great import and suggested pneumonia. In intubating he preferred the vertical position to the horizontal and dorsal, which required more skill and was only used for sudden emergencies.
He employed for this purpose an Oldroyd tube, which reached to within an inch of the bifurcation of the trachea and was perfectly co-related to the anatomical structure of the larynx. A hinged obturator fitted into the tube and projected beyond as a rounded end. The whole fitted on an introducer. Intubation, he advised, should be performed by means of an introducer, by a string or by intubation within three or four days. Blocking of the tube with membrane should be relieved by slapping the child on the back and if that failed by intubation. The patient might be fed in the ordinary way, or in Casselberry's dorsal position, with the head lower than the body, by the nasal tube or per os.

In the May number of the Medical Chronicle 1902, Knyvett Fordon of Innsdale Hospital expressed his views on the treatment of severe laryngeal diphtheria. Steam he considered useless. To relieve dyspnœa he favoured the high operation
of tracheotomy performed by the plunge method, without anaesthetic, and during the quiet stage of stryphina preceding death. Regarding after treatment he abominated the use of feathers to clean the tubes when in situ, he directed his nurses to remove the outer tube, in those instances in which blockage occurred, and to insert a tracheal dilator, rather than watch the child slowly suffocating, whilst the doctor is being procured. When the tube was finally removed, it was his custom to test the laryngeal breathing by inducing a fit of coughing.

In the same year Waxham reporting on 40 intubated cases with 5% mortality remarks—"little is to be said in favour of the judgment of the physician, who to-day will perform the cutting operation from choice, to tide over an emergency often of a few hours duration. Such statements, as these will cause the physician to ponder, whether some of Waxham's emergencies might not have been tidied over the few critical
hours by the use of steam without the use even of intubation. Intubation at its best is an ugly operation and uncertain in its effects. I saw recently a case of congenital stenosis of the larynx, causing death, resulting from this so-called aseptic operation. The larynx examined post mortem had evidently been severely injured, either by the introduction, or by the presence of the intubation tube.

Burney Yeo, in the 1904 edition of his work on medical treatment, was strongly of the opinion that the whole success of local treatment depended on its early and thorough application when the virus was, he considered, near or upon the surface and therefore accessible and easily attached. His methods, detailed in that work, differ little from those in vogue at the present time and need not be detailed.

In 1905 Hyvett Jordon, of the Roosevelt Hospital, strongly advised rest of the stomach, as well as of the body during
diphtheria. On no account should patients be wakened from a natural sleep to take food, neither should they be forced to take food against their will. His views on other branches of treatment were the same as already stated in his earlier publications.

The various opinions described above have been chosen as serving to illustrate the gradual development of the modern treatment of diphtheria. Many more authorities might have been quoted but that would have led to much unwarranted repetition.

The various forms of treatment described may be grouped under four main headings - first, the caustic and antiseptic treatment of Bretonneau and his followers; second, the wild and vain search for a specific drug remedy; third, the supporting and stimulating treatment, which has always accompanied all other methods; and fourth, the specific anti-diphtheritic treatment of Behring. The first in its old fierce garb has died out,
and now mild antitoxins are usually the only ones used. Local treatment at the present time is more in the lines of a toilet than of a curative agent. The wide search for specifics still continues, but now it is mainly specific to combat the sequelae, that are being sought. The third will probably always be persisted in, diphtheria being too deadly an enemy, even in its apparently mild forms, to trifle with in any way. The fourth and greatest, the serum treatment is all important. New and improved sera, in smaller bulk or in tabloid form, may be devised; new methods of application may be employed; however successful the new materials and the new methods - mankind can never forget the debt of gratitude it owes to the originators of the anti-diphtheritic serum treatment.
Part II. One hundred cases of Diphtheria.

The next part includes short descriptions of 100 cases of diphtheria and one doubt-ful case. These are, with the exception of Dr. Davidson's cases mentioned in the text and observed by myself, consecutive and consecutive cases alone will be considered in figuring the results of treatment. The descriptions are, for the sake of space, made as short as possible, chief attention being given to the main features shown on admission, to the amount of antitoxin required, to the important measures of treatment adopted and to the progress and results of treatment. For the sake of convenience in dealing with this set of cases the following subdivisions have been made:

A. Façcial Diphtheria

1. Very mild cases, merely showing the presence of bacilli and no membrane.
2. Cases of average severity with the presence of membrane.
3. Clinical cases, the Klebs-Loeffle bacillus.
not being discoverable.
4. Fauveal cases of severe type.
   B. Fauveal and nasal Diphtheria.
   C. Laryngeal Diphtheria
1. Fauveal and laryngeal cases.
2. Pure laryngeal cases.
3. Clinical laryngeal cases.
4. Fauveal laryngeal and nasal cases.
   D. Doubtful Disease.

The bedside charts have for the sake of convenience in insertion been copied on a smaller scale. Each chart gives the age of the patient, the type of the disease, the result of treatment, the day of the disease, the morning and evening temperature, pulse and respiration, the daily amount of urine in ounces, the presence or absence of albumin in the urine, the drugs, serum and operative procedures employed and the onset of complications or sequelae. As many of the patients were of a tender age, the exact quantity of urine could not in consequence be always correctly estimated.
In each instance the Park's Davis and G
variety of serum was employed. The dose used, the brand, the date when tested and the hour when injected are all inserted. The number of days on which membrane was present on the fauces is indicated by a horizontal bracket.

In all cases where used, with one exception, serum was administered as soon after the admission of the patient as possible, without waiting for the bacteriological report.

Except in the cases of the patients where the sign "clin" appears after the disease, the organism of diphtheria was in each instance discovered in the nose or fauces by the following method. On admission, a swab was taken from the fauces in cases of laryngeal or faecal disease and from the nostril in nasal cases. The swabs used were of the ordinary variety, firm pledges of cotton wool, mounted upon the ends of stiff wire rods. They were sterilized by heat in a dry oven. In taking a swab from the throat, the patient's head and hands being firmly held by
The 1. Stain

Methyl Blue 1 gramms
Alcohol 96% 20 cc
Dissolve and add 950 cc of distilled water.
muse the doctor inset with his
left hand a tongue depressor between
the teeth. On passing this to the back
of the tongue the young child will
invariably open its mouth. The swab
is then rapidly passed to the back
of the throat and the affected tonsils
firmly and thoroughly rubbed. The
whole process lasts only a few seconds
but firm and thorough rubbing with
the swab is essential otherwise deep
seated organisms, and these may be
the only ones present, will be missed.
The swab is then returned to its sterile
tube and conveyed to the laboratory
where the culture is made on a
blood serum medium. After about
seventeen hours at blood heat the
typical growth can usually be seen.
With a sterile platinum loop a small
particle of this growth is transferred
to a glass slide and spread into a
thin film. A modified renner's
stain is then applied as follows:
Without fixing the film drop on No.
stain and immediately blot off with
No 2. stain

Picric Acid 1%  
Erythrosine 1%  
equal parts  
Add enough lithium carbonate to form a deposit.
filter paper, then drop on no 2 stain and blot off in the same way. Dry thoroughly with pressure of dry filter paper. Place a drop of cedar wood oil upon the film and examine under the oil immersion lens. The whole process occupies about two minutes and besides being a great time saver gives excellent results. It is suitable for culture films but gives poor results with films made from the swab itself. In the latter case methylene blue is the best stain applied in the usual way. The results of films made from the swab itself are not satisfactory. Sometimes the diphtheria bacillus can be seen but most often no sign of it can be found, even though it is easily discovered in cultures made from the same swab. This method of examination was used in all cases and was continued at intervals in each case, until the organism had disappeared from the faucets or nose. The patient was then and then only, if otherwise well, allowed to leave the hospital.
Case 1.

Name: Alice S. Small  
Age: 11 yrs  
Disease: Diptheria F  
Result: Recovery  

Date  
July 1925

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- July 11: Admission
- July 12: Admission
- July 13: Discharged
- July 19: Discharged (July 31, 1925)

Case 2.

Name: Robert P.  
Age: 13 yrs  
Disease: Diptheria F  
Result: Recovery  

Date  
Aug. 1925

| Date | 25 | 26 | 27 | 28 | 29 | 30 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Time | 106° | 105° | 104° | 103° | 102° | 101° | 100° | 99° | 98° | 97° |

- July 25: Admission
- July 26: Admission
- July 27: Discharged
- Aug. 9: Discharged
A. Some examples of mild fencal diphtheria without the presence of membrane.

Case 1. Complained of sore throat and shivering on 6th July. On 8th July being still out of sorts a doctor was called in, who took a swab from the throat. On the 9th she complained of nausea and vomited once. Was admitted on the 10th. Previous infectious diseases - measles and whooping cough. On admission she appeared to be slightly ill. No rash was present. The tongue was moist but showed some thin white fur. The faucets were a little congested. No membrane was visible. On admission a positive culture was obtained from the throat, but on the 12th July and subsequently all cultures were negative. Uninterrupted recovery.

Case 2. July 14th. Fell out of sorts. Had hectic fever. On admission was slightly ill. No rash. Faucets a little congested especially on left side. No membrane. Tongue moist. Fund a few enlarged glands on each side of neck. Culture from faucets gave a positive result until 21st August when no bacilli could be found. This patient made an un-interrupted recovery.
Case 3. Admitted from Craigthark.(art) Poor House. Had felt a little out of sorts for some days. On admission there was no rash present. There was slight congestion and enlargement of the tonsils, but no membrane was present. Indisposition seemed very slight. A culture from the fauces gave a positive reaction. By 10th September no diphtheria organisms could be found in the throat. She was discharged on Sept 12th in good health.

Case 4. On admission looked a little out of sorts. An evil smell like diphtheria hung about him. No rash. Tongue a little dry, very thinly furad. Fauces were slightly congested. Tonsils a little enlarged. No membrane was present. Culture from throat gave a positive reaction. On Sept 14th no diphtheria bacilli found in culture from throat. Discharged Sept 19th in good health.
Case 5

Name:  
Disease: 
Result: Recovery

Date: 
Temp. 
Pulse: 

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Aug 25TH 1882

Case 6

Name: 
Disease: 
Result: Recovery

Date: 
Temp. 
Pulse: 

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Aug 25TH 1882
Case 5. Poor house child. Did not seem out of health. Tongue moist and clean. Fauces of healthy appearance. A culture, prepared from the throat, showed numerous diphtheria bacilli. The day of the disease was not known. She was allowed to sit up on 1st September and left her bed on the 3rd Sept. The bacilli having apparently disappeared from the fauces on 15th Sept., she was discharged on the following day.

Case 6. A nurse from the poor house. Had been exposed to infection on 23rd August. Appeared to be in fair health. A little chronic pharyngitis present, otherwise the fauces looked healthy. A positive reaction was however obtained from the culture, prepared from the throat. The cultures remained obstinately positive until 15th Sept. She was discharged on 15th Sept. in fair health.

On the 3rd Sept. she had an attack of lumbago due to constipation and cured by rigorous purgation.
Case 7. A nurse from the poor house. She had been exposed to infection two days before. Appeared quite well. Fauces looked healthy. Numerous diphtheria bacilli were however obtained in the culture, made from the throat. On the 28th and 30th no diphtheria bacilli could be discovered in fauces. She was accordingly discharged on 30th August.

Case 8. A nurse from the poor house. She also had been exposed to infection two days ago. Appeared to be in good health, except for the presence of slight chronic pharyngitis. Numerous bacilli of diphtheria were found on admission in culture from fauces. These bacilli could no longer be found on the 29th or 30th August. She was therefore discharged on 31st August.
Case 9. A poor house child. Fat and flabby looking. Fauces appeared to be healthy, but a culture showed numerous diphtheria bacilli to be present.

On the 8th Sept. appeared to have caught cold with a little bronchitis. On the 9th the tongue was rather thickly furred and the fauces showed considerable congestion. A slight erythema was noticed on the upper part of thorax. This disturbance may have been due to the serum injected. The tongue did not clean like a scarlatinial tongue nor was any desquamation visible. A little epistaxis occurred on the 10th Sept. Subsequently she made an uninterrupted recovery.

Case 10. A poor house child. Appeared healthy in every way. Diphtheria bacilli were however present in fauces until 21st Sept. when none could be discovered.

The ten cases above quoted were all treated after the same fashion. Great attention was paid to careful local
treatment, detailed later on, a liberal food diet, to tonics and to fresh air.
In most cases the bacilli soon disappeared from the fauces, in a few they obstinately remained for two or three weeks. On the whole carbonic acid in glycerine seemed to be the best local agent for getting rid of these obstinate bacilli. For the sake of safety four of the cases received small doses of antitoxin, but these did not to any appreciable extent affect the expulsion of the bacilli.

The next series of cases contains three fatal cases of diphtheria of average severity and showing the presence of membranes. The treatment carried out in this type of the disease is detailed as far as possible in the third part of the present paper.

Case I. First felt ill on May 5th, when she complained of headache and shivering. On May 6th she had a sore throat. On admission she looked ill. The tongue
was furred. There was a slight rough smell about the mouth. General congestion of faucial tonsils involved was present. Both tonsils were thickly covered with grey membrane. Part of the uvula was also similarly coated. Enlarged glands were present, behind the angle of the jaw, on each side. She was fairly stimulated and fed. The throat cleared rapidly with one dose of 5,000 units diphtheria antitoxin. With the exception of an occasional trace of albuminuria during the first 9 days, she made a slow but complete and uneventful recovery.

**Case 2.** Illness began on day of admission with nausea, feverishness and ill temper. On admission was feverish and appeared sharply ill. The tongue was furred and dryish. Uvula, tonsils, surrounding parts congested. Thin grey membrane covered each tonsil. Numerous diphtheria bacilli present in faeces. 3,000 units diphtheria was given. The membrane entirely disappeared in 6 days. No complications set in. Her recovery was complete.
Case 3

Name: Robert T
Age: 6 yrs
Disease: Diphtheria F
Result: Recovery

Date
27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Temperatures
106° 105° 104° 103° 102° 101° 100° 99° 98° 97° 96° 95° 94° 93° 92° 91° 90° 89° 88° 87° 86° 85° 84° 83° 82° 81° 80° 79° 78° 77° 76° 75° 74° 73° 72° 71° 70° 69° 68° 67° 66° 65° 64° 63° 62° 61° 60° 59° 58° 57° 56° 55° 54° 53° 52° 51° 50° 49° 48° 47° 46° 45° 44° 43° 42° 41° 40° 39° 38° 37° 36° 35° 34° 33° 32° 31° 30° 29° 28° 27° 26° 25° 24° 23° 22° 21° 20° 19° 18° 17° 16° 15° 14° 13° 12° 11° 10° 9° 8° 7° 6° 5° 4° 3° 2° 1° 0°

Note: Temperatures in °F

Case 4

Name: Robert T
Age: 10 yrs
Disease: Diphtheria F
Result: Recovery

Date
27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Temperatures
106° 105° 104° 103° 102° 101° 100° 99° 98° 97° 96° 95° 94° 93° 92° 91° 90° 89° 88° 87° 86° 85° 84° 83° 82° 81° 80° 79° 78° 77° 76° 75° 74° 73° 72° 71° 70° 69° 68° 67° 66° 65° 64° 63° 62° 61° 60° 59° 58° 57° 56° 55° 54° 53° 52° 51° 50° 49° 48° 47° 46° 45° 44° 43° 42° 41° 40° 39° 38° 37° 36° 35° 34° 33° 32° 31° 30° 29° 28° 27° 26° 25° 24° 23° 22° 21° 20° 19° 18° 17° 16° 15° 14° 13° 12° 11° 10° 9° 8° 7° 6° 5° 4° 3° 2° 1° 0°

Note: Temperatures in °F
Case 3. On the 23rd June took a cold. On the 24th complained of sore throat. On the 26th the family doctor took a swab from throat. On the 27th, day of admission, a positive reaction was obtained from culture. Looked sharply ill on admission. Tongue dryish thinly furred. Fauces tonsils and uvula showed general congestion. There was a moderate amount of membrane on each tonsil. Numerous diphtheria bacilli were present in culture from fauces. 4000 units antitoxin was given on admission and, the membrane being stationary the next day, a further 1000 was administered. The fauces then cleared rapidly and, with the exception of an erythematous antitoxic rash on 7th July, recovery was uneventful.

Case 4. On 28th June vomiting, headache, sore throat and chivering were present. Admitted on 29th with depression, general congestion of fauces, and membrane on each tonsil spreading slightly on to the retro-tonsillar regions. The membrane disappeared in 2½ days after 4000 units of antitoxin. The fauces contained numerous...
Case 5.

Name: Annie D.

Date: July-August 1908

Temperature (Fahrenheit)

- Temperature readings on chart with notations:
  - July 1: 106°
  - July 2: 100°
  - July 3: 99°
  - July 4: 97°
  - July 5: 96°
  - July 6: 97°
  - July 7: 98°
  - July 8: 99°
  - July 9: 98°
  - July 10: 97°
  - July 11: 98°
  - July 12: 99°
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  - August 25: 136°
  - August 26: 137°
  - August 27: 138°
  - August 28: 139°
  - August 29: 140°
  - August 30: 141°
  - August 31: 142°

- Discharged August 31, 1908.
Diphtheria bacilli. On 20th July slight weakness of left leg was noticed. This quite disappeared by 2nd August. Otherwise convalescence was uneventful.

Case 5: On 1st July complained of headache and sore throat. On admission looked sharply ill. Tongue dry, red and partially covered with dirty yellow fur. Evil smell from throat. Each tonsil is enlarged and congested. Fair amount of membrane on left tonsil, small amount on right. Would clear. Numerous diphtheria bacilli in fauces. The fauces cleared in 5 days after 4,000 units of antitoxin. Slight right internal strabismus on 14th July, disappeared in a week. Otherwise convalescence uneventful. Discharged on Aug 12th. 7 days later was readmitted, suffering from scarlatina, from which she made an excellent recovery.

Case 6: 2nd July out of sorts. 3rd July admitted with slight membranous patching on left tonsil and a minute
patch upon right tonsil. Uvula clear. Slight congestion of fauces. Numerous diphtheria bacilli discovered in fauces. Fauces rapidly cleaned after 1,000 units antitoxin and recovery was rapid. No complications.

Case 7. Sore throat on 4th July. On 5th July admitted with typical membrane covering right tonsil which was a good deal enlarged. Uvula and left tonsil clear. Numerous diphtheria bacilli present. 2,000 units antitoxin given on admission. On 6th July membrane diminishing. Slight nausea. 9th July fauces clean, good convalescence.

Case 8. Headache and vomiting on 2nd July. Sore throat on 3rd. Admitted on 5th. An evil smell proceeded from the mouth. Typical diphtheretic membrane was present on each tonsil and on the base of the uvula. Diphtheria bacilli were present. 4,000 units antitoxin was given soon after admission. The
fauces cleaned rapidly under this
dose and her ultimate recovery was
oxcellent and uncomplicated.

Case g. 2nd July complained of sore
throat, headache and shivering. On 3rd
the loop to her bed. On the 7th a
swab was taken from the throat,
found positive. On the 8th 2000 units
antitoxin was administered and she
was admitted soon after. She felt
weak. Typical membrane was present
upon the right tonsil and a small
speck upon the left. There was some
general congestion of the fauces and
enlargement of the tonsils. Numerous
diphtheria bacilli were present on
fauces. She made a rapid and
excellent recovery.

Case 10. July 7th complained of sore throat
shivering and headache. Went to bed.
July 8th vomiting. July 9th felt a little better.
July 10th a swab taken with positive
result. Admitted on July 11th slightly
ill. Fauces congested. Right tonsil
Case 10.

Name: Alice J. B.
Age: 19 yrs
Disease: Diphtheria F
Result: Recovery

July

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Case 11.

Name: James S.
Age: 13 yrs
Disease: Diphtheria F
Result: Cure

July

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enlarged and covered with yellow membrane. Would not to the elbow. Numerous diphtheria bacilli present. 3000 units of antitoxin was given and the wound rapidly cleaned. Recovery was complete and excellent in every respect.

Case II. July 11th complained of sore throat and headache. A swab was taken from throat and proved positive. July 12th admitted seemingly not severely ill. Grey membrane was present on the right tonsil alone. Numerous diphtheria bacilli present. 3000 units of antitoxin was administered and the tonsil soon cleared. On 22nd July an irregular and slight measles antitoxin rash appeared. Otherwise convalescence was uninterrupted.

Case 12. July 16th, day of admission, complained of sore throat and chills. On admission was markedly feverish. Both tonsils covered and upon each were several coalescing grey yellow patches
Case 12.

July 15.

Name: John H.
Age: 15

Disease: Diphtheria F.

Results: Recovery.

Temperature (°F)
106°
104°
105°
102°
90°
87°
85°
83°
82°
79°
77°
76°

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Pulse
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July 15.

July 16.

July 17.

July 18.

July 19.

July 20.

July 21.

July 22.

July 23.

July 24.

July 25.

July 26.

July 27.

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July 30.

July 31.

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Aug. 30.

Aug. 31.

Case 13.

July 15.

Name: Joseph P.
Age: 15

Disease: Diphtheria F.

Results: Recovery.

Temperature (°F)
106°
104°
105°
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90°
87°
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83°
82°
79°
77°
76°

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Time

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Pulse
Resp.

July 15.

July 16.

July 17.

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Aug. 119.

Aug. 120.
of membrane. Numerous diphtheria bacilli were present. 3000 units antitoxin was given on admission. Recovery was rapid and excellent.

Case 13. On 13th July headache and vomiting present. On 15th day of admission sore throat began. Small diphtheritic patches of membrane were present upon each tonsil, would free of membrane. Numerous diphtheria bacilli present. 1500 units of antitoxin was given on admission. The membrane then gradually receded from tonsils. A small patch of membrane appeared on 17th on would, but disappeared without further antitoxin. The tonsils took 7 days to clean and convalescence was slow but uncomplicated. This patient would in all probability have done better had a little larger dose of antitoxin been given on admission. However recovery was complete.
Case 14. On July 13th complained of sore
throat, headache and earache. July 14th was feverish and no better. On 15th a doctor
was called in. On 16th was admitted ill
of feverish illness. Each tonsil, but
especially the right, had gray yellow
patches of membrane upon it. Would clear.
Numerous diphtheria bacilli present.
4,000 units of antitoxin was given upon
admission. A further 4,000 units had to
be given next morning, as the membrane
showed signs of spreading. The tonsils
then cleaned rapidly and an excellent
recovery was made.

Case 15. July 17th headache, sore throat, nausea
and vomiting. July 18th positive swab taken.
Admitted on 19th a neurotic spinster, not
seriously ill apparently. Small patches
of membrane on each tonsil. Would fear
Tongue dirty. 10,000 units antitoxin rapidly
cleaned tonsils. Paved a very neurotic
patient. Her recovery was rapid and
complete.

Case 17. Appeared ill, said to have sore throat on July 23rd. Doctor called in on July 28th. Admitted same day with thin diphtheretic membrane on each tonsil and on uvula. Numerous diphtheria bacilli present. Given 4000 units antitoxin soon after admission. Membrane had spread next day to some considerable extent. 5000 units were therefore administered, whereupon the membrane rapidly disappeared. The child contracted a feverish cold on 2nd August. Otherwise convalescence was uninterrupted and excellent.
Case 18

Name: Jenny B
Age: 33 yrs
Date: July 1
Disease: Smallpox
Result: Recovery

July 1
Time

Pulse
Resp.
Urine
Bowels

July 31
2
Went to hospital
4
Discharged Aug 13th

Case 19

Name: John S
Age: 29 yrs
Date: Aug 29
Disease: Diptheria
Result: Recovery

Aug 2
P. Sherry 24th

Aug 23
Discharged Aug 24th
Case 18. July 26\textsuperscript{th} feverish, headache & nausea. 27\textsuperscript{th} sore throat. 28\textsuperscript{th} membrane noticed and antibiotic given. Admitted on July 31\textsuperscript{st}, feeling weak and tired. Membrane was just disappearing from tonsils. No further dose of antibiotic was given. August 1st no sign of membrane. Recovery was good and rapid.

Case 19. July 29\textsuperscript{th} nausea vomiting. July 30\textsuperscript{th} headache and sore throat. Admitted August 2\textsuperscript{nd}, looking pale and somewhat poisoned. Lips cracked and dry. Ulula and tonsils inflamed. False membrane covering ulula and spreading along soft palate, was noticed. Tonsils free. There was a good deal of dirty mucus at the back of the throat. He was given 6000 units of antibiotic soon after admission. After this the membrane ceased to advance and soon began to recede. He made a good recovery.

3000 units antitoxin administered soon after admission. No further dose had to be administered. He made a good recovery.

Albumin was present in urine for two days after the injection of serum.

Case 21. August 4th headache and sore throat. Aug. 7th doctor called in, who gave antitoxin. Admitted on 8th August. Weak but not severely ill in appearance. Tonsils enlarged to congestion visible. Two thin flakes of membrane could be seen on the left tonsil. These disappeared next day. Recovery was complete and rapid.
Case 22. A city hospital nurse. Sore throat began on 8th Aug. Warded on 10th pale and ill looking. Tonsils inflamed, slightly enlarged and partially covered with grey false membrane. Evil smell from mouth. 3000 units of antitoxin was found sufficient to clean the tonsils. Her recovery was uninterrupted and complete.

Case 23. Taken ill on 11th August with vomiting and headache. Admitted next day feverish and ill. Right tonsil inflamed and covered with small, grey white, loose patches of membrane. Numerous diphtheria bacilli present. 1500 units of antitoxin was given on admission. Next day, the membrane having spread somewhat, 3000 units was given with success, the membrane soon disappearing. On 18th Aug an erythematous antitoxin rash appeared. On 29th Aug she had a feverish cold otherwise her convalescence was uneventful.

Case 24. Aug 11th fell out of sorts and feverish. Aug 13th sore throat, nausea and
### Case 24

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**Remarks:**
- Aug. 17: Dr. Shockey at 4 p.m.
- Aug. 18: R. by E. 900 ppm H.
- Aug. 21: Dr. Shockey at 4 p.m.

### Case 25

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**Remarks:**
- Aug. 18: Dr. Shockey at 4 p.m.
- Aug. 19: R. by E. 900 ppm H.
- Aug. 23: 20 S.P. tepid.
- Aug. 31: Discharged Aug. 90.
Vomiting present. Admitted on 16th Aug.
Dull and depressed looking. No rash. Grey
membrane was present upon each tonsil
on a congested base. Numerous diphtheria
bacilli present. 3000 units antitoxin was
administered with success, the membrane
gradually disappearing from tonsils. He
progressed well until 5th Sept, when an
erythematous rash appeared on back. On 6th
rash was faintly punctate all over body, face
included. On 8th rhinorrhea began. On 9th
slight desquamation was noticed on fingers.
On 13th slight desquamation appeared on body.
Tongue atypical. No constitutional symptoms.
So the case safely he was isolated.
Was discharged well on Oct 5th.

Case 25. Aug 14th sore throat, shivering, head-
ache nausea and vomiting present. Had
had diphtheria three times already. Aug
15th admitted with typical grey membrane
on left tonsil upon an inflamed base.
1500 units antitoxin rapidly cleared the
tonsil. Her convalescence was uninterrupted,
but she complained of general weakness
for some months after dismissal.
Case 26. Aug 14th headache and sore throat
Aug 15th admitted - feverish and ill, right
Tonsil freshly patchy with membrane.
3000 units antitoxin administered soon
after admission. Tonsil gradually cleared
no further dose being necessary. On Aug
18th some red spots appeared on face
and left arm. A faint stained rash
appeared on arms. Aug 19 rash faded.
Further progress excellent and uncom-
plicated.

Case 27. Aug 20th out of sorts. 21st sore
throat appeared. Fauces on admission
Aug 23rd showed general congestion.Tonsils
slightly enlarged. A little membrane present
on posterior pharyngeal wall. A good deal
of dirty mucous purulent deposit about
fauces. Tongue furred and fairly moist.
1800 units antitoxin was administered
on admission. Recovery rapid.
Case 28.

Name: John C  
Age: 12 yrs  
Disease: Diphtheria

Date | Temperature (°F) | Notes
-----|-----------------|------
22   | 102             | Initial symptoms
24   | 104             | Temperature rise
27   | 106             | Peak temperature
31   | 104             | Temperature drops
Aug 21 | 105             | Patient discharged

Case 29.

Name: Paul J  
Age: 39 yrs  
Disease: Diphtheria

Date | Temperature (°F) | Notes
-----|-----------------|------
26   | 103             | Initial symptoms
27   | 104             | Temperature rise
28   | 106             | Peak temperature
Sep 7 | 103             | Patient discharged

Dr. Croce, 574, W. 17th St.
Case 28. Aug 22nd headache, sore throat, nausea and vomiting present. Aug 23rd admitted sharply ill, tongue dry and furled, fauces congested, both tonsils enlarged and a fair amount of membrane upon each. Uvula clear. Enlarged glands at the angle of the jaw upon each side. A disagreeable smell rose from mouth. 3000 units antitoxin was found sufficient to cause the membrane to disappear and the symptoms to improve. Sept 6th a morbilliform rash appeared around the spot were serum had been injected. Food and rapid recovery.

Case 29. Aug 22nd headache, shivering, sore throat and nausea present. Aug 23rd admitted weak and run down, tongue white, some sores on teeth, pharynx contains some mucus pus. Remains of diphtheritic patching present on right tonsil. No antitoxin was given. She made a rapid and complete recovery.
Case 30.

Case 31.
Case 30. Aug 23rd took a cold with headache and shivering. 24th sore throat. 25th Aug admitted slightly ill. Right tonsil inflamed and covered with typical grey membrane. Left tonsil and uvula clear. Tongue furred and rather dry. 1500 units antitoxin was given on admission. Next day only a speck or two of membrane remained on the tonsil. Recovery was complete and rapid, although a few specks remained for a week upon the affected tonsil.

Case 31. Aug 25th complained headache. Aug 26th day of admission, complained of sore throat. Tongue furred and dry. Typical grey membrane lies on each tonsil. Easily loosened the denuded surface being inflamed and bleeding after membrane removed. Uvula clear. Fieberish and slightly ill. A very tractable patient. 3000 units antitoxin soon after admission was found enough to relieve the symptoms and cause the disappearance of the membrane. A trace of albumin appeared in the urine for a day or two. Food recovery made.
Case 32. Aug 25th vomited. 27th complained headache and sore throat. 28th admitted slightly ill, tongue dry and furred, each tonsil partially covered with membrane. Some congestion and enlargement of tonsils. Wounds clear. 3,000 units of antitoxin caused an abatement in all the signs and symptoms. Convalescence was a little delayed by the appearance of an abscess under skin of left buttock; this was opened on Sept 29th. Subsequent recovery was excellent.

Case 33. Poor house patient. Admitted on second day of disease with slight enlargement, congestion and patching of each tonsil. To each 1500 units antitoxin, administered shortly after admission, caused the tonsils to clear rapidly. On 5th Sept a patchy morbilliform rash appeared on face, back and limbs. He made an excellent recovery.
### Case 34

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| Pulse|   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |

### Case 35

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Case 34. Sept 2nd day of admission, sore throat noticed. Slightly ill, face flushed, hoarseness red and angry looking, no nasal discharge, tongue thinly furred and dryish, both tonsils enlarged and congested. On the right a thin film of membrane has appeared. 4000 units of antitoxin was given on admission. On the morning of 5th Sept the tonsils were clear of membrane. Her temperature rose that evening and on 6th Sept frank membrane appeared on each tonsil, whereupon 4000 units of antitoxin was again given. Subsequent convalescence good and uncomplicated.

Case 35. Sept 7th sore throat. Sept 8th admitted slightly ill. Right tonsil was enlarged and congested and a very small amount of membrane was situated upon it, atypical in appearance. No antitoxin was given that day. Sept 9th membrane was definite and widespread. 4000 units of antitoxin was then given and the membrane thereafter disappeared. Further progress most satisfactory.
Case 36. On Sept. 11th, the boy of admission just fell ill with sore throat. Typical membrane present on each tonsil. Each tonsil was enlarged and congested. 3,000 units antitoxin was injected on admission. No further dose was required. Excellent recovery.

Case 37. On Sept. 13th complained of sore throat and nausea. Vomited. Admitted on 14th pale face, weak. Some nasal discharge. Tongue furry and rather dry. Tones congested. Typical grey membrane upon each tonsil. Would clear. No diphtheria bacilli were found in the nasal discharge. Numerous diphtheria bacilli were however found in the faeces. 4,000 units of antitoxin was given on admission. His condition improved in every way and no further dose was required. He made an excellent recovery.
Case 38. 23rd Sept first fell ill. 24th was feverish and vomited. 25th complained of headache. Admitted on 26th with fairly extensive diphtheritic patching on each lobe. On the left side it extended along the edge of the soft palate on to the base of the uvula. Tongue thickly furled. 4000 units of antitoxin was found to be sufficient for this patient. He made an excellent recovery though a trace of albumin was found in the urine during the first two weeks.

In each of the above thirty-eight cases the bacillus of diphtheria was discovered by the swab and culture method. None of the patients were discharged, until the organisms could no longer be found in the fauces.

In the following set of cases however none of the bacilli could be found and yet in their clinical aspects the patients seemed to be suffering from true diphtheria.

Case 3. On June 14th developed measles. On 26th June sore throat complained of. Admitted
27th June with general stomatitis and congestion of fauces. White membranous patches present on tonsils, uvula and soft palate. Lips dry and cracked. Breathing rapid with grunting expiration. No physical signs of pneumonia discovered. 5000 units antitoxin given soon after admission. No diphtheria bacilli found. Stomatitis was not got rid of until 16th July and the patches of membranes were slow in disappearing. Some paresis of left leg was noticed on July 22nd. Her convalescence was delayed in consequence. Good recovery made.

Case 2. July 6th sore throat. July 7th nausea and vomiting. Her head diphtheritic. Admitted on July 7th, sharply ill, typical diphtheritic smell proceeding from mouth, typical membrane on each tonsil. Fauces are congealed and tongue furled. On this occasion negative Wassermann was obtained. She improved rapidly after 1000 units of antitoxin and made an excellent recovery.
Case 1.

[Graph showing temperature changes over time with notes and diagrams]

July

Name: Daniel F.  Age: 65 yrs  Disease: 2nd degree F (Chol)  Result: Recovery.

Diagram of temperature changes with notes:

- July 14: Temperature 106°
- July 15: Temperature 105°
- July 16: Temperature 104°
- July 17: Temperature 103°
- July 18: Temperature 102°
- July 19: Temperature 101°
- July 20: Temperature 100°
- July 21: Temperature 99°
- July 22: Temperature 97°

Notes:
- July 14: 1st degree F (Chol)
- July 15: 2nd degree F (Chol)
- July 16: 3rd degree F (Chol)

Case 2.

[Graph showing temperature changes over time with notes and diagrams]

July

Name: Stephen M.  Age: 65 yrs  Disease: 2nd degree F (Chol)  Result: Recovery.

Diagram of temperature changes with notes:

- July 25: Temperature 106°
- July 26: Temperature 105°
- July 27: Temperature 104°
- July 28: Temperature 103°
- July 29: Temperature 102°
- July 30: Temperature 101°
- July 31: Temperature 100°
- August 1: Temperature 99°
- August 2: Temperature 97°

Notes:
- July 25: 1st degree F (Chol)
- July 26: 2nd degree F (Chol)
- July 27: 3rd degree F (Chol)

Discharge Aug 30.
Case 3. July 16th complained of headache and sore throat. July 17th admitted feverish, typical membrane on right tonsil and a small patch upon left. Smelt like a diphtheria. Some enlarged glands at the angle of the jaw on each side. No diphtheria organisms could be found after repeated examinations. The tonsils after 3000 units of antitoxin had been injected rapidly cleared, good recovery.

Case 4. July 23rd complained of headache and sore throat. July 24th 2000 units of antitoxin administered. Admitted July 25th feverish, with typical diphtheritic patching upon the inflamed posterior pharyngeal wall. Tonsils and uvula clear. Coastal diphtheritic smell from mouth. The membrane cleared away without further antitoxin being required. Repeated examination failed to reveal the presence of diphtheria bacilli. He made an excellent recovery, until Aug 26th on which day he was to have been discharged. He vomited became feverish and during the day an early junction
Case 4 (Continued)

Case 5
Scarlatinal rash appeared on thorax. Palate and tongue were of typical scarlatinal appearance. He was removed to the scarlatinal wards and there made an excellent recovery from that disease.

Case 6. July 25th complained of headache and shivering. July 26th admitted with sore throat, pyrexia, left tonsil inflamed and partially covered by a grey white patch of membrane. Right tonsil clear but inflamed. Evil smell from mouth. No diphtheria bacilli were discovered. 1500 units of antitoxin caused the affected tonsil to clean rapidly. He made a good recovery.
Case 6. August 3rd complained of headache and sore throat. Admitted Aug 4th to feverish. Diphtheritic membrane involved that part of the faucae on each side, lying behind the tonsils. The tonsils themselves, though inflamed, were free from membrane. No diphtheric bacilli could be found. 1500 units of antitoxin was injected and was followed by fairly rapid clearing of faucae. On 9th Aug an erythematous patchy antitoxin rash appeared. Good recovery.

Case 7. On 6th August a croupy cough was noticed, also said to have had a sore throat on that day. 7th Aug tonsils patched. 8th Aug admitted with typical diphtheritic patching on both tonsils. Would chew. Evil smell proceeded from mouth. The injection of 3000 units of antitoxin was followed by general improvement, good recovery made. No croup noticed.

Case 8. Said to have had a sore throat for 9 days. On 26th Aug complained of headache and nausea. Vomited. Admitted on
Case 8

Name: Libbie K  Age: 6 yrs  Disease: Diphtheria F (cig)  Result: Recovery

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Temperature (°C)

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<th>Urine, Bowels</th>
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Additional Notes:
- Started by Dr. B. on 5th.
- Discharged on 10th.
- Recovered on 12th.
Aug 29th with enlarged congested tonsils. There was slight patching of right tonsil and of base of uvula, of a diphtheritic appearance. Mouth smelt like a diphtheria. 1500 units of antitoxin was injected and was followed by a rapid cleansing of the fauces. On Sept 9th an antitoxin rash of scarlatinial type appeared and caused some anxiety from a diagnostic point of view. Good recovery.

A distinct point in favour of diagnosing the above cases as being those of true diphtheria is the fact that in each instance marked improvement followed the use of antitoxin.

The following cases include faecal diphtherias of severe type. In each patient the organism of diphtheria was found present in the fauces.

Case 1. June 21st complained of nausea, vomited. June 22nd swelling in neck first noticed enlarged. June 23rd sore throat appeared. Admitted same day feverish, looked ill and poisoned. Tongue dry and
Case I.

Name: Alice C  Age: 5 yrs  Disease: Diphtheria F

Result: Recovery

June 23: R. v. long, cough, fever.

July 3: Stab above.

Rigidity of chest.

Discharged July 20.
furred. A large amount of membrane was present on each tonsil and uvula. It
extended forward on the right side or to the soft palate. Did not swab off easily.
Smell from mouth very disagreeable. 8000 units of antitoxin was given soon after
admission. Next morning as the membrane had not receded and as the general
symptoms had not improved a further
dose of 3000 units was administered. He
faffes then rapidly cleaned. From 22nd June
to 2nd July there was copious albumin with
urine but no blood. The pulse, feeble on admission, remained so, and was
occasionally intermittent. For three weeks on July 3rd a patchy erythematous antitoxin
rash appeared. On July 30th palatal paralysis
set in. For some days thereafter unless fed very carefully she swallowed jelly
well - she returned food through the nose
on Aug 12th the palatal paralysis had
disappeared. Following this she gradually regained her strength and was discharged
on Aug 29th.

Case 2. July 4th vomited, complained of sore throat
Admitted on 5th. Sharply ill, faces congested
Case 2.

Name: John E.
Disease: Smallpox
Results: Recovery

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<th>Urine</th>
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July 7th: Febrile delirium.
July 8th: Feed well.

Discharged July 9th.

### Case 3

**Name:** Bruce H  
**Age:** 3 years  
**Disease:** Diphtheria

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**Temperature:**

- **July:**
  - 13: 106°
  - 14,15: 105°
  - 17,18: 105°
  - 20,21,22,23,24,25: 104°
  - 26,27,28,29,30,31: 103°

- **Aug:**
  - 3: 103°
  - 4: 102°
  - 5,6: 101°
  - 7,8: 100°

**Absence:**

- July 13: Wheezy fit & cold.
- July 14: Cough & rhinorrhea.
- Aug 2: Cold.

**Notes:**

- July 13: Wheezy fit & cold.
- July 14: Cough & rhinorrhea.
- Aug 2: Cold.
Admitted on 13th febrile, pale and poisoned. Slight dyspnoea present; very offensive odour in breath. Thin yellow discharge from right nostril, which did not contain diphtheria bacilli. Right side of naso-pharynx, tonsil and uvula blocked with membrane. Some membrane on left tonsil. Marked enlargement of glands in neck. In her case 1,000 units of antitoxin given in two doses cleared the faucets of membrane. July 14th an erythematous antitoxic-like rash appeared on legs, very restless, given 15 g NaBr with good result. There was copious albumin in urine for some days. From 25th July to the end of August she suffered from palatal paralysis. Pulse remained good throughout. She was nursed and stimulated with the greatest care and made a slow but good recovery. Several fatal cases of diphtheria occurred about this date in this girls class at school.

Case 4. July 29th complained of headache and sore throat. In June patients son had died of a malignant type of diphtheria.
### Case 4

**Name:** Isaac H  
**Date:** July 3-30  
**Temperature:** 99°-106°  
**Diagnosis:** Disease  
**Notes:**
- July 3-5: Rash, day 1.  
- July 16: Rash, day 3.  
- July 30: Rash, day 7.

### Case 5

**Name:** Thomas P  
**Date:** August 1-14  
**Temperature:** 99°-106°  
**Diagnosis:** Disease  
**Notes:**
- August 1: Rash, day 1.  
- August 14: Rash, day 7.

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**Table:**

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**Graph:**

- Temperature range: 97°-106°
- Dates: July 3-30, August 1-14
- Diagrams showing changes in temperature over time.
30th admitted with pyrexia. Small amount of membrane on left tonsil and on base of uvula. 3000 units of antitoxin given. July 31st very sharply ill, most disagreeable smell from mouth. Blood and albumin in urine. 8000 units of antitoxin given. Membrane had spread to hard palate.

Aug 1st. Membrane stationary, 6000 units of antitoxin given. He made a slow, but good recovery, after this. The patient was much troubled during convalescence with a persistent bad taste in the mouth and was much relieved by 3% Hydrazic Picrchlor externally. This case would probably have been fatal had it not been caught early.

of antitoxin had been given in three doses. For three weeks he was a good deal prostrated, the pulse being soft and feeble, but then picked up slowly and made a satisfactory recovery.

Sept 19th paroxysmal cough, no whoop or vomiting, had developed. Sept 23rd 0.45 pm a violent paroxysm of coughing occurred followed by cessation of respiration, perhaps due to laryngeal spasm or to a particle of vomited food lodging in larynx. Laid on face and feet raised. Breathing then returned. Hot fomentations applied to precordia. Patient was very cyanosed and almost pulseless when she revived. Put on Peptoneised milk 3 tit three hourly with Whiskey 3 tit. 24th 1.45 pm a similar collapse took place. She revived after getting up some thick rum and 7.30 pm after a severe paroxysm of coughing respiration and heart failed and patient died. There was no sign of laryngeal diphtheria. She was said to have already suffered from whooping cough. Throughout her illness the entertia gave considerable trouble. Complexion fair.

Case 7. Aug 18th nausea and vomiting. Aug 19th sore throat. Admitted Aug 22nd very ill. Terrible smell from mouth. He looked
Case 7.

[Graph with dates and temperatures, showing a fever curve with peaks and troughs.]

**Aug. 1911**

Date of Dis. 1911

Disease: Typhoid Fever

Result: Death

Temperature Chart:

- Days: 22, 25, 26, 27, 28
- Time: 7 a.m., 7 p.m.

Febrile: 99°, 100°, 101°, 102°, 103°, 104°, 105°, 106°

August 22, 3 p.m.: 101°
August 25, 3 p.m.: 104°
August 26, 3 p.m.: 103°
August 27, 3 p.m.: 100°
August 28, 3 p.m.: 99°

Death: Aug. 29, 1911
thin, pale and poisoned. While naso-
pharynx blocked with membrane on a
bleeding base. Aug 24th 14,000 units
of antitoxin has been given. Membrane
coming away in large clumps. Colour
detter. Aug 25th Pulse becoming feeble,
sometimes intermittent. Some nausea.
Aug 26th Palatal paralysis present. Aug
27th Pulse, hands cold, pulse weaker.
Aug 28th Failing slowly, had colour. Pulse
slow and feeble. No vomiting. At midnight
she seemed to be gradually dying. Pulse
slow and almost imperceptible at wrist.
Strychnine 1/2 hypod produced no effect.
Adrenalin Chloride (1 in 1000) var
given hypod: three hourly. The first
injection rendered the pulse more
palpable at wrist for 30 minutes after
use, otherwise produced no apparent
effect. Strychnin 1/2 hypod: three hourly
was quite ineffective. She seighed frequently.
There was a peculiar earthy smell about
her breath. A little restless. Stimulants
by mouth produced no effect. Hot
bottles and hot blankets were applied.
Her extremities were cold and the eyes a
little vacant. Intestinal and stimulant enemata were given three hourly. At 7.30 am vomites. Pulseless at 9 am. 10.45 am, 29th Aug, died. A typical case of heart failure. Nothing was of any lasting benefit in opposing this. She was a fair complexioned child.

Case 8. Sept 1st Complained sore throat. Sept 2nd admitted severely ill. Tonsils enlarged and congested. Right covered with membrane. Left partially covered. Would clear but oedematus. On same day was admitted patient's brother, ill one day longer and suffering from faucial and nasal diphtheria. These two cases illustrate well the importance of early antitoxin. 8000 units of antitoxin in two doses was found sufficient to clean fauces. This patient made a very slow convalescence. Sept 30 some bronchial catarrh. Sept 25th pulse weak, extremities cold, no vomiting and no weakness. Freely stimulated with good result. Sept 28th vomites. Pulse feels. Colour good. Respirations sighing.
### Case 9

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**Diagnosis:**
- Sept. 9: R. upper leg, 3½ days.
- Sept. 11: Staph. Ag. positive.
- Death occurred Sept. 12.

Case 6. Admitted on Sept 8th from Sick Children's hospital. Had recently had pneumonia and on Sept 7th was operated on for left pneumococcal empyema. Died ill and poisoned. Membrane covered wound and spread to posterior pharyngeal wall. 5000 units of antitoxin cleaned fauces. Albumin copious in urine. Gradually sank and died as much from the empyema as from the diphtheria. Complexion fair.
Case 1

<table>
<thead>
<tr>
<th>Name</th>
<th>Date</th>
<th>Month</th>
<th>Disease</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catherine B</td>
<td>12</td>
<td>Mar. 1945</td>
<td>Diphtheria</td>
<td>Death</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature (Fahrenheit)</th>
<th>Pulse</th>
<th>Respiration</th>
<th>Urine</th>
<th>Bowels</th>
<th>Antibiotics</th>
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</thead>
<tbody>
<tr>
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<td>100</td>
<td>20</td>
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<td>No fever</td>
<td>None</td>
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<td>100</td>
<td>20</td>
<td>Clean</td>
<td>No fever</td>
<td></td>
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</tbody>
</table>

Die 5.15 Jan. 1945
No antitoxin given.
B. The following cases include those of
febrile and nasal diphtheria combined.
In each patient the bacillus of diphtheria
was found present both in the fauces
and in the nose.

Case. Dr. Davidson's case - On 9th May she
was ill, vomited. Her neck was swollen.
On 10th a doctor was called in who thought
the child had mumps. On the 12th a sore
throat was noticed. Admitted at 1 pm
moribund. Almost pulseless. Dyspnoea
and cyanosis present. Copious nasal
drainage. Mouth very dirty, whole
mass pharynx blocked with membrane.
She was put under steam and a hypo-
dermic of strychnine given. No improvement.
At 2 pm adrenalin chloride was given
hypodermically. This was repeated at 3
and at 5 pm. Each hypodermic caused a
slight rise in blood pressure, the
amount and duration of the rise
being successively shorter after each dose.
She died at 5.15 pm. This case illustrates
the importance of throat inspection in
children and the desperate nature of
many of the cases sent for hospital treatment.
Case 2

<table>
<thead>
<tr>
<th>Date</th>
<th>Day of Ill</th>
<th>Pulse</th>
<th>Resp.</th>
<th>Urine</th>
<th>Bowels</th>
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</thead>
<tbody>
<tr>
<td>June</td>
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Case 3

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<th>Resp.</th>
<th>Urine</th>
<th>Bowels</th>
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<tbody>
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</table>
Case 2. June 28 complained of headache and sore throat. Doctor called in who suspected diphtheria and took a swab. June 29th admitted with thick sanguous discharge proceeding from each nostril, with general palatal congestion and with membrane covering each tonsil. 5000 units of antitoxin cleared up the local conditions and he made an excellent recovery.

Case 3. June 23rd rhinorrhea noticed. 25th headache, sore throat and vomiting. Admitted on 29th generally depressed, with thick bilateral nasal discharge, with congestion of fauces and with membrane covering each tonsil. 5000 units of antitoxin cleared the fauces rapidly but the nasal discharge was most troublesome and caused his stay to be much prolonged. On June 25th septic spots appeared on face and on fingers. Aug 2nd slight paresis of each leg. Aug 12th stenocoria present. He left cured and free of diphtheria bacilli on Sept 22nd.
### Case 4.

<table>
<thead>
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</tr>
<tr>
<td>8/10</td>
<td>37.4°C</td>
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</tr>
<tr>
<td>8/11</td>
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<td></td>
</tr>
<tr>
<td>8/12</td>
<td>37.0°C</td>
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</tr>
</tbody>
</table>

**Disease:** Diphtheria

**Result:** Recovery

**Notes:**
- July 16: Respiratory infection.
- July 28: Improved condition.
- Aug 25: Discharged.

**Aug 1907:**

<table>
<thead>
<tr>
<th>Time</th>
<th>Temperature</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
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### Case 5.

<table>
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</tr>
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<tr>
<td>8/12</td>
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</tbody>
</table>

**Disease:** Diphtheria

**Result:** Recovery

**Notes:**
- Aug 21: Respiratory infection.
- Aug 28: Improved condition.
- Sept 15: Discharged.

**Aug 1907:**

<table>
<thead>
<tr>
<th>Time</th>
<th>Temperature</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>8/12</td>
<td>37.0°C</td>
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</tr>
</tbody>
</table>
Case 4. July 13th headache. 14th sore throat. Admitted on 16th sharply ill, bilateral nasal discharge, membrane on each tonsil. 2000 units of antitoxin had been given before admission. 3000 units given on admission. On 18th July membrane still stationary. 4000 units injected with good result. On 25th July a patchy erythematous antitoxin rash appeared. Excellent recovery made.

Case 5. Had not been well since 1st Aug. On 20th Aug complained sore throat. Admitted on 21st sharply ill, evil smell from mouth. Pusous discharge from left, purulent from right, unilateral membrane covered each tonsil. Tongue raw and dry. 14000 units of antitoxin was given in two doses. Local conditions then slowly cleared up. Made an excellent recovery.

The next case illustrates well the importance of prolonged rest in bed in all serious forms of diphtheria.
**Case 6**

<table>
<thead>
<tr>
<th>Time</th>
<th>Temperature (F)</th>
</tr>
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<td>101°</td>
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</tr>
<tr>
<td>100°</td>
<td>99°</td>
</tr>
</tbody>
</table>

**Results:**
- Death

**Diagnosis:** Diphtheria F.O. N

**Patient's Name:** John S

**Age:** 5 yrs
Case 6. Aug 19 th sore throat. Aug 20 th severe headache and vomiting. Aug 21 st admitted very ill. Face pale and earthy looking. Throat diphtheritic smell present. Lips and tongue dry and raw. Sanguous nasal discharge. Neck swollen. Membrane visible on edge of soft palate, also upon uvula and tonsils. 20,000 units of antitoxin was given in 24 hours. Aug 24 th no trills oozing with blood the last 36 hours, was plugged with wool soaked in adrenalin chloride (1 in 1000). Taking fluids well. Pulse keeps good but he looks poisoned.

Case 7

Case 8
Palatal paralysis still present. Left internal strabismus appeared today.
3.30 pm some twitching of mouth. Could not swallow. Profuse salivation. 8 pm -


Case 8. Sept 2nd admitted with sore throat - has been ailing for 3 days. Pale and ill. Nasal discharge. Evil smell. Thin membrane on right tonsil, soft palate and uvula.
15,000 units of antitoxin was given. Sept 5th adenitis (neck). He made a good recovery.
### Case 9

<table>
<thead>
<tr>
<th>Date</th>
<th>Temperature</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>106°</td>
<td>Feeling very ill</td>
</tr>
<tr>
<td>3</td>
<td>104°</td>
<td>Pulse 132, Resp 29, urine positive</td>
</tr>
<tr>
<td>4</td>
<td>100°</td>
<td>Pulse 110, Resp 25</td>
</tr>
<tr>
<td>5</td>
<td>99°</td>
<td>Pulse 94, Resp 18</td>
</tr>
<tr>
<td>6</td>
<td>97°</td>
<td>Pulse 90, Resp 16</td>
</tr>
<tr>
<td>7</td>
<td>98°</td>
<td>Pulse 90, Resp 16</td>
</tr>
<tr>
<td>8</td>
<td>99°</td>
<td>Pulse 90, Resp 16</td>
</tr>
<tr>
<td>9</td>
<td>101°</td>
<td>Pulse 90, Resp 16</td>
</tr>
<tr>
<td>10</td>
<td>102°</td>
<td>Pulse 90, Resp 16</td>
</tr>
<tr>
<td>11</td>
<td>103°</td>
<td>Pulse 90, Resp 16</td>
</tr>
<tr>
<td>12</td>
<td>104°</td>
<td>Pulse 90, Resp 16</td>
</tr>
<tr>
<td>13</td>
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<td>Pulse 90, Resp 16</td>
</tr>
<tr>
<td>14</td>
<td>106°</td>
<td>Pulse 90, Resp 16</td>
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<tr>
<td>16</td>
<td>108°</td>
<td>Pulse 90, Resp 16</td>
</tr>
</tbody>
</table>

**Diagnosis:** Smallpox

**Result:** Death on 15th Sept.
Case 9. The brother of case 8, see severe facial series. Took ill on Aug 31st.
Sore throat Sept 1st. Admitted Sept 2nd
Tounces contained much mucus pus membrane
or each tonsil. Some bleeding from tonsils.
9000 units given on admission. Sept 3rd
a mass of membrane filled naso pharynx extending forward on to hard palate.
A further 900 had to be given to cause disappearance of membrane. Sept 8th
Sept 8th Wakes. Sept 10th vomited 10.15 pm.
Colour varies - pale or flushed. 10.45 pm
Adren. Chloride (1-1000) m/x given hypodermically
Pulse improved palpably in a few seconds and remained better till midnight, when it again began to flag. 11.40 pm
Vomited, grunting, sighing respirations.
Sept 17th 2.15 am Adrenalin Chloride m/x hyper. Pulse improved again in a few
seconds, but not quite so noticeably as after previous dose. Three hourly injections of Adren. Chloride 0.1 % and Strychnin Hyd. $\frac{1}{60}$ vel Stryphanthin $\frac{1}{100}$ ordered. 11 am. no more vomiting. Pulse still very feeble. Has slept a little. 12 Sept had a restless night. Rectal feeding. Feci colour but pulse very weak. 9.30 pm Extremities cold. Hot precordial fomentations tried. Pulse failing. Adrenalin Chloride no effect now. Given frequent sips of brandy. Hot bottles applied. Sept 13th 11 am Pulse almost imperceptible at wrist. Heart sounds galloping rhythm no bruits. Had a very bad night. Given hypodermics of brandy. Frequent nutrients per rectum. Hundred last and hot precordial fomentations. All useless. Died 2.30 pm. Complexion dark.

**Case 10. Admitted Sept 13th.** Pale and ill. Smell like a diphtheria. Right tonsil discharging and bleeding a little. Back of mouth and soft palate covered with membrane. Sept 14th. Pale and poisoned. 10,000 units of anti-toxin has
been given. Local conditions improved.
Right base of lung involved with lobar pneumonia. 15th. Bad night, cold at times
given whiskey frequently. Brighter this
ing morning. 16th. Better night. Herpes or
lips. Troubled with diarrhea. 19th. not
so well. 20th. Troublesome short cough,
Right base duller, suggested fluid. Right
pleura explored and aspirated 3 x 11 of
pus, pneumovocal, removed. Breathing
relinued. Sept 21st. at noon, under
chloroform a portion of 8th rib, at angle
of right scapula, removed and a drainage
tube inserted. She improved temporarily
after this, but gradually sank and
died on Sept 30th from exhaustion.
Median complexion neither dark nor fair.

Case II. Sept 13th. Shivering, headache, pain in
back and sore throat. Admitted on 14th.
Pyrexia, diphtheritic smell, would much
swollen and congested tonsils enlarged
and covered with thin membrane,
extending to soft palate. Nasal discharge.
A severe case. 15th. Membrane spread with
great rapidity, invaded hard palate. 17,000
units of antitoxin checked spread. Sept 22 albumin copious in urine. Sept 23° palatal paralysis. She remained weak for some time but ultimately made a good recovery. It would probably have gone hard with her, had she not been treated early. She was a very fair complexioned girl.

The following cases include those of combined faucial and laryngeal diphtheria. In each case the Klebs-Loeffler bacillus was found present in the fauces.

Case 1. (Dr. Davidson’s Case). April 9th took a vague illness. Vomited. April 10th a doctor called in. April 12th became croupy. April 13th doctor again called in. Admitted same day very ill, cyanosed, noisy breathing with marked indrawing of epiglottis and intercostal spaces. Croupy cough. General faucial congestion. Membrane covered each tonsil and right side of uvula. Ill humped and nourished. Put under steam 8000 units of antitoxin
Case 1.

April 12th 1906

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<td>97°</td>
<td>96°</td>
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</tbody>
</table>

Remarks:
- April 13th 1906: Subcutaneous 0.5 of 2 per cent. 1/2 c.c. to 1 c.c.
- April 14th 1906: Subcutaneous 0.5 of 2 per cent. 1/2 c.c. to 1 c.c.
- April 15th 1906: Subcutaneous 0.5 of 2 per cent. 1/2 c.c. to 1 c.c.

Died April 19th 1906.
given intravenously. 7.35 pm breathing worse. Intubated with no 3 vulcanite tube. As the child immediately showed signs of suffocation, the tube was pulled out, whereupon a complete cast of the trachea on membrane was coughed up. At midnight breathing again very bad, no 3 metal intubation tube then inserted. Breathing improved a little. At 14 & 11.10 am tube removed as breathing much worse. 11.30 am 8000 units of antitoxin given intravenously. 11.35 am pulse very feeble, given atropin Sulph. 1 hypod; also adrenalin Chlorid (1:1000) x viii hypod. Temporary and very slight improvement produced. 11.55 am no 3 metal intubation tube again inserted. 12.55 pm tube coughed out having given little relief. Several further doses of adrenalin Chloride were given, saline enema, stryphantin and atropin sulphate were also tried, all to no purpose, the child dying of suffocation and heart failure at 5 pm. The intravenous injection of antitoxin produced a good deal of depression apparently. Tracheotomy should
**Case 2.**

<table>
<thead>
<tr>
<th>Name</th>
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<th>Age</th>
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<table>
<thead>
<tr>
<th>Time</th>
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</thead>
<tbody>
<tr>
<td>100.00</td>
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</tr>
<tr>
<td>101.00</td>
<td>Translated in Crisis</td>
</tr>
<tr>
<td>102.00</td>
<td>June 29th, 3 p.m.</td>
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<tr>
<td>103.00</td>
<td>Died</td>
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</tbody>
</table>

Died Aug 21st, 03, 11:30 a.m.
have been given a chance instead of repeatedly trying intubation, which obviously did not relieve the breathing. The fauces were continuously being blocked with muco pus.

Case 2. (Dr. Davidson's case). 17th May sore throat. 18th Croupy and dyspnoeic. Has had whooping cough for three weeks. 19th May admitted very cyanosed. Marked dyspnoeic with indrawing of spigastrum and intercostal spaces. Spasms of whooping cough present. Consists covered with membrane. Fauces full of muco pus. Put under steam. In half an hour no improvement, child was intubated with no 2 vulcanite. There was slight momentary improvement, then urgent dyspnoeic. Tube pulled out. Dyspnoeic continued and tracheotomy (high) was performed on the spot. Much relieved. 8000 units antitoxin given intravenously. Next day 6000 units was given intravenously but child sank and died apparently of lung infection. Respiration gone just before death.
### Case 3

**Name:** Arthur B  
**Age:** 7 yrs  
**Disease:** Scarletina

<table>
<thead>
<tr>
<th>Date</th>
<th>Pulse</th>
<th>Resp.</th>
<th>Temp.</th>
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</thead>
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<tr>
<td>10th</td>
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</table>

**Result:** Recovered  

**Date:** Sept. 21st

---

### Case 3 (continued)

**Name:** Arthur B  
**Age:** 7 yrs  
**Disease:** Scarletina

<table>
<thead>
<tr>
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<th>Pulse</th>
<th>Resp.</th>
<th>Temp.</th>
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<tr>
<td>10th</td>
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</tbody>
</table>

**Result:** Recovered  

**Date:** Sept. 21st
Case 3. Aug. 10th admitted to Chalmers hospital as an urgent surgical case. At 5.30 pm a high tracheotomy was performed by Dr. Holmes. At 6.15 pm the public health authorities were approached, but would not remove the boy to the city hospital as it was after 6 pm. The child had to be isolated from the other patients in a scullery. Admitted at noon next day, comfortable. Some patching on right tonsil. 8000 units of antitoxin was administered. On 13th an attempt was made to remove tube, but fright and spasm of larynx caused its reintroduction in 1 hour. On 15th the tube successfully removed during sleep. Did very well until 29th, when he developed scarlatina, from which he made a good recovery.

This case illustrates the importance of having the city hospital open at any time day and night, at least for serious infectious cases of this nature. His presence was a menace to the other patients in the general hospital.

Case 5. (Dr. Thompson's case). July 10 th ill. Sore throat headache and cough. July 14 th croupy and dyspnoea. Doctor called in. July 15 th admitted dyspnoea very marked. Croupy cough. Membrane on each tonsil. Intubation performed at once, no 3 vulcanite tube inserted. Face relief. Put under steam and given 8000 units of antitoxin. 3 pm child suffocating. Tube pulled out. Large piece of membrane coughed up. Tube reinserted. Breathing not relieved. 4.15 pm metal tube no 3 inserted. 5 pm high tracheotomy performed on the child, now exhausted by 5 days illness, and three operations of intubation. July 16 th Child dies of exhaustion. An interesting question regarding this case might be, was it one diagnosed after 6 pm or 14 h.
July and therefore too late for admission to the City Hospital on that day?

Case 6. July 22nd sore throat. 23rd croupy cough. July 24th admitted face pale, a little croupy. Mouth contains much frothy mucus. Membrane covers uvula. Tonsils clear. 4000 units of antitoxin was found sufficient. A wide spread antitoxic rash of scarlatinial type appeared on Aug 20th, otherwise convalescence was uninterrupted.

Case 7. July 27th croup, nausea and vomiting present. July 28th worse. July 29th admitted sharply ill. Croupy. Some dyspnea. Very slight indrawing. Membrane on left tonsil and on pharyngeal wall. Put under steam. Given 6000 units antitoxin. 8pm marked indrawing. Crowing inspiration. 8.30pm slight improvement. This night worse, intubated without improvement. July 30th 12.30am. Low tracheotomy performed under chloroform. This gave instant relief and child slept for an hour, then woke and was restless. Given paraldehyde
Case 8

Name: Thomas W
Age: 3 yrs
Disease: Diphtheria F & L
Result: Recovery

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<th>Date</th>
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<th>Pulse</th>
<th>Resp.</th>
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<td>107°</td>
<td>120</td>
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Discharged Oct 7th, 1935

Temp. Chart

H. E. Underwood, M.D.
m.x.x. per rectum and ammox: Bromid q.t
by mouth. It rested well after these.
During the day much slimy mucus was
expelled through tube. Aug. 1st tube
removed successfully during sleep. Did
well and made an excellent recovery.
12,000 units of antitoxin in all was used.

poisoned looking and collapsed. Cynoex.
Marked in drawing of pharynx and
Fauces full of mucus pus, membrane on
tonsils. Pulse week. Put under steam
and given 6,000 units of antitoxin.
Worse at 7.30 p.m. A low tracheostomy was
then performed under chloroform. On
opening trachea a large amount of
evil smelling mucus pus was expelled.
Some membrane shedding from above was
pulled down and removed. The inside of
the trachea could be seen lined with
grey, grey membrane. Jaws spasmatic
and hyped and hot precordial fiomatitis
after operation. Aug 23rd: 8 p.m. not so well
pulse weaker, cyanosed. A large amount
Case 9.

Name: Emily L
Age: 3 yrs
Disease: Typhoid Fever

Temperature:
- Day 3: 103.5° F
- Day 4: 102.5° F
- Day 5: 101.0° F
- Day 6: 100.0° F
- Day 7: 99.0° F
- Day 8: 97.0° F

Tests:
- Urine: Normal
- Bowels: Normal

Treatment:
- Bed rest
- Fluids
- Rest

Imagery Complete

Discharged 17th Feb 1903.

Given 5,000 units of antitoxin. Sept 9th Breathing good. Less croupy. Tonsils less enlarged. Membrane has appeared under tongue. Given 4,000 units antitoxin. Sept 14th tendency to cardiac failure. at 8:30 am was cold and almost pulseless. Freely
Case 10.

Temperature Chart

Date
Date of Disease
Result
Recovery

Name: Annie P.

Sept. 11

Sept. 15

Infection

Temp. Standard

Albumin

Fat
stimulated. At 11 am revived somewhat. Sept 15th vomited. Sept 25th child very dull mentally. Progressing slowly. Sept 27th left side adenitis (neck), improved after fomenting. Albumin remained in urine for some weeks. She was also troubled with occasional diarrhoea. Left cured of diphtheria, but still a sickly looking child.

milk well by mouth from espoon. Large amount of mucous pus being discharged. Sept 18th had done well. Tube removed during sleep at 9.30 pm. Cried loudly at 11 pm. Sept 20th slight twitching of fingers. Stethoscope stopped. 11,000 units of antitoxin was given in all. This was a most successful case of tracheotomy considering the age and the disadvantage of two previous operations of intubation.

Case 11. Sept 17th ailing. Sept 18th sore throat. Sept 17th cough. Sept 18th admitted very ill. Cyanosed. Indrawing of epiglottis and intercostal spaces. Croupy membrane on each tonsil. Put under steam without benefit. Gave 6000 units antitoxin. At 6.15 pm was intubated. Tube appeared to be blocked with membrane, a piece of which was coughed up. Tube pulled out, whereupon child breathed fairly well. Sept 19th breathing worse. Intubated at 9.40 am. Tube pulled out, covered with thick mucus. Child then became very cyanosed and ceased breathing. It was lifted on to table in adjoining room. One nurse held the arms and legs, another the head well back, and in the windpipe
### Case II

**Name:** Andrew H.  
**Age:** 1yr.  
**Disease:** Diphtheria  
**Result:** Recovery

<table>
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<tr>
<th>Date</th>
<th>Day of Week</th>
<th>Temperature (°F)</th>
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<tr>
<td>9/30</td>
<td>12</td>
<td>100.2</td>
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</tbody>
</table>

**Notes:**  
- 9/21: Hoarse at night.  
- 9/22: Hoarse at night.  
- 9/25: Hoarse at night.  
- 9/26: Hoarse at night.  
- 9/27: Hoarse at night.  
- 9/28: Hoarse at night.  
- 9/29: Hoarse at night.  
- 9/30: Hoarse at night.  

**Discharge:** Oct 14, 1905
A low tracheotomy was then rapidly performed, the trachea being opened in a few seconds. A tracheal dilator was inserted and artificial respiration started, whereupon natural breathing soon recommenced. Stimulants Strychn Hyd. 1/20, Ether 25% were given hypodermically and hot precordial fomentations applied. Aug 20th swallowing well. Has slept well, few little sputum, therefore given more anti-toxin, 18,000 units in all. Aug 21st a paroxysmal dry cough troublesome. Aug 22nd tube successfully removed during sleep. Aug 25th Steam accidentally went off for a short time. Patient seemed upset by this. Croupiness increased and temperature rose. Aug 27th steam off. Made an excellent recovery. This patient's life was undoubtedly saved by a rapid tracheotomy after intubation had twice failed and the last time nearly killed the child.

Case 12: Sept 18th sore throat and croupiness. Sept 19th admitted sharply ill, cyanosed. Tracheal epigastria indrawing. Fauces full
Case 12.

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<th>Temp</th>
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<td></td>
<td></td>
</tr>
<tr>
<td>98°</td>
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</tbody>
</table>

Date | Day of Dis | Disease | Result |
-----|------------|---------|--------|
1912 | 10/14/12   | Dysentery | Recovered |
of mucus. Extensive membranous deposit on each tonsil. Tonsils are bleeding slightly. Put under steam and five minutes later intubated with no 4 metal tube. Some membrane and a large amount of mucus pus expectorated and breathing released. Slept quietly after. 8000 units antitoxin given.

Aug 20. Fluids taken well by mouth. good color. given 4000 units antitoxin.

Aug 21. Tube removed at 3 p.m. At 11 p.m. breathing a little stridulous. 

Aug 22. Steam off. Made a good recovery. In this case the patient was strong enough to expel, and the tube large enough (204) to allow the passage of the thick mucus pus. This might explain the reason why this intubation case was successful, whereas the preceding ones had been unsuccessful.

The following cases illustrate pure diphtheria. In no instance was there any membranous impaction of the farce, although in each patient the Klebs-Loeffler bacillus was found
Case 1.

Name: David S
Age: 37
Disease: Diphtheria
Result: Death

<table>
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<th>Date</th>
<th>Time</th>
<th>Temperature</th>
<th>Pulse</th>
<th>Resp.</th>
<th>Diagnosis</th>
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<td>Tachycardy, 2:1</td>
<td>96</td>
<td>18</td>
<td>April 18, 3/4 p.m.</td>
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present in that region.

Case 1. (Dr Davidson's case) on 8th April caught cold. Progressively worse ever since. Admitted 18th very ill, has been croupy for four days. Marked dyspnoea and cyanosis. Indrawing of epigastrium and intercostal spaces very pronounced. Put under steam. Given Physohum 1/4 and ether m & k hypodermically. Given good units of antitoxin. Shortly after admission a high tracheotomy was performed under chloroform. This gave great relief. He however died next day from diphtheritic pneumonia. Patient expels practically no expectum.

Case 2. July 29th obstructed breathing. Had measles 13 days ago and had been croupy ever since. Admitted on July 30th very ill, pale and cyanosed, croupy, breathing obstructed. Some indrawing of epigastrium and intercostal spaces. Put under steam and given 5,000 units of antitoxin. Improved slowly, so that by evening the colour had improved and the indrawing was
less marked. July 31st 11.15 am breathing worse. Intubated after some difficulty in introducing tube. Breathing improved. At 2 pm a piece of membrane was coughed up. 6.30 pm breathing much worse, low tracheotomy was performed under chloroform. A large amount of evil smelling pus and a little membrane was coughed out. Great relief followed. A further 6000 units of antitoxin had been given at noon. Aug 2nd very good progress. Tube removed during sleep successfully. Aug 10th some tracheal and nasal catarrh. Aug 20th tonsils enlarged and congested. Aug 30th Scarlatinal rash. Aug 31st Vonicated. Sept 2nd a septic scarlatina. Some nasal discharge. Sept 13th given 6000 units antitoxin as nasal discharge profuse and contained diphtheria bacilli. Sept 6th died after several syncopal attacks. He recovered from his laryngeal attack, but succumbed to the combination of scarlatina, infection source not discovered, and nasal diphtheria. The last 6000 units should have been given.
on Sept 2nd.

Case 3. Poor house case, first day's illness.
Steady in neck enlarged. This patient did well, being taken early.

Case 4. Poor house case admitted Aug 23d, on second day of illness. Pulse good on admission, croupy, slight indrawing of epigastrium. No cyanosis. At 5.30 pm, 5000 units of antitoxin had been given at noon, was worse, indrawing and cyanosis marked, pulse weaker. Under chloroform a low tracheotomy was then performed. On opening the trachea very little mucous pus and no membrane was expelled. Given strychnia 3/6 and hot precordial fomentations. Aug 24th rested well and breathing good. Inclined to vomit through night. Given salines and nutrients per rectum. 4000 units given. Aug 25th little discharge expelled
therefore 4000 units of antitoxin again given. In evening looked better, spurious fairly profuse. Improved rapidly after this. Aug 27th tube successfully removed during sleep. Aug 30 steam, in which she had been lying since admission, turned off. Sept 7th morbilliform antitoxic rash. Made an excellent recovery.

Case 5. Aug 29th croupy, restless, feverish, treated by a chemist. Aug 30th taken to Sick Children's Hospital and sent on to the City Hospital. Admitted in a state of collapse, restless, anxious expression, markedly cyanosed. Much indrawing of epigastrium and intercostal spaces. Croupy. Pulse feeble. Child very dirty, emaciated and ill looked. Very undersized. Put under steam and 6000 units of antitoxin given. So urgent that in 10 minutes chloroform given and a low tracheotomy performed. Several large veins and an enlarged thyroid interfered somewhat, but were hooked out of the way. The smallest tracheotomy tube was introduced, with considerable difficulty.
## Case 5.

<table>
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<th>Date of Birth</th>
<th>Lay of Death</th>
<th>Disease</th>
<th>Result</th>
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<td>12/31/1905</td>
<td>Diphtheria</td>
<td>Death</td>
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</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Temperature</th>
<th>Remarks</th>
<th>Pulse</th>
<th>Respiration</th>
<th>Convulsions</th>
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<td>Weakness, %ly</td>
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<td>18</td>
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<tr>
<td>12/31/1905</td>
<td>105°F</td>
<td>Dr. Sturgis App.</td>
<td>80</td>
<td>18</td>
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</table>

Died 2:15 am 31st Aug 1905.
owing to the diminished size of the teacher,
Sphen. Sphen. M. 60. hypod and not
precordial fomentations. At 7 p.m. looked
well. Pulse good. Breathing easily.
Swallowed milk, whiskey and tovinine
well. Passed urine freely. Put on
Sphen. Sphen. Hyd M. 60. hourly through
night. At midnight a change for the
worse came over it. About every two
minutes fits lasting ten seconds or so
came on. During a fit, the child was
unconscious, mouth drawn into vacant
smile, eyes wide open, pupils widely and
equally dilated and insensitive to light,
pairs clenched, head aimlessly oscillated,
muscles of arms and neck contracted, teeth
ground together. Between fits the pupils
contracted, consciousness did not return.
Given morphine 6f. Freely stimulated
with brandy enemata and hypodermics.
Fits gradually ceased as life ebbed
away. Died 2.15 am 31st Aug. Sphen. Hyd
M. 60 and Sphen. M. 60. had been
given in the 12 hours since admission.
Chloroform would probably have done better
than the morphine used. Fair complexion.
### Case 6

**Name:** 
**Age:** 26 yrs. **Disease:** 
**Result:** 

| Date | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Time | 108° | 106° | 104° | 102° | 100° | 98° | 96° | 94° | 92° | 90° | 88° | 86° | 84° | 82° | 80° | 78° | 76° | 74° | 72° | 70° | 68° | 66° | 64° | 62° | 60° | 58° | 56° |

**Temperature (°F):**

- **Temperature (°C):**

**Respirations:**

**Pulse:**

**Diagnosis:**

**Result:**

**Notes:**

- Condition: *
- Treatment:
- Outcome:

**Diagnosis:**

- Condition: *
- Treatment:
- Outcome:

**Diagnosis:**

- Condition: *
- Treatment:
- Outcome:

**Diagnosis:**

- Condition: *
- Treatment:
- Outcome:

11am tube removed when child awake.
It became nervous, took spasm of the larynx
and the tube had to be reininserted. Temperature
rose, looked pale. Sept 5th much the same.
Sept 6th am obstructed breathing. Tube
removed. Membrane visible in trachea.
A larger tube was inserted and 500 units
of antitoxin given. Did well after this.
Sept 8th tube successfully removed at
midnight during sleep. Sept 10th steam
off. Made a good recovery. The small
amount of discharge from trachea should
have earlier suggested a further dose of
antitoxin.

Case 8. Admitted Sept 7th. Has been croupy
four days. Breast fed hitherto. On
admission pale, thin and ill. Marked
inspiratory indrawing of epigastrium.
Put under steam, given 3000 units of
antitoxin. At 7.30 pm being worse was
intubated. Rectal fed, being unable to
swallow. Aug. 17th tube removed, breathing
Made a good recovery. Intubation was
here most successful.
**Case 1.**

<table>
<thead>
<tr>
<th>Time</th>
<th>Temperature</th>
<th>Pulse</th>
<th>Respiration</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:00</td>
<td>106°</td>
<td>105/90</td>
<td>98</td>
</tr>
<tr>
<td>02:00</td>
<td>102°</td>
<td>103/80</td>
<td>96</td>
</tr>
<tr>
<td>04:00</td>
<td>100°</td>
<td>101/70</td>
<td>94</td>
</tr>
</tbody>
</table>

**Notes:**
- Date: May 28
- Diagnosis: Diphtheria (Cul)
The next series contains those cases clinically of a diphtheritic nature. In none was the Klebs-Löffler bacillus found in the fauces or in the membrane expectorated.

Case 1. May 20, sore throat, cough. May 23 admitted (Dr Davidson's case). Dyspnoea and cyanosis marked at 5.20 p.m. Harken indrawing of epigastrium and intercostal spaces. No faecial membrane visible. Put under steam. At 5.30 p.m. a low tracheotomy was performed under chloroform. Dyspnoea relieved. Pulse fast. Some membrane was expelled. Given 8,000 units of antitoxin intravenously.
10 p.m. more membrane expelled. At 10 a.m. on 24th May dyspnoea had returned. Tube removed and some membrane pulled up from below. 16,000 units given intravenously in two doses. Very exhausted today. 7.30 p.m. lungs involved marked dyspnoea and cyanosis. 10 p.m. colour temporarily improved. Nasal fed. May 25th 2.15 a.m. died of suffocation and exhaustion.
## Case 2

<table>
<thead>
<tr>
<th>Date</th>
<th>Ave.</th>
<th>Pulse</th>
<th>Resp.</th>
<th>Urine</th>
<th>Bowels</th>
<th>Result</th>
<th>Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 1-7</td>
<td>90°</td>
<td>80°</td>
<td>90°</td>
<td>3</td>
<td>1</td>
<td>Rest</td>
<td>July 10th Recovery</td>
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<tr>
<td></td>
<td>80°</td>
<td>100°</td>
<td>100°</td>
<td>1</td>
<td>0</td>
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<td>July 10th Recovery</td>
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<tr>
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<td>90°</td>
<td>100°</td>
<td>100°</td>
<td>1</td>
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<td>July 15th Recovery</td>
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<td></td>
<td>80°</td>
<td>90°</td>
<td>90°</td>
<td>3</td>
<td>1</td>
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<td>July 20th Recovery</td>
</tr>
<tr>
<td></td>
<td>70°</td>
<td>80°</td>
<td>80°</td>
<td>2</td>
<td>0</td>
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<td>July 25th Recovery</td>
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<td>60°</td>
<td>70°</td>
<td>70°</td>
<td>1</td>
<td>0</td>
<td></td>
<td>July 30th Recovery</td>
</tr>
</tbody>
</table>

July 1st-7th: 
- July 1st: 90°-95° (normal) 
- July 2nd: 95°-100° (febrile) 
- July 3rd: 100°-105° (febrile) 
- July 4th: 105°-110° (febrile) 
- July 5th: 110°-115° (febrile) 
- July 6th: 115°-120° (febrile) 
- July 7th: 120°-125° (febrile)

Case 3. July 2<sup>nd</sup> measles. July 6<sup>th</sup> croupy with obstructed breathing. July 9<sup>th</sup> doctor called in. Admitted same day, pale and cyanosed. Remains of measles rash still present. Pulse feeble. Inspiration crowing with marked indrawing of epigastrium and of intercostal spaces. Fauces clean. Intubation tried three times without success, the tube having to be withdrawn on each occasion owing to impending suffocation. Chloroform given and a low tracheotomy performed in bed. A large amount of viscid mucus pus was expelled and a little membrane. Colour slowly improved. Breathing not very good.
Case 3.

<table>
<thead>
<tr>
<th>July</th>
<th>Name</th>
<th>Age</th>
<th>Month</th>
<th>Disease &amp; Cause</th>
<th>Recovery</th>
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<tbody>
<tr>
<td>Date</td>
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<td>31</td>
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</tr>
</tbody>
</table>

Temperature (°F): 106°, 105°, 104°, 103°, 102°, 101°, 100°, 99°, 98°, 97°, 96°, 95°, 94°, 93°, 92°, 91°, 90°, 89°, 88°, 87°, 86°, 85°, 84°, 83°, 82°, 81°, 80°, 79°, 78°, 77°, 76°, 75°, 74°, 73°, 72°, 71°, 70°, 69°, 68°, 67°, 66°, 65°, 64°, 63°, 62°, 61°, 60°, 59°, 58°, 57°, 56°, 55°, 54°, 53°, 52°, 51°, 50°, 49°, 48°, 47°, 46°, 45°, 44°, 43°, 42°, 41°, 40°, 39°, 38°, 37°, 36°, 35°, 34°, 33°, 32°, 31°, 30°, 29°, 28°, 27°, 26°, 25°, 24°, 23°, 22°, 21°, 20°, 19°, 18°, 17°, 16°, 15°, 14°, 13°, 12°, 11°, 10°, 9°, 8°, 7°, 6°, 5°, 4°, 3°, 2°, 1°, 0°, -1°, -2°, -3°, -4°, -5°, -6°, -7°, -8°, -9°, -10°, -11°, -12°, -13°, -14°, -15°, -16°, -17°, -18°, -19°, -20°, -21°, -22°, -23°, -24°, -25°, -26°, -27°, -28°, -29°, -30°, -31°, -32°, -33°, -34°, -35°, -36°, -37°, -38°, -39°, -40°, -41°.

Temperature (°C): 41°, 40°, 39°, 38°, 37°, 36°, 35°, 34°, 33°, 32°, 31°, 30°, 29°, 28°, 27°, 26°, 25°, 24°, 23°, 22°, 21°, 20°, 19°, 18°, 17°, 16°, 15°, 14°, 13°, 12°, 11°, 10°, 9°, 8°, 7°, 6°, 5°, 4°, 3°, 2°, 1°, 0°, -1°, -2°, -3°, -4°, -5°, -6°, -7°, -8°, -9°, -10°, -11°, -12°, -13°, -14°, -15°, -16°, -17°, -18°, -19°, -20°, -21°, -22°, -23°, -24°, -25°, -26°, -27°, -28°, -29°, -30°, -31°, -32°, -33°, -34°, -35°, -36°, -37°, -38°, -39°, -40°, -41°.

There was much coughing after the operation. Hot precordial fomentations were applied and Strychnine Hydrochloride given hypodermically. Put under steam. Breathing slowly improved. 5,000 units of antitoxic given. July 10th Paraldehyde on mouth per rectum given at 12.30 a.m. Slept two hours after the dose. Breathing rapid. Pulse running. Colour good. A large quantity of mucus pus expelled. Bronchitis sounds over front of chest. July 11th doing well. July 13th tube removed during sleep. July 21st steam off, coughiness absent. Made a good recovery.

The next case is one of combined general, laryngeal and nasal diphtheria, the Kebs-Loeffler bacillus being found in membrane obtained from each locality.

freely. Membrane visible in each nasal cavity. The membrane loose and on a bleeding surface. Given 8000 units of antitoxin and put under steam.


Name: Janet K. K.
Sex: Female
Date: Sep 11, 1917
Cause of Death: Acute Staphylococcal Infection

Temperature (Rectal):

<table>
<thead>
<tr>
<th>Time</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>106°</td>
<td></td>
</tr>
<tr>
<td>105°</td>
<td></td>
</tr>
<tr>
<td>104°</td>
<td></td>
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<tr>
<td>103°</td>
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<tr>
<td>102°</td>
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<td>101°</td>
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<td>100°</td>
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<tr>
<td>99°</td>
<td></td>
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<tr>
<td>98°</td>
<td></td>
</tr>
<tr>
<td>97°</td>
<td></td>
</tr>
</tbody>
</table>

Pulse: 88
Resp.: 28
Bowel: No. 11

Sept 11, 1917, 11:30 a.m.:
- Fever.
- Pulse.
- Resp.
- Bowel.

Sept 15, 1917, 4:30 p.m.:
- Severe headache.
- Rigidity of the neck.

Dec. 1267, 9:11, 10 p.m.

Diagnosis: Staphylococcal Infection

11:20 p.m.

Death.
disturbance. Was isolated. Made a good recovery.

The last case is interesting from the point of view of diagnosis. The fauces showed a large amount of apparently typical diphtheritic membrane, the uvula were oozing with serous discharge. There was a profuse mucous purulent discharge from the fauces. The tongue was atypical. There was no sign of a rash. Repeated examinations failed to show in the fauces or nose the presence of any organisms except streptococci. Antitoxin had no curative effect on the condition. The brother and one sister were at this time isolated on the scarlatinial side of the hospital with apparently typical scarlatinia combined with diphtheria. In their cases also streptococci alone could be found in the fauces and antitoxin was given without benefit. The present patient died in a convulsion. Complication fair.
The following table illustrates some of the results of treatment in the cases of cases described. Consecutive cases alone are considered and in estimating the average duration in residence fatal cases are not considered.

<table>
<thead>
<tr>
<th></th>
<th>Total Cases</th>
<th>Recoveries</th>
<th>Average in hospital</th>
<th>Average in antitoxin units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild faucials</td>
<td>10</td>
<td>10</td>
<td>19.5</td>
<td>52.5</td>
</tr>
<tr>
<td>Average faucials</td>
<td>38</td>
<td>38</td>
<td>31.4</td>
<td>3250</td>
</tr>
<tr>
<td>Clinical faucials</td>
<td>8</td>
<td>8</td>
<td>30.5</td>
<td>2687</td>
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<tr>
<td>Severe faucials</td>
<td>9</td>
<td>6</td>
<td>46.6</td>
<td>10,555</td>
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<tr>
<td>Nasal faucials</td>
<td>10</td>
<td>7</td>
<td>48.4</td>
<td>1230</td>
</tr>
<tr>
<td>Laryngeal faucials</td>
<td>9</td>
<td>9</td>
<td>38.3</td>
<td>5888</td>
</tr>
<tr>
<td>Larynx</td>
<td>7</td>
<td>6*</td>
<td>31.8</td>
<td>7142</td>
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<td>Clinical larynx</td>
<td>2</td>
<td>2</td>
<td>27</td>
<td>6000</td>
</tr>
<tr>
<td>Traumatic larynx</td>
<td>1</td>
<td>1</td>
<td>44</td>
<td>20000</td>
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<tr>
<td>Total cases</td>
<td>94</td>
<td>87</td>
<td>35.2</td>
<td>7360</td>
</tr>
</tbody>
</table>

* One died a few weeks later of scarlatina and a relapse of diphtheria.

It is thus seen that the mortality of these hospital cases was one of 7.5%. Out of 11 tracheotomies only one died, and that one from convulsions, giving a mortality of 9.09%. Five of these had had a previous intubation performed. Of two intubation cases neither died.
In several of the fatal cases, described above, appears a note on the complexion of the patient. The majority of very severe cases occurred in children of fair complexion. With one exception the worst cases of cardiac failure occurred in such cases. This may be merely a coincidence but is interesting and worth noting as possibly having some bearing on the question of prognosis.

In many of the above cases, the day of admission followed the day on which the diagnosis of diphtheria was made. There is no doubt that patients should be admitted as early as possible and at least on the day of diagnosis. Not only would the hospital serum till, as small item by any means, be smaller, but the mortality would be appreciably diminished. This question is discussed at the end of this paper.
Part III. Conclusions.
The third part of this paper will be devoted to a consideration of the best methods of treating diphtheria at the present time. The modern treatment will be discussed under four headings:

I. **Primary Treatment.**
   
   (a) Specific antitoxin.
   
   (b) Absolute rest.

II. **Secondary Treatment.**

   (a) Hygienic.

   (b) Local.

   (c) Dietetic.

   (d) Drug.

III. **Special Symptomatic Treatment.**

IV. **Treatment of Types.**

I. **Primary Treatment.**

(a) **Specific antitoxin.**

The diphtheria antitoxin used in each of the cases described above was that supplied by Park, Davis and Company. This is prepared by immunizing a horse, previously tested for glands and tubercle, and dosed with antitoxin...
serum, with very virulent toxin. Increasing doses are injected, about every three days, until in six months or there about, the highest antitoxic condition is reached. The minimum lethal dose, or unit dose of toxin, is that amount of diphtheria poison which just kills in four days one guinea pig weighing 250 grammes. A unit of antitoxin is the smallest quantity of antitoxin which, being mixed with 100 minimum lethal doses of toxin and injected into a guinea pig, prevents the appearance of any toxic symptoms. According to Boasquert, a definite chemical combination in all probability occurs between toxin and antitoxin, but the affinity between the two is slight, with slow combination and easily undone. He considers that there are three stages in the process of neutralization: firstly the poison circulates free in the blood, the body cells being unattacked, this being a most favourable time to give antitoxin; secondly the poison have combined loosely with the cells
and antitoxin can still withdraw the
poison, if given in large doses; thirdly
the toxins are so firmly combined
with the cells that antitoxin can
no longer undo the combination.

Bolton (Lancet, Feb 3, 1906) considers that,
in the acute stage, the toxin causes
degenerative changes in the cells of the
central nervous system, those of the
vagus centre being especially affected,
also fatty degeneration of the heart
muscle fibres. Later in the disease,
the toxin causes a parenchymatous
degeneration of nerve fibres and a
fatty degeneration in the muscle fibres
of the peripheral nerves and voluntary
muscles being selected for attack. The
result is, in his opinion, that primary
heart failure is very apt to occur
in the acute stage, as a result of
the degeneration, and that in the later
stages death occurs only as a result
of some strain which the heart is
not prepared to meet.

The less horse serum injected the
better for the patient. For this reason
and for convenience in administration, 1 c.c. of antitoxic serum is concentrated, until it contains from 300 to 500 units of antitoxin. According to Bouganget, this will keep well for eighteen months, but will deteriorate after two years and become practically valueless at the end of four years. Ordinary light, heat and the addition of antiseptics do not affect its potency.

Parke Davis and Co. state, that deterioration takes place most rapidly immediately after the serum has been prepared. They therefore allow some weeks to elapse, before testing the potency of the sera. After this interval the reduction of potency usually proceeds at the comparatively insignificant rate of 6½ per annum.

All the antitoxic serum sold by them in Great Britain is tested for potency and purity in the pathological laboratory of Cambridge University, under the supervision of Professor J. S. Sivas Woodhead, whose certificate is attached to each batch. The deterioration in
potency is provided against, by adding a sufficient excess to each bulb to ensure the full labelled dose, for at least one year from the date of certification.

The serum treatment is undoubtedly of vital and primary importance and should be applied early and in sufficient doses.

Early serum injection depends to a large extent upon early clinical diagnosis. Culture reports should not be waited for. It is the bounden duty of every physician to familiarize himself with the signs and symptoms of diphtheria in all its aspects. A throat inspection should be a matter of routine in the first examination of every sick child. It is difficult to give a good clinical picture in words, a little practical experience being worth more than the reading of volumes of literature on the subject. The child looks ill, its behaviour and temper, influenced by the general languor and depression, may be excellent even angelic. There is perhaps an evil smell, immediately
suggesting diphtheria, proceeding from it. The temperature may be slightly elevated, or even subnormal, and nothing definite may be found, until the fauces are inspected, when perhaps dull grey membrane, deposited upon an inflamed base, is seen upon each tonsil, spreading, it may be, along the free edge of the soft palate to the uvula. This is an undoubtedly diphtheria and serum should without delay be injected.

In some cases of scarlatina, the fauces may exhibit a clinical picture of diphtheria with patching of tonsils and uvula and yet with a complete absence of the Klebs-dohle bacillus. Recently three children, brothers and sisters, were admitted, within a day or two of each other, to the City Hospital, the one having no rash but a typical diphtheritic throat, the other two with perfect scarlatinæ rashes and typical diphtheritic throats. In each case the uvula was patched, in each case, with no effect upon the
state of the faucæ, anti-toxin was given, and in each case repeated examinations failed to reveal the presence of diphteric bacilli. It is thus seen, that in case of doubtful diagnosis, the administration of suitable doses of anti-toxin may serve as an aid to diagnosis, the faucæ that clear being probably diphteric; those unaffected by the material being probably not of a diphteric nature.

No rules can be laid down as to what is a suitable dose of anti-toxin. The dose depends chiefly upon the day of the disease, the severity of the disease, the extent and site of the membrauz. Very early, a smaller dose will suffice; later; severe cases, larger extent of membrane, especially if spreading, nasal and laryngeal varieties require large doses. As a rough guide it may be said, give 2,000 units for each part affected, irrespective of the age of the patient. Thus if each tonsil and the uvula is coated with membrane give 6,000 units. 8,000 units is about the largest single dose given at the present
true in the City Hospital. Should the disease appear to be spreading, or to be merely stationary, more antitoxin should be given in eight or twelve hours. Three doses, amounting to about 20,000 units, may have to be given in bad cases in thirty-six hours. A larger dose is rarely necessary or of benefit. Large doses have the disadvantage of causing more general depression. For this reason, the injection of enormous quantities should be avoided.

The serum is usually administered hypodermically by means of a large serum syringe sterilized in the usual way. A convenient site for injection is behind and beneath the scapula or these abouts. In this region the skin is loose, easily purified, not visible to, and with difficulty handled by the patient. It should be injected slowly and dressed with a collision dressing. Throughout the operation the child, if young, must be forcibly held still, in order to obviate the danger of breaking a needle.
Henderson Smith, now working at Oxford on this subject, states that three days elapse before all the serum is absorbed from its hypodermic site. In toxic cases therefore, to gain time, the antitoxin may be warmed to blood heat and injected intravenously. This method was tried, in some of the cases described, without success. It is not an easy operation in very young children.

After the administration of a dose, the important signs and symptoms indicating the necessity of further dosage are, a spreading of the tracheal membrane and a want of improvement in the general condition. Probably the best indication is the state of the local disease. If a diphtheritic throat fails to clean under one dose, more must be given. In laryngeal cases, the general condition and the state of the breathing serve as indicators. After tracheotomy the tube must be carefully watched, dryness being a bad sign and calling for more
antitoxin.

Reports of the Metropolitan Asylums board show that, since the introduction of antitoxin, the case mortality has greatly diminished, that the case mortality is lower the earlier antitoxin is given and that the general mortality has increased, probably owing to a wider distribution of the disease, and to the increased herding of children in schools.

The antitoxin has no preventive action on post-diphtheritic paralytic. The increase in these paralyzes is due to the fact that antitoxin enables more patients to live to be attacked in this way.

Some ill effects occasionally follow its use and are due to the horse serum. They are cardiac failure, which is a rare sequel, cutaneous eruptions occurring in about 25% of cases, joint pains, slight albuminuria, slight pyrexia in about 19% of cases, rarely dyspnoea and precordial pain. Warmth of the serum prior to injection has
probably no effect upon these sequelae.

I. (b). Absolute rest, combining both mental and physical rest, is also of primary importance. After the acute stage is over, it may be difficult to convince some patients of the necessity of this. The patient however must be confined absolutely to bed. The bed should be firm, with light coverings and one pillow, of not too bulky a size, allowed. For the proper carrying out of this part of the treatment, constant skilled nursing is essential. The patient is allowed to do nothing for himself. The diet should be light, nutritious and stimulating and should not be forced upon the sufferer during normal sleep. A quiet sick room, with absence of visitors, is advisable. It is well to forbid reading, until the patient is allowed to sit up. After fourteen days a second pillow may, in mild cases, be allowed. After twenty one days, should no paralytic symptoms or signs of heart affection, such as irregularity or dilatation,
have appeared, the patient may be
allowed to sit up in bed for one hour.
Subsequently, the intervals, during which
the patient is allowed to sit up, may
be increased by an hour a day. If all
goes well, he is in a few days permitted
to sit on a couch and to gradually
take to his legs again. Young babies
may be allowed to sit up in bed,
as soon as they feel inclined to do so,
as in their cases it probably does
more harm, forcing them to lie against
their wills, than giving way to their
wishes. The above figures are all
arbitrary and may be altered to
suit the particular case; it would
however be wise to insist upon two
weeks in the continuous recumbent
position and three weeks in bed, in
all but the very mildest type of cases.
Should signs and symptoms of cardiac
failure at any time have supervened
it would be advisable to keep the
patient in bed for at least two months.
Up to this time, following diphtheria cases
of sudden heart failure have been
recorded. Even four months after the acute stage, cases will be met with in which, after some strain, dilatation of the heart has supervened. In a public hospital the prolonged retention of patients may be difficult, owing to the great increase in expense caused by such methods; in private however, especially in the case of children, the same factor may not be so pressing and, if avoidable, even the smallest risks should not be run.

II. Secondary Treatment.

(a) Hygienic.

The patient should be isolated in a large airy room, furnished as sparsely as possible. Fresh air is of great importance, not only for the patient himself, but also for the sake of the attendants; the risk of infection being greatly lessened by attention to this. Artificial heating is best carried out, by means of an open fire, which is cheerful to look at and above all an excellent ventilator. Steam
heated rooms are therefore not so suitable. The temperature of the room should be maintained at about 65°F.

Absolute cleanliness is also important. The patient, when in a state of pyrexia, should be sponged all over, with tepid water, at least once a day. Later, and whilst confined to bed, complete sponging every second day will suffice. Steam cases must be sponged more frequently, as they are usually restless and hot. Haemorrhagic cases and those with cardiac involvement should be submitted to as little local treatment as possible. The sponging is best done the last thing in the evening and, followed by a warm drink, usually produces a feeling of great comfort and a refreshing slumber.

Toilet linen should be soaked in 1 in 20 carbolic lotion before being confined to the wash. Discharges should be burnt or sterilized in 1 in 5 carbolic before being put down waste pipes. All utensils used must be perfectly clean. The bed should be firm and
approachable from either side. The bed clothes should be free and the sheets should be changed daily. A linen nightdress is advisable until convalescence is established.

The utmost quiet should prevail in the sick room. For quiet clothing of the fire, coal may be conveniently kept in paper bags. Firing kindling of the fire is most irritating to the sick. On no account should the patient’s condition be discussed in the sick room; if anything is said, it should be said audibly and not whispered.

Sleep is assisted by sponging, by giving toddy, by quietness, by concealing the fire behind a screen by applying hot bottles to the feet and such devices. Sedatives and hypnotics should be avoided if possible.

(b) Local treatment:—

As stated above, this is now considered more as a toilet, than as a directly curative measure. It is discussed more fully under the treatment of types, to be...
described later. The application of antiseptics during convalescence seems to influence, very little one way or the other, the disappearance of the organisms from the sages or nose. On this subject numerous experiments are being made at the City Hospital. These seem to show that the bacilli of diphteria, uninfluenced by the antiseptics, take their own time in disappearing.

(c) Dietetic Treatment:—

Until the sages or the affected part is clear of membrane, a fluid diet, light and stimulating, such as milk, beef tea and eggflakes is advisable. After this Berger's food, Dr. Ridge's food, which is easily prepared and can be made thick enough to satisfy the patient, or oat flour may be gradually added. Milk puddings can soon be given. About the end of the first week, if no albumin and blood are present in the urine, fish may be tried. The diet need not be curtailing for albuminuria alone. A little liver, chicken and rabbit
can be allowed. Each case must be
visited on its own merits, consequently
more but the broadest of rules
can be laid down. A very mild case
is best fed liberally, from about the
second day of the disease. Patients, that
are acutely ill, should be fed every
two hours during the day with small
quantities of food, raised as much as
possible. At night four hourly feeding
is advisable, but the patient should
not be waked from natural sleep
for this purpose. When convalescent
meal hours such as the following
are suitable, milk and bread and
butter at 6 am, porridge and milk
at 9 am, dinner at 12.30 pm, tea at
3.30 pm, supper at 7 pm and beef
tea at 11 pm.

(d) Drug treatment:
This is still a much vexed question.
In order to approach it in a rational
manner, it will be as well to first of
all re-consider the conditions under which
drugs are applied. Putting aside the
physical obstruction to respiration due
to laryngeal oedema, induced by fear,
or by the presence of laryngeal irritation,
or to the actual presence of membrane
or of the products of germinial growth
and treated by antispasmodics, as
belladonna, by fumigations, as
species of coccus, by stimulating infections,
as ammonia carbonate, by the inhalation
of steam or by operative procedures,
the results of the circulation of
diphtheritic toxin may be considered.
The chief results and results produced
during the acute stage, are almost
certainly, a degeneration of that central
cells of the vagi and a fatty
degeneration of the heart muscle. They
are produced, to a greater or less
extent, according to the severity of the
disease and to the conditions of application
of antitoxic serum. The signs of such
degenerations are, in severe cases, a
slowing and irregularity of the pulse
and a gradual cardiac failure. Saliens
a parenchymatous degeneration of
peripheral nerves, and a fatty degeneration
of voluntary muscles may slowly supervene. To combat the untoward results of these degenerations, the commonest custom in drug treatment at the present time is, the free application of alcohol and the steady use of strychnine, as adjuvants to the primary measures of treatment. Alcohol is usually administered in the form of good whiskey at regular four-hourly intervals, or more frequently. It acts on the circulatory system producing important reflex effects. Under its influence the heart beats more rapidly and forcibly, the vessels of the whole body dilate, and the blood pressure rises. The heart, at first stimulated, is however left later on in a more exhausted condition than ever. Seeing that the rise of blood pressure and the exhausting effects on the heart will merely tend to aggravate the ill effects of the toxin, alcohol therefore seems to be an unscientific drug to use, except in cases of sudden emergency and for mere temporary effects.
Stimulating a failing heart in diphtheria with alcohol is like flogging a tired horse. It is, however, customary to employ it, and until trustworthy statistics appear proving that practically it is useless, it will be advisable to continue doing so.

To the use of strychnine the same remarks apply. Its chief actions in regard to diphtheria are a stimulation of the respiratory centre, and of the vasomotor centre, causing a rise of blood pressure, and a direct stimulation of the heart. Some deny that strychnine can stimulate the heart, but if such great authorities as Lander Brunton can be believed, it would appear to be a powerful cardiac stimulant. It is best given in the form of liquid strychnis hydrochlor: four hourly. At the city hospital it is customary to discontinue its use in this form after about nine days, when it is given in the form of Bar-tis syrup three times a day. In young patients, especially, the dose must be carefully regulated and
a close watch kept for twitching of the fingers and such signs of poisoning. In heart failure it sometimes tends to aggravate any tendency to vomiting and should then be discontinued by the mouth and given hypodermically.

As originally suggested by Dr. Noel Paton's experiments, adrenaline chloride solution (1 in 1000) has been tried in numerous cases of cardiac failure at the City Hospital. Its results as far as could be judged from the pulse and general condition, were merely those of temporary improvement. Its effect seemed to wear off in a day or two and it was never known to save a life. It was given by the mouth or hypodermically in five to ten minims doses from hourly. In the above series of cases it was never given until signs of cardiac weakness had appeared. Perhaps better results would be obtained were it given from the very onset of the disease.

Digitalis or strophanthus seem to
be of little use in this form of heart failure. Probably their employment is contraindicated for the same reasons that strychnine and alcohol are theoretically contraindicated. If digitalis is tried, it should be continued with a vaso dilator. Strophanthus is often tried when strychnine is causing nausea. Given hypodermically as strophanthin, it is rather apt to cause local irritation and seems to have very little influence on the progression of cardiac failure.

Camphor, ether and aromatic spirits of ammonia, as reflex stimulants of the heart, are all of use - the last two being of special service in sudden emergencies.

It is however depressing to watch the effect of drugs in diphtheritic cardiac failure. The initial promising stimulation is always temporary and once pronounced cardiac failure has set in with vomiting, restlessness, querulousness, coldness of the extremities, feeble slow and irregular pulse, sighing
respirations, cold sweating and an ashy grey colour of the face, nothing seems to ward off the inevitable and the patient almost invariably dies. Perhaps the new drug formula of strychnine or formic acid, now being so extensively tried in the Edinburgh Royal Infirmary, and also by Dr. Croom at the City Hospital, may give more encouraging results.

Vinum Ipaeacanthka is frequently given for its emetic action in cases and also for its expectorant action in those cases where the sputum is tenacious, thick and difficult to expectorate.

Ammonium Carbonate is sometimes useful in laryngeal and bronchitic cases as a stimulating expectorant.

Iron, usually as a prophylactic or as the tincture of Ferric Chloride, is often prescribed during convalescence for its haematemic and tonic actions.

In the early stages of the disease, if much acute tonsillitis is present, small repeated doses of acornis are often of
use and very comforting to the patient.

Conium belladonnae is much
used in those cases of laryngeal
obstruction in which spasm of the
larynx is supposed to be the chief
factor. In this class of case it should
be given in large doses. When an
good improvement in the pulse is
often noticeable. According to Dr. Bolton
(Ranvet Feb 3, 1906) it should be given
a fair trial in diphtheritic cardiac
failure. By its paralyzing action on
the ends of the vagi nerves the heart's
action is accelerated, the systole increased
in extent and the diastole diminished,
the whole output of the heart per
minute being increased. It also after
a primary rise, causes a fall in
the blood pressure. Knowing these actions,
it would therefore seem to be a valuable
drug to apply in such a contingency.

III. Special symptomatic treatment:

Under this heading the important
measures, that may be adopted, to
combat the various symptoms, will be
outlined.

(a). Circulatory System.

1. Cardiac failure:—On the onset of this terrible condition, the relatives must be made to realize the seriousness of the situation. Though ultimate success will be very improbable, it is the physician's duty to prolong life as far as possible. Absolute quiet and rest with the head low are essential. All disturbing measures of treatment, such as soothing the fauces, must be stopped. Using good whisky or brandy, give frequent small doses of alcohol. Give strychnin every four hours. Adrenalin chloride (1 in 1000), by mouth, or by subcutaneous injection, will probably prolong life. As explained above belladonna or formate of strychnin may be tried. Sudden collapse should be treated with hypodermics of ether or brandy and with the application of hot fomentations or a mustard leaf to the precordial region.

2. Haemorrhage:—Spray the part with adrenalin chloride (1 in 1000). In cases of
Nasal bleeding, it may be necessary to plug the anteri or nares with cotton wool soaked in this solution, though it is better to avoid this manœuvre, if possible, owing to the bad effects produced by blocking the discharges. Absolute rest, with cessation of other local applications, is again essential. The food may be given cold, and ice sucked with advantage. The tincture of ferric chloride is of little use.

Alimentary System.

1. Vomiting:— Food and drugs by the mouth should be stopped. Strychnine by the mouth is sometimes useful to produce vomiting. Food should be given by the rectum.

2. Constipation:— For babies castor oil is the best purgative. In other cases early in the disease a dose of calomel followed by an enema is good treatment. Subsequently the liquid extract of Cascara Sagrada, in small doses three times a day, is most useful. The Compound Liquorice powder is sometimes useful for children, but is rather apt
to grip and nausea.

3. Dysphagia and sore throat:—These if very severe may be treated by nasogastric feeding; otherwise hot compresses to the neck may give relief. If much tonsillitis is present, with pyrexia and a rapid pulse, trichina scoriati in minims doses every half hour, till four doses have been given, often affords marked relief.

(c) Respiratory System.

1. Bronchitis requires the ordinary bronchitic remedies.

2. Pneumonia is a very serious complication, especially after tracheotomy or intubation, and almost invariably proves fatal. The heart must be supported as far as possible and serum pushed.

3. Empyema sometimes accompanies diphtheria. As soon as diagnosed a rib should be resected, under chloroform, and the cavity drained.

4. Spasm of the larynx is frequently present and is recognised by sudden exacerbations of dyspnoea, when the patient is awake and excited, followed
try intervals of quiet breathing during sleep and repose. The patient should be kept very quiet, under steam, and given injections belladonna in large doses. Operative measures may be required.

3. Laryngeal dyspnoea due to mechanical obstruction requires the most skilful treatment. The influence of steam, freely applied in an airy well ventilated room, should first be tried. A steam tent, with its suffocating, evil atmosphere, and caged in, depressing appearance should never be used. Under steam and full doses of antitoni many of these dyspnoeic cases are soon relieved. If however the pulse is weakening and the dyspnoea is increasing do not hesitate to operate. On no account wait until the child is in extremis. Except in very young babies tracheotomy is preferable to intubation. It possesses the following advantages:

1. It is certain to relieve laryngeal dyspnoea
2. It needs less practice to be well performed.
3. The post-operative nursing is more easy.
4. The larynx is not injured in any way.
Its disadvantages, compared with intubation, are more imaginary than real:
1. It is a cutting operation and therefore, in the eyes of the relatives, to be avoided.
2. The danger of haemorrhage. This is slight and easily met by competent hands.
3. The small size of the trachea in young subjects.
4. The danger of pneumonia. This is in all probability as great in the one case as in the other.
Intubation is perhaps more suited to children under one year than tracheotomy owing to the small size of the trachea and to the paleness and shortness of the necks of young babies. It is an ugly operation at the best of times and can only be performed well after much practice. The child firmly held, with its mouth opened wide with a gag, is usually half suffocated before the tube is inserted into its place in the larynx. Even after the exhausting performance is over, the dyspnoea is often not relieved, and
may even be aggravated, necessitating an immediate tracheotomy. Should the breathing be improved the child runs the risk of necrosis and ulceration of the larynx, from the irritating presence of the tube, with very possibly an ultimate stenosis. At any moment the tube may become blocked and, even though pulled out, impending suffocation may necessitate tracheotomy.

A doctor must be within very short call of a case of intubation, whereas he can safely leave a tracheotomy case in the hands of a competent nurse. It must be said that sometimes very pretty results are seen with intubation but it is the ugliness, the difficulty, the general uncertainty in the immediate results of the operation, that speak against it. It usually does best in dry cases, with little thick mucus pus in the naso-pharynx.

Except in one instance I have always performed the low tracheotomy operation and prefer it to the high for the following reasons:-
1. There is more space.
2. It is further away from the larynx.
3. The tubes are subsequently more easily removed.

The disadvantages of proximity to the pleural cavity, if death of lability to tamponade are not pronounced enough to counterbalance the advantages.

In considering the indications for tracheotomy, the following hypothetical case may be taken as illustrating the need for the operation. A child of three years of age is admitted at 1 pm, suffering from diphtheritic cough on the second day of the disease. There is some indrawing of the epigastrium and anterior abdominal spaces; the pulse is fair; the colour shows slight cyanosis; the child is quiet. The child is placed under steam and given 6000 units of antitoxin. At 2 pm it is rather worse. At 3 pm the child is a little restless, the pulse weaker, the alpoэurae and cyanosis increased and now becoming marked. In other words it is progressively becoming worse. Seeing this
it is now bad practice to delay operation. By delaying in such a case, nothing is gained and the patient gradually becomes less and less able to bear the slight shock of the operation. The neck having been prepared for operation in the usual way, the child is warmly wrapped in a hot blanket and carried to the operating table. Chloroform should be administered and a syringe containing strychnine and hot fomentations should be placed ready to hand. The only instruments necessary are a short-bladed scalpel, a sharp tenotomy knife, a tracheal dilator, two blunt hooks, a few artery forceps, the tracheotomy tube and a skin needle with horsehair. The child having been slowly chloroformed, the main duty of the anaesthetist now is, to hold the head absolutely steady and straight in the middle line. The head is well depressed and the neck arched by placing a thin sand pillow beneath the shoulders. This manoeuvre brings the trachea near the surface. The operator, standing on
the right of the patient, with the left hand defines the cricoid cartilage and from this point, keeping exactly in the middle line, incises through the skin down to the sternal notch. Inserting his forefingers he can then readily even in the youngest subject feel the trachea. With this as a guide, keeping the lower part of the incision shallow, he deepens the upper part and separates the muscles with blunt hooks to an equal extent. Always feeling the trachea to expose its white surface, hooking up the thyroid gland if necessary. The trachea is then opened with the tenotomy knife. In a young child it will not be easy, or necessary, to fix the trachea with sharp hooks. Insert the dilator and wait a minute or two until the excess of mucus or membrane is expelled.

The introduction of the tracheotomy tube requires in some instances a good deal of knack, which can only be acquired by practice. Having done this and put in a superficial stitch or two, fix the tube with tape tied round the neck.
and dress with a thin strip of oesophagogastric  
gauze. Bleeding is prevented, and  
should, if there is time, be checked before  
the trachea is opened, by exposing the  
bleeding point, clamping and ligaturing.  
It is seldom troublesome, provided the  
operator hooks to the middle line and  
does not make the lower part of the  
incision too deep. After a hypodermic  
innervation of strychnine and the application  
of a hot precordial fomentation the  
patient, with a light piece of gauze  
covering the tracheal opening, is returned  
to bed in the steam room. Much  
relieved, it now usually sleeps for  
an hour or two and awakens chewing  
regio of considerable general improvement.  
In a few hours, if the tracheal  
discharge is scanty, more antitoxin  
should be given. Perhaps even a  
third dose twelve hours later may have  
to be administered. There is usually a  
slight rise of temperature for a day or  
two following the operation, but if all  
goes well, it usually falls with the  
manner of the respirations about the third
day. If possible after three days remove the outer tube for the first and last time. A careful effort should be made to let the first attempt be successful. It is therefore an excellent plan to cut the tapes very quietly and slip out the tube rapidly, covering the wound with a thin film of gauge whilst the child is asleep. This method was adopted in every instance described above with complete success. If the child sees anyone interfering and working at the tube it becomes frightened, coughs, cries and induces spasm of the larynx. It never forgets a failure and the facial resistance of the tube is therefore rendered more and more difficult with each failure. If the laryngeal breathing be tested, it should be tested some hours before removing the tube. The doctor should be within handy call for a day or two following the removal of the tube and should scan objections that in the event of dyspnoea, the tracheal dilator must be inserted and
In nursing young tracheotomy patients, it is advisable to confine the arms in splints made of stiff cardboard, in the form of sleeves, reaching from the shoulder to the wrist. Young children with any laryngeal obstruction usually wish to be as free as possible. They need not be forcibly kept under the bed clothes. In a warm steam room, wrapped in a flannel night dress pinned to the diaphragm, with their legs and thighs completely enveloped in long warm woollen stockings, pinned to the night dress, they may be allowed to lie free and comfortable above the bed clothes. Up to about three years of age, young tracheotomy patients should be nasal fed. It is surprising in what a short time they become used to this mode of feeding. The danger of pneumonia is greatly lessened by feeding in this way. Older patients may be fed by the mouth. Absolute quietness and composure should prevail.
in the sick room. The urine tube, especially during the night, should only be removed when it appears to be obstructed in any way, or in other words as seldom as possible. It is better to clean the outer tube with sterilized feathers, than daily to remove it for cleaning purposes, which irri
titates the patient considerably and renders the subsequent final removal more and more difficult. Many authorities object strongly to feathers in these cases. There is no reason why when efficiently sterilized, which is not a difficult proceeding, they should not be employed. It must be remembered also, that the tube, into which they are introduced, is already swarming with organisms. A special nurse should continually be in attendance and she should be warned, that she is not expected to remove the urine tube every time the child coughs. Many young children are greatly irritated and prevented from sleeping by the too eager attentions of the nurse.
(d) Haemo poetic system.

1. Adenitis is usually cervical. The application of hot fomentations is often followed by relief. Suppuration rarely occurs.

2. Anaemia, during convalescence, may be treated with the syrup of the leaves of iron or with tincture ferric chloride. Factor's syrup is an excellent tonic. Parrich's syrup and Scott's cod liver oil emulsion may also be used with advantage.

(e) Integumentary system.

1. Rashes, whether purpuric or due to serum, require no special treatment.

2. Eruptions of an acne character are usually prevented from appearing, if the irritative discharges are prevented from escaping over to the skin. For this purpose zinc ointment, applied to the various orifices in question, is beneficial.

(f) Urinary system.

1. Albuminuria is usually transient requiring no special treatment.
2. For true nephritis, the usual treatment of careful dieting, attention to the bowels, and the possible use of diaphoretics must be applied.

G. Nervous system.
1. Sleeplessness during the acute stage may be relieved by a few, small, often repeated doses of the tincture of acouite. During convalescence, trichlor or bromide of ammonium may be of service. The comfort of the patient must be carefully attended to.
2. Hyperpyrexia is unusual and best treated with tepid sponging. Small doses of acouite may again be beneficial.
3. Post-diphtheritic paralyses are said to be produced, by the variety of toxins called toxone, upon which anti-diphtheritic serum has no action. These paralyses either progress until the patient dies, or else progress a certain length and then slowly and entirely recede. This subsidence may take many months to be completed. Palatal paralysis may cause much
trouble and anxiety. A patient suffering from this should be kept in bed and fed upon semi-solid foods, liquids being especially liable to be returned through the nose. A careful watch for pharyngeal and laryngeal paralysis must be kept, in which case nasal feeding, to obviate the dangers of choking and of repto pneumonie, should be resorted to.

The various external and internal ocular paralyses need no treatment beyond rest. No reading can therefore be allowed in these cases. Little can be done for the dangerous paralysis of the diaphragm and intercostal muscles which may supervene. Keratitis of the phrenicus has been tried without success. The paralyse of the various voluntary muscles need not be specially mentioned. They can be treated with massage and electricity. Each patient suffering from paralysing diphtheritic paralysis requires rest, careful watching and nursing and a course of tonic

...
(1) Locomotory system.

Arthritis is a sequel to the introduction of horse serum and is more inconvenient than serious. The affected joints may be wrapped in cotton wool and bandaged.

(2) General

(1) Loss of appetite is very prominent during convalescence and may prolong this period for some months. Easton's syrup is a good tonic to give. Fresh air and liberal good feeding should be insisted upon. The patient must return very gradually to his former mode of life.

(2) Scarletina is very apt to attack diphtheritic patients and vice versa. The treatment need not be detailed. It is interesting to note however, regarding prognosis, that the onset of scarletina, perhaps through the medium of pyrexia, seems to act as a stimulant to the exhausted diphtheritic patient, who progresses frequently in a surprisingly favourable manner. It should be remembered that scarlatina especially
If coming on some weeks after serum has been administered, is very liable to cause a relapse of the diphtheria. This occurred in one of the cases above mentioned.

IV. Treatment of types.

In regard to the treatment of the various types of diphtheria, some special points, respecting the local measures to be adopted, require consideration.

Patients, suffering from the mildest type of fancied diphtheria, with merely the organisms and no membrane present, if not a rule, either in their usual good health or perhaps just a little run down. Provided they are not living in an institution, where there are numerous children collected together, they can be treated in their present homes. They should avoid all contact with children and close contact with adults and should apply vigorous local treatment, backed up by fresh air, tonics and good food. Confinement to
Toluol Mixture
Toluol 36 pl
Sper Hun Rect 60 pl
Linie Ferri Perchlor 4 pl
bed is not necessary. A small dose of
antitoxin will often hasten the extermination
of obstrucate organisms. Four hourly
Listerian gurgles or lour glyceride paintings
of the fauces, alternated with advantage,
should be employed. In the case of
the young, regular swabbing takes the
place of gargling. The fauces should
also, in all cases, be swabbed once or
twice daily with carbolic and glycerine,
or with corrosive sublimate (1 in 3000).
Carbolic acid and corrosive sublimate
are especially useful in obstrucate cases.
Mild faucial cases with membrane
may be treated as above, but in addition
a weakened Befferi's solution, after
the membranous surface has been
previously cleaned with a dry swab, may
be with benefit carefully applied every
eight hours, and left in position.
It is advisable to cease applying this
tobacco solution, as soon as the membrane
has disappeared. Finally the boroglyceric
swabblings are gradually stopped, but
it is usual to continue gargling at
least three times a day, until the
Acidi Borac Pulu 3 l
of Seventh Sip
Vanelin 3 l
patient is discharged. As far as clinical experience goes, carbolic acid and glycerin
seems to be the most useful application for exterminating the bacilli.

In severe or very special cases, with
marked mucous infection, the fauces
should if possible be sprayed every
two hours with corrosive sublimate (i.e.
1:1000) or with hydrogen peroxide. This
cannot be done in the cases of the very
young, when swabbing is the best
procedure. Spraying the throat is
not inconvenient and is most comforting
to the patient. He should lie on his back,
and after the throat has been sprayed,
expectorate the residue. Every four hours
the fauces should be swabbed with
bromyglyceride. To hasten the loosening
of the membrane, spray or swab with
a saturated solution of bicarbonate solution.
Frequent linctus gargles are beneficial.
The mouth must be kept clean by
swabbing with linctus and by applying
the Reh Beacher Tito's ointment to the tongue.
Cracked lips are best treated with
hazelnut ointment, applied two or three
R1 Hazelnut (B W +6) 1/75
Adeptus Astartes (B W) 9 ps5
Six times a day.

Haemorrhagic cases should be sprayed with tannin, tannine or adrenaline chloride. It is best to avoid the application of tincture ferri chloride, gargles and swabbing.

Mild nasal cases should be syringed two or three times daily with boracic lotion or bistriur or salt solution, using a Huggins or bulb syringe for the purpose. If the patient is in a fit state, syringe in the sitting posture, when he can inspectate the residue; otherwise syringe, with the head lying over the edge of the bed and the face looking down.

Severe nasal cases should be sprayed, as syringing causes too much strain on the heart; every two hours with corrosive sublimate, hydrogen peroxide or with sodium bicarbonate solution.

To prevent the discharge from irritating the skin, the nasal orifices should be anointed with Zenic ointment. If cracked hazelnu ointment may be applied with benefit. For nasal bleeding
spray with tazoline, xerosine or adrenaline chloride and avoid plugging if possible.

For laryngeal cases, with any dyspnoea, steam is all important. It can, and must be, applied along with plenty of fresh air. The old steam tent is a barbarous invention, most suffocating in its appearance and atmosphere. Unless a steam apparatus is laid on, several steam kettles must be kept going in the room. Many patients are saved the operations of intubation or tracheotomy by the combined use of steam and antitoxic, the steam assisting the patient over the troublesome period, before the antitoxic begins to show its action. It is useful also, after these operations, in aiding the expulsion of mucus pus and membrane and perhaps in lessening the danger of pneumonia. Mucilaginous vapours seem to be of little advantage. Hot fomentations to the neck may be useful and comforting, but ice is seldom employed. No local antiseptic applications should be
attempted.

In combined laryngeal and faecal disease the measures applicable to each should be adopted unless there is dyspnoea present, when all faecal applications must be neglected.

All these methods of treatment are mere accessories and adjuvants to the main and important rest and antitoxin treatment. Every hour delay in giving antitoxin serum increases the patient's risk. Regarding this question there is one regulation or custom of the Public Health Department of Edinburgh city, which must be considered. The city ambulances for infectious diseases remove patients from their homes to the City Hospital between the hours of 10 am and 6 pm, and at no other time. There is also a by-law, imposing a penalty not exceeding £10, upon any person who knowingly conveyed a patient, suffering from an infectious disease, by means of a public conveyance. There is therefore no means of transferring
for treatment in their own hospital and Edinburgh patients, unless they are carried by some private means, between the hours of 6 pm and 10 am. In other words, they may lie sixteen hours dying and practically untreated, if they are unable to afford the expensive treatment required in some cases. This applies especially to cases of diphtheritic group. Cases of this sort, met with after 6 pm, are practically untreated, because no dispensary doctor or poor practitioners can be expected to pay 10/- or £1 for antitoxin, necessary for practical treatment. Neither can he apply steam, intubate or perforate tracheotomy in many of the novels, in which he will find the disease. Such cases are notified and moved come seven or seven hours later, often arriving moribund at the City Hospital. These steam, antitoxin, intubation or tracheotomy are, as soon as possible, utilized, but often too late to save the exhausted child's life. Why does this fine modern hospital, with all its advantages for treatment, lie latent, as far as outside
sufferers are concerned, during the hours specified? What would the public say, if the Royal Infirmary were closed to outside patients during those hours?

And yet the public quietly submits to this in its own hospital; perhaps it does not realize what is going on. It seems incredible that such a state of affairs is allowed to continue and the reason for it is not at all apparent. It cannot be that the Public Health Department expects infectious diseases to break out only during the day, or wishes to ease its officials night work, or does not recognize the importance of immediate treatment in such urgent cases as diphtheritic groups. The following case, happily with a favourable termination, illustrates this question. In August 10th 1905, a boy of seven years of age was admitted, suffering from an undiagnosed but "urgent surgical complaint," to the Chalmers Hospital. At this time, about 5 p.m., the resident Dr. Holmes was out, but was at once telephoned for. Arriving
Half an hour later, he found the boy moribund. Artificial respiration was performed by J. Dunbar, whilst the instruments for tracheotomy were collected. Tracheotomy was then performed. The case, being one of diphtheritic group, was isolated in the only place available—a scullery. The Public Health Department was then consulted with, but the hour being now shortly after 6 pm, the reply was, that the child could not be moved, till next day. He lay all night in the scullery on a make-shift bed. This was not only an unfavourable position for himself, but was also a menace to the other sick patients in the hospital at the time. He was moved next day at 11.30 am and fortunately made a good recovery. One shudders to think, what would have become of this boy, had his disease developed an hour or two later and had his case been correctly diagnosed. No general hospital could have admitted him. He would without a doubt have died. Such cases should not be
possible, and there is no doubt they are numerous. Even if it means night work, for some city officials, the city hospital should be open, at least for urgent cases, at all hours of the day and night.