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Introduction.

The increasing prevalence of diphtheria in Great Britain, the large annual mortality from this disease render the question of its treatment one of great importance to the general practitioner. 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 lulls the doctor into a feeling of false security. Thinking only of the bacteriological report and perhaps forgetting, or untrained in, the clinical aspects, he leaves 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 diphthérite to denote a certain specific inflammation. Previous to the work of this distinguished Frenchman, there was great confusion between the various forms of faucial inflammations. Thus Dr Buchan M.D; F.R.C.P; Edin, in his Domestic Medicine published 1820, described under quinsy, what appear to be various forms of tonsillitis, true diphtheria and scarlatina. It is impossible to mistake the "swelling of the tongue, frothing of the mouth, pallor and ghastliness of the face, coldness of the extremities, the laboured breathing the swelling of the neck spreading to the chest" of his malignant quinsies for anything but diphtheria. His treatment, crude and barbarous in some respects, was on the whole very sensible. For malignant quinsy 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 pulv: ipecac: for nausea. Peruvian bark, taken as such or in the form of a decoction with virginian snake root, water and elixir 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 blisters, setons, poultices of bread, the application of swallows' 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 eel's skin passed into the oesophagus. In croup 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 to be 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 Actius in the 6th, by the Spaniards in the 16th, who referred to it under the name of garotillo, a most suggestive title, by the Italians 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 disorder.

Hippocrates wrote vaguely about ulcers of the pharynx assuming an acute form by bringing on dyspnoea. Whether he was referring to diphtheria or not is uncertain.

Since Bretonneau's time local applications as pure HCl, $CuSO_4$ or $AgNO_3$ 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. "Tonsillar 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 of

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 fumigations of hydrochloric acid and the application of silver nitrate solution to the glottis, but admitted the danger of pneumonia in consequence. Tracheotomy 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 post mortems!

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

Guersant, 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 four to the ounce of water, but suggested that the operator, in applying the medicaments, should not struggle too much with the patient. Mercurials by injection or as calomel be used with considerable success, except in patients of feeble constitution, in whom the lowering effect of the salivation and purging was too apparent. Strong purges and blood letting be 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 emetics 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 combatting this disease. In 1835 in the Dictionaire 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 he considered less useful. Calomel 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 canula should be removed in five or six days, and the patient fed in the meantime on milk and soups. He admitted the danger of pneumonia following the operation. Thus for the most part he followed out the principles and ideas indicated by Bretonneau.

Davot 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 guttural inflammation local bleeding, every six hours until the symptoms ameliorated, by means of leeches. This he encouraged by means of diluent drinks, 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 croup" 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 "lapis 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 Necker 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. Calomel 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 continued 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 nés et des enfans à la mamelle, are most original and important. He favoured alteratives such as mercury, sulphuret of potash, copper sulphate, believing

that they promoted the expectoration and rejection of membranes. In Mercury he had especial faith. He applied it either by unction or as calomel internally, and discontinued its use as soon as the bowels were free and salivation had commenced. The expulsion of membrane was also aided by the use of emetics, the best of which was ipecacuanha, and of sternutatories. Revulsives 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 3ii to aqua 3i, applied twice daily by the sponge and whalebone 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 intra tracheal medicaments. It is interesting to note that at this time the great authority Trousseau had also given up intra tracheal 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 continuously 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 stimulation throughout the disease and tonics for the various sequelae.

The work of Dr Freenhow 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, saline 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 favorite 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 chlorine, for foetor of the breath, chlorate of potash, dilute hydrochloric acid in syrup and water or Tinct. Ferri

Perchlor: 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 croup he favoured emetics or calomel and as a last, and almost hopeless, resort tracheotomy. Strychnine in small doses he thought very useful for paraplegia. As a general tonic during convalescence he employed the citrate of iron and quinine.

Sir William Jenner in his lectures on diphtheria in 1861 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 calomel and a saline, gave simple

febrifuges as acetate of ammonia, or citrate of potash. He fomented the throat, gave inhalations of acetic acid in water and gargled with diacetate of lead ʒi to rose water ʒviii. 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 ʒvi 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 sesquichloride of iron, calomel or sesquicarbonate of ammonia he thought of very doubtful advantage. Locally he directed that the membrane should on no account be torn off, that caustics, 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 scruple 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 rickets 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, for children high 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 Condy's fluid and even applied silver nitrate freely to prevent septicaemia. 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 paralyses. He considered that strychnine in small doses should be given a fair trial in cardiac paralysis,

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.

Begbie'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. Muriated tincture of iron in the early and in the convalescent stages he thought useful. Condy's fluid and chlorine 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 proceedure.

In 1870 Amussat, 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 proceedure and a good deal of success followed the new departure.

In 1883, the year in which Klebs discovered the bacillus of diphtheria, and in which Loeffler grew the

organisms in separate media and by inoculating 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 & the perchloride of iron. He also used potassium chlorate mixture, a dilute hydrochloric acid and quinine combination, liquor chlorinatae and the free application of food and wine, feeding by the rectum if necessary. The calomel treatment at this date had been abandoned. Pilocarpin,

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 severer 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 isolated his patients in

well ventilated rooms, at a temperature of about 55°F. Emetics and blisters 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 postponed until the sufferer was in extremis.

A long and minute account of the treatment of diphtheria appeared in Jelli's Sanné on Diphtheritic Croup 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 nearer the surface. The canula was also more easily introduced in this method. The disadvantages of the high operation were the closer proximity of the larynx,

the speaking organ and the seat of the disease, and of the isthmus 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 crevat of tarlatan and another of wool 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 styptics, tincture of the perchloride of iron, ice or other cold applications, adenitis with cataplasms, oily embrocations, wool to the neck or if necessary by operation,

pulmonary inflammations with free alcoholic stimulation, paralyses with thick soups, porridge and such like if there were any difficulty in swallowing, with tonics, sea bathing, cautery to the spine or electricity. Calomel, mercurial inunctions, alkalies, tartar emetic, sulphuret of potash, bromine, iodine and the balsams 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 membrane. Blood letting and revulsives should be avoided. Internal antiseptics such as perchloride of iron, carbolic 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 cauterization and tonsillotomy 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, lime 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 solvent and disinfectant, given internally. Alum might be insufflated with benefit and it was advisable to employ irrigations of one 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 lime water in croup were highly dangerous procedures. Inhalations of

steam were useless. Atomizers of lime water, antispasmodics, stemtalonics 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. Strychnin was considered of very doubtful advantage in paralyses. For sudden cardiac failure hypodermic injections of brandy were recommended. Regarding general treatment, much stress was laid upon frequent sponging of the patient, who was on no account to be moved from his bed. A warning

was offered to the unwary not to allow the slumber of toxaemia 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, to 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 Wasserman 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 Aronson, Katz first applied horse serum. After that date the anti-diphtheritic serum treatment rapidly spread, soon becoming world wide. Its success has been undoubted and marked especially in early cases a fact which emphasizes most forcibly the great importance of early diagnosis.

Neither Fagge and Pye Smith nor Osler in their works published in the years 1891 and 1892 respectively made any mention of the then newly suggested form of treatment. The former suggested few new expedients. Digitalis was recommended for cardiac failure and tracheotomy was preferred to intubation. Osler'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 he advised frequent local swabbing or syringing with mild antiseptics and the use of such solvents as trypsin or pepsin in lime water.

No mention of the proposed serum treatment was made in Whitla's Dictionary of Treatment published 1892. In that work a good diet with free alcoholic stimulation was emphasized as of vital importance. Peptonised food might be used when digestion was weak. Tinctura Ferri Perchloridi 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, creasote salicin and the sulphocarbolates were innovations. Mild local applications and inhalations were considered useful, caustics and solvents useless. The injection of chlorine water into the tonsil, at the seat of the disease, was suggested as being of possible advantage. For laryngeal dyspnoea 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 1894 and the 15th March 1895 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 Childrens 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 Osler's Medicine 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 thrice. The immunizing period of antitoxin was considered to be three weeks. Loeffler's antiseptic solution, consisting of menthol grammes X, alcool to cc XXXVI, Liq Ferri Sesquichlorati cc IV and absolute alcohol cc LX. was also recommended for local application.

Chapin in 1898, in the New York Medical Recorder, recommended whiskey strychnine, nitro glycerine and digitalis, given hypodermically if vomiting should be present, as useful drugs in cases of cardiac failure.

Gordon Morrill, after experimenting extensively with the serum, concluded (1898 North Carolina Medical Journal) that 100 to 200 units given 24 hours before infection 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 paralyses was rather a good sign, proving as it did, that more patients lived to suffer from these nerve lesions.

Kassowitz in the same paper and

year remarked that he could find no encouragment 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.

Herringhams article, in Allbutts System of Medicine 1901, may be taken as embodying the treatment in vogue in Great Britain at that date. Locally he preferred carbolic lotion 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. For heart failure he advised strychnine and alcohol, for laryngeal suffocation tracheotomy in preference to intubation. Lastly serum, concentrated and pushed if necessary, must be used.

In 1901, Osler, quoting McCallum of Boston recommended the giving of

antitoxin till the characteristic effects as shrinking of the membrane, loss of foetor, diminution of nasal discharge and general improvement were produced even if, to effect this, 70,000 units had to be administered.

Dr Louis Cairns, in the Lancet 1902, judging from 20 cases so treated in the Glasgow Belvidere Hospital, recommended the intra venous 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 Northnagel'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 germs were removed. The general treatment described was the usual stimulating and supporting one. The specific serum had taken the place of the old so called specifics, such as calomel fumigations, though even at this time Jacobi still believed in this treatment for laryngeal cases, pilocarpin, guaiacol, citric acid, tincture of myrrh and chlorine. Regarding indications for serum treatment, Northrup considered, that in mild cases over one year, the bacteriological report might be waited for. In croup, it should be given without delay and so also in clinical cases, in which the Kleb. Loeffler bacillus was 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 neuralgic, arthropathies,

menorrhagia, vomiting, diarrhoea, fever or rashes were apt to follow the introduction even of concentrated horse serum. Skin rashes occured in 25% of cases, about the second to the eighteenth day and were erythematous, urticarial, nuscid 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 sequels. Intubation he 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 grave 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 O'Dwyer's tube, which reached to within an inch of the bifurcation of the trachea and was perfectly correlated 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. Extubation, he advised, should be performed by means of an extractor, by a string or by enucleation 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 extubation. 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 rectum.

In the May number of the Medical Chronicle 1902, Knyvett Gordon of Monsall Hospital expressed his views on the treatment of severe laryngeal diphtheria. Steam he considered useless. To relieve dyspnoea he favoured the high operation

of tracheotomy performed by the plunge method, without an anaesthetic, and during the quiet stage of asphyxia 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 occured, 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." Statements such as these will cause the physician to ponder, whether some of Waxham's emergencies might not have been tided 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 cicatricial stenosis of the larynx, causing death, resulting from this so called simple 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 Knyvett Gordon, of Monsall Hospital, strongly advocated 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 publication.

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 inadvisable 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 wide 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 antiseptics 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 specifics 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 of one doubtful 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 shewn 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. Faucial diphtheria

1. Very mild cases, merely shewing the presence of bacilli and no membrane.
2. Cases of average severity with the presence of membrane.
3. Clinical cases, the Klebs Loeffler bacillus

not being discoverable.
4. Faucial cases of severe type.

B. Faucial and nasal Diphtheria.

C. Laryngeal Diphtheria

1. Faucial and laryngeal cases.
2. Pure laryngeal cases.
3. Clinical laryngeal cases.
4. Faucial 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 respirations, 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 Parke Davis and Co

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 when 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 faucial disease and from the nostrils in nasal cases. The swabs used were of the ordinary variety, firm pledgets 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 a

No 1 Stain

Methyl Blue 1 gramme
Alcohol 96% 20 cc
Dissolve and add 950 cc of distilled water.

nurse, the doctor inserts 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 streak cultures are 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 Neisser's stain is then applied as follows:- Without fixing the film drop on No 1 stain and immediately blot off with

No 2 stain.

Picric Acid 1%

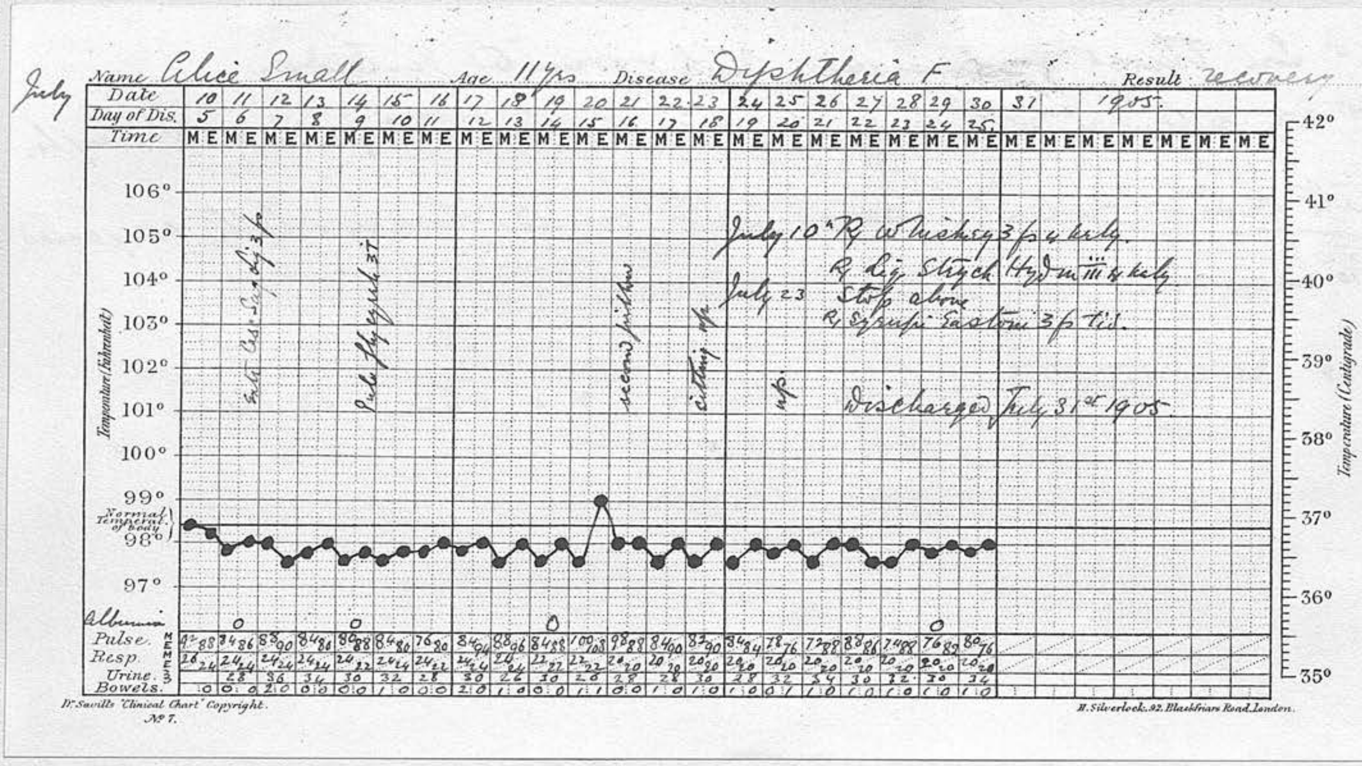
Erythrosine 1%.

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 more 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 fauces or nose. The patient was then and then only, if otherwise well, allowed to leave the hospital.

Case 1.


July
Name Alice Small
Age 11 yrs
Disease Diphtheria F
Result Recovery
1905
July 10th Rx Whiskey ʒ j 4 hrly.
Rx Liq. Strych Hyd m III 4 hrly
July 23 Stop above
Rx Syrup Easton ʒ j t.i.d.
Discharged July 31st 1905
second pillow
up
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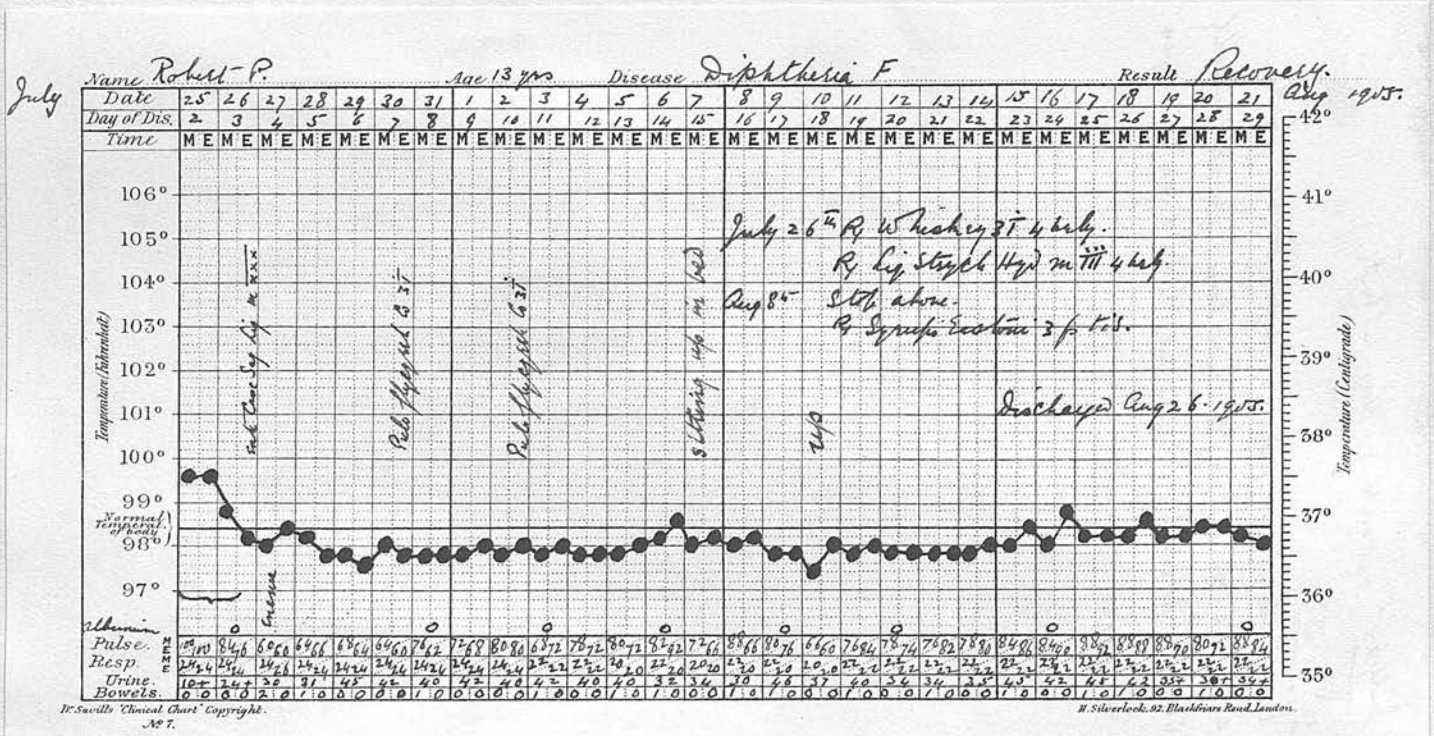
Case 2.


July
Name Robert P.
Age 13 yrs
Disease Diphtheria F
Result Recovery
Aug 1905.
July 26th Rx Whiskey ʒ i 4 hrly.
Rx Liq. Strych Hyd m III 4 hrly.
Aug 8th Stop above.
Rx Syrup Easton ʒ j t.i.d.
Discharged Aug 26. 1905.
sitting up in bed
up
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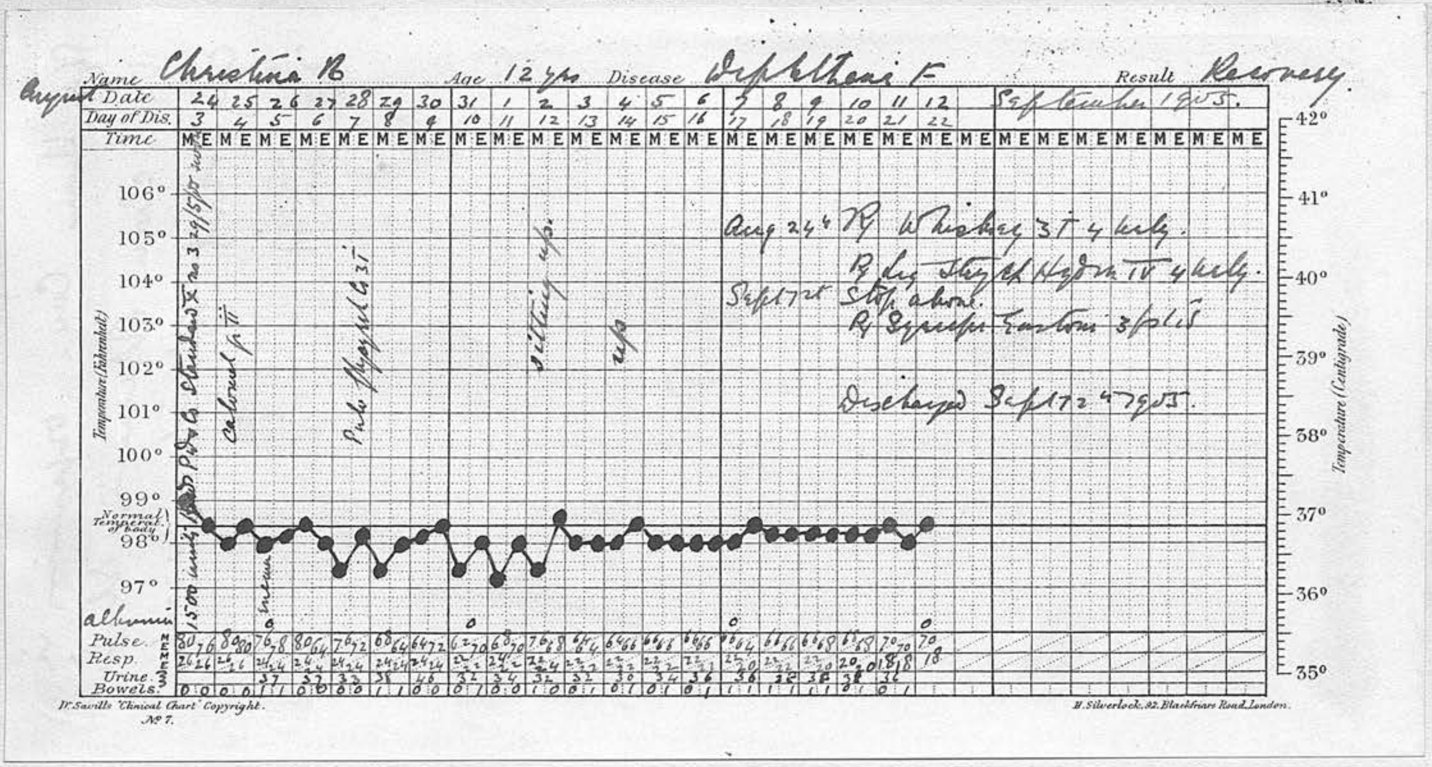
A. 1. Some examples of mild faucial diphtheria without the presence of membrane.

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 fauces 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 24th Felt out of sorts. Has had enteric fever. On admission was slightly ill. No rash. Fauces a little congested especially on left side. No membrane. Tongue moist & furred. A few enlarged glands on each side of neck. Culture from fauces gave a positive result until 21st August when no bacilli could be found. This patient made an uninterrupted recovery.

Case 3


Name Christina B
Age 12 yrs
Disease Diphtheria F
Result Recovery
August Date
Day of Dis.
Time
September 1905.
Aug 24th Rx Whiskey 3T 4 hrly.
Rx Liq Strych Hydr ℳ IV 4 hrly.
Sept 7th Stop above.
Rx Syrup Easton 3 f t.i.d.
Discharged Sept 17th 1905.
calomel gr ii
sitting up
up
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
Pulse.
Resp.
Urine.
Bowels.
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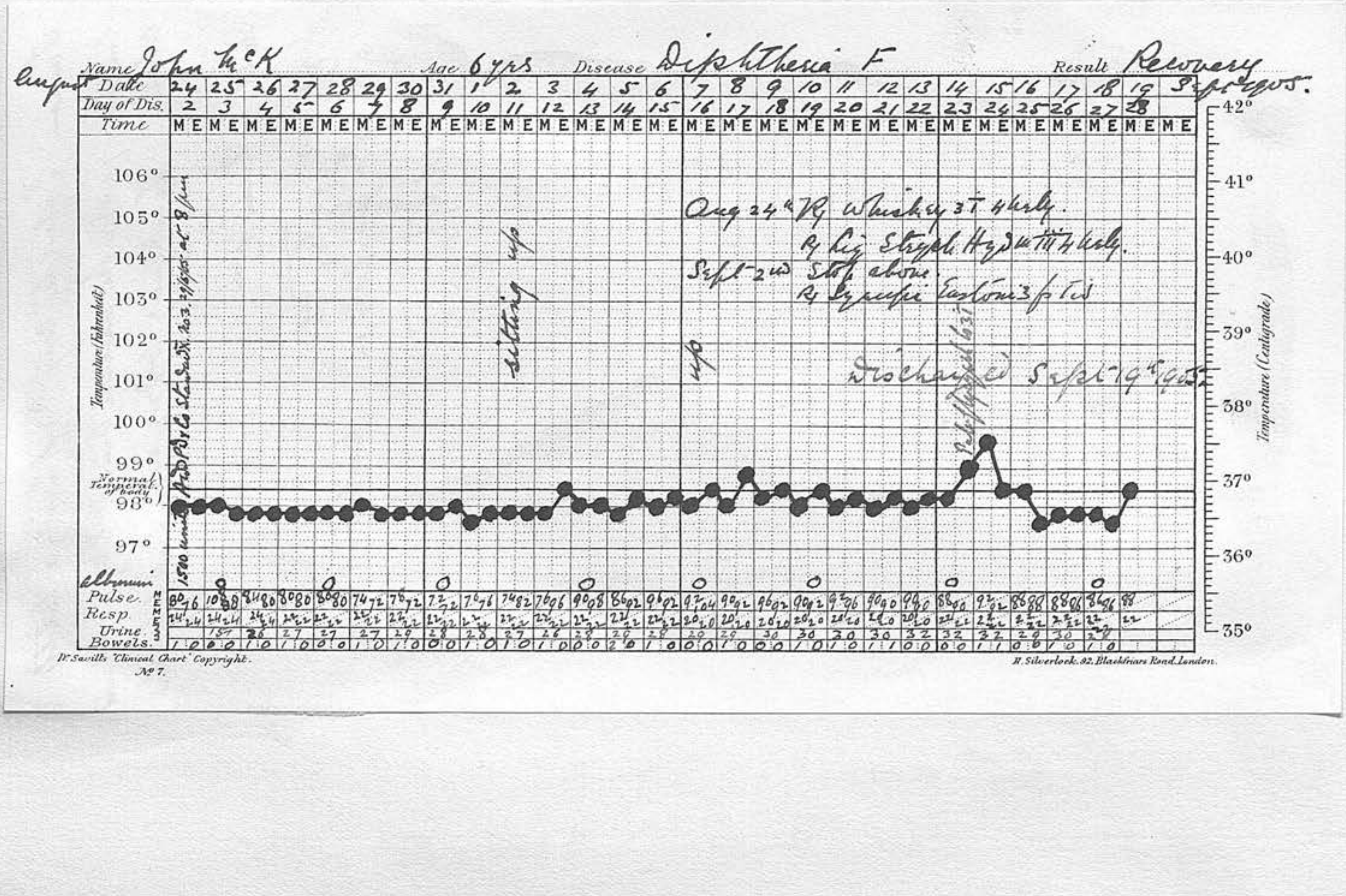
Case 4.


Name John McK
Age 6 yrs
Disease Diphtheria F
Result Recovery
August Date
Day of Dis.
Time
Sept 1905.
Aug 24th Rx Whiskey 3T 4 hrly.
Rx Liq Strych Hydr ℳ III 4 hrly.
Sept 2nd Stop above
Rx Syrup Easton 3 f t.i.d.
Discharged Sept 19th 1905.
sitting up
up
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
Pulse.
Resp.
Urine.
Bowels.
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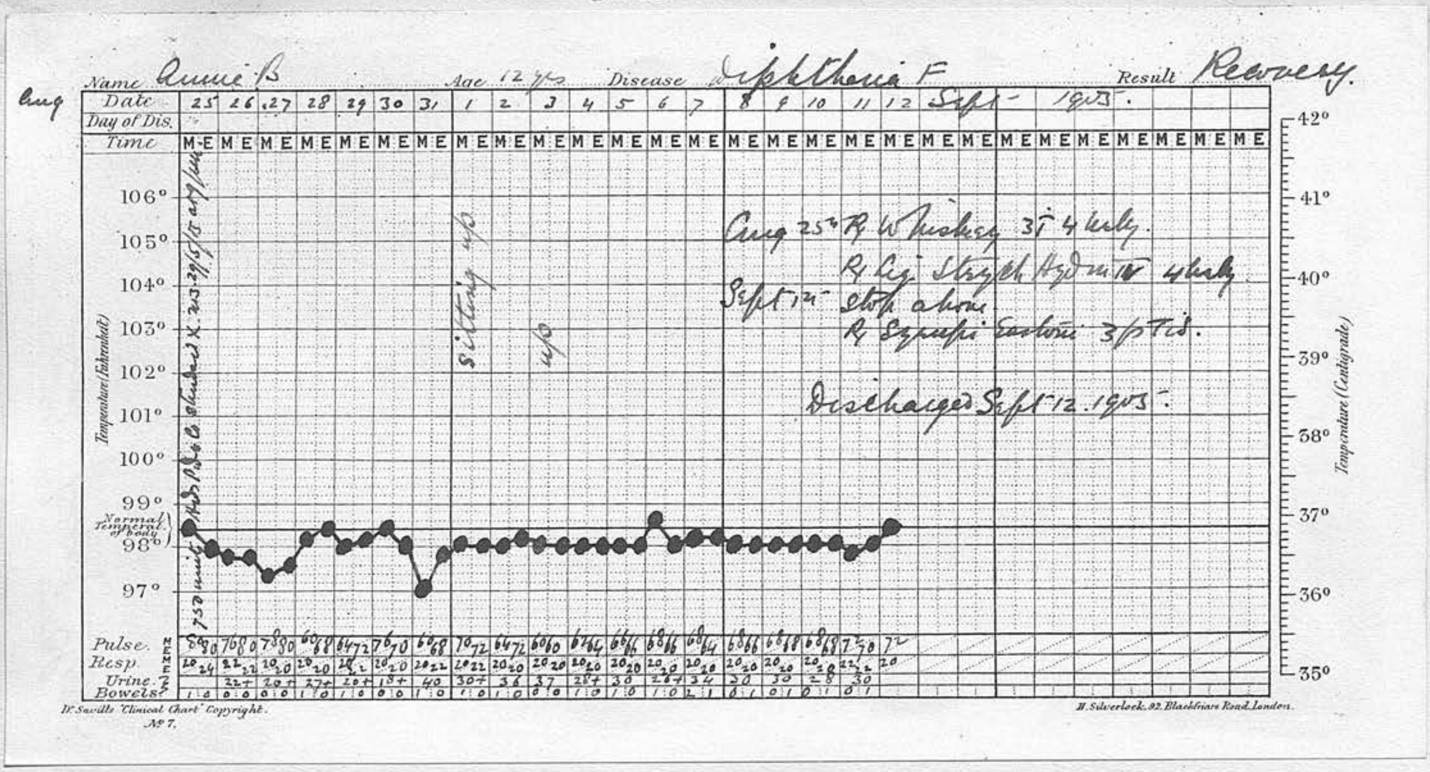
Case 3 Admitted from Craiglockhart Poor House. Had felt a little out of sorts for some days. On admission there was no rash present. There was slight congestion and enlargement of the tonsils, but no membrane was present. Indisposition seemed very slight. A culture from the fauces gave a positive reaction. 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 furred. 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 Annie B
Age 12 yrs
Disease Diphtheria F
Result Recovery
Date
Day of Dis.
Time
Aug 25th R Whiskey 3i 4 hrly.
R Liq. Strych Hyd m iii 4 hrly
Sept 1st Stop above
R Syrupi Easton 3ß t.i.d.
Discharged Sept 12. 1905.
sitting up
up
Pulse.
Resp.
Urine.
Bowels.
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
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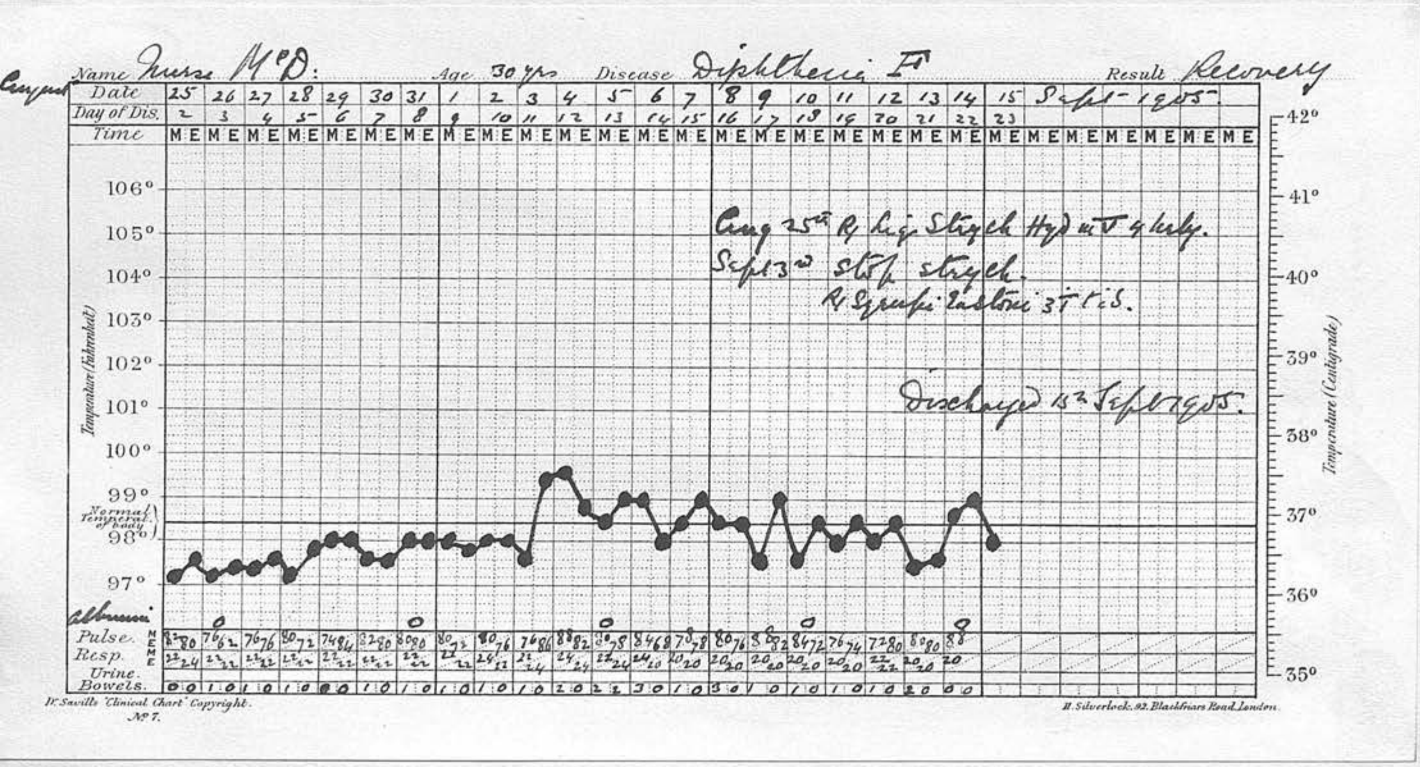
Case 6.


Name Nurse McD:
Age 30 yrs
Disease Diphtheria F
Result Recovery
Date
Day of Dis.
Time
Aug 25th R Liq. Strych Hyd m v 4 hrly.
Sept 3rd Stop strych.
R Syrupi Easton 3i t.i.d.
Discharged 15th Sept 1905.
Albumin
Pulse.
Resp.
Urine.
Bowels.
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
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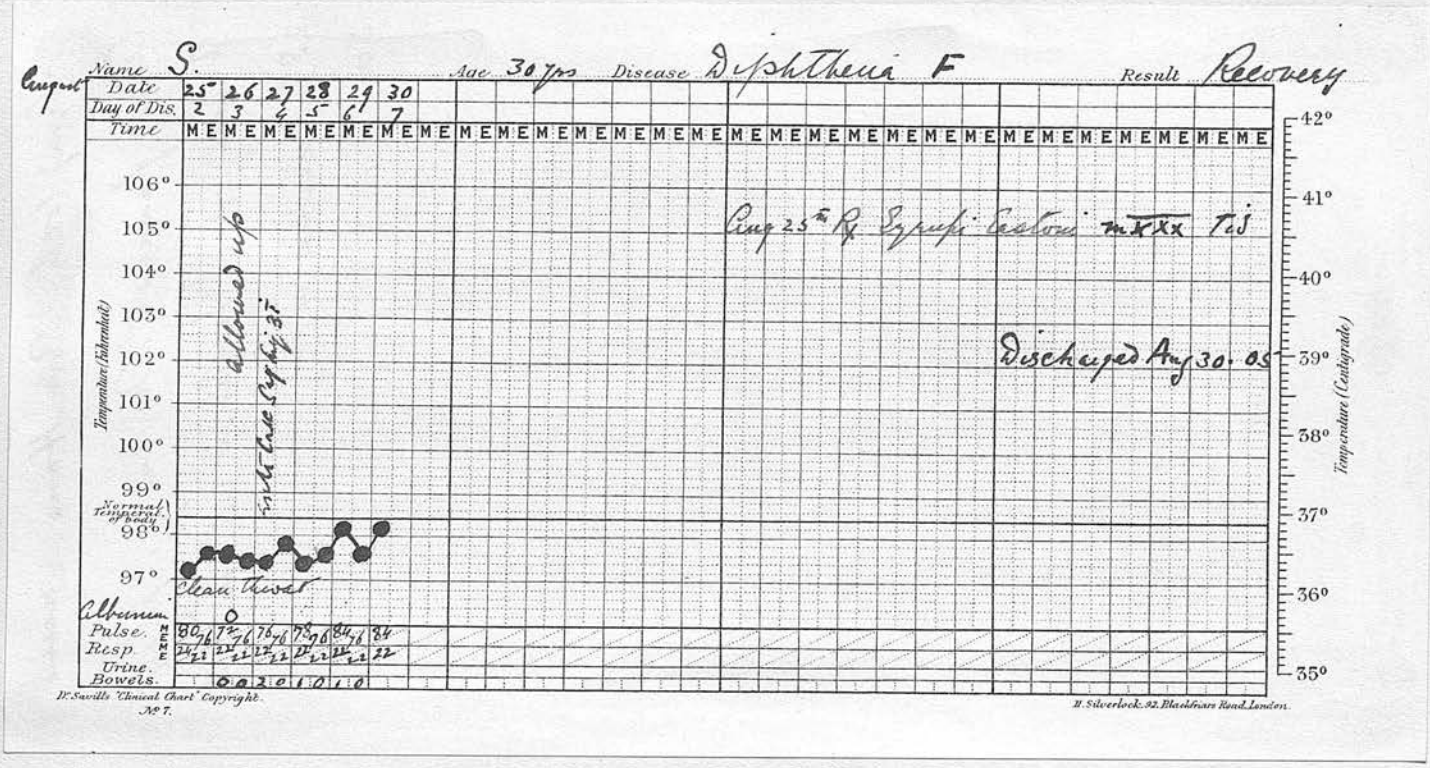
Case 5 Poor house child. Did not seem out of health. Tongue moist and clean. Fauces of healthy appearance. A culture, prepared from the throat, shewed numerous diphtheria bacilli. The day of the disease was not known. She was allowed to sit up on 1st September and left her bed on the 3rd Sept. The bacilli having apparently disappeared from the fauces on 11th 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 result was however obtained from the culture, prepared from the throat. The cultures remained obstinately positive until 13th 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.


August
Name S.
Age 30 yrs
Disease Diphtheria F
Result Recovery
Date 25 26 27 28 29 30
Day of Dis. 2 3 4 5 6 7
Aug 25th Rx Syrup Castor mXXX T.d.
Discharged Aug 30. 05
allowed up
Clean throat
Albumin 0
Pulse.
Resp.
Urine.
Bowels.
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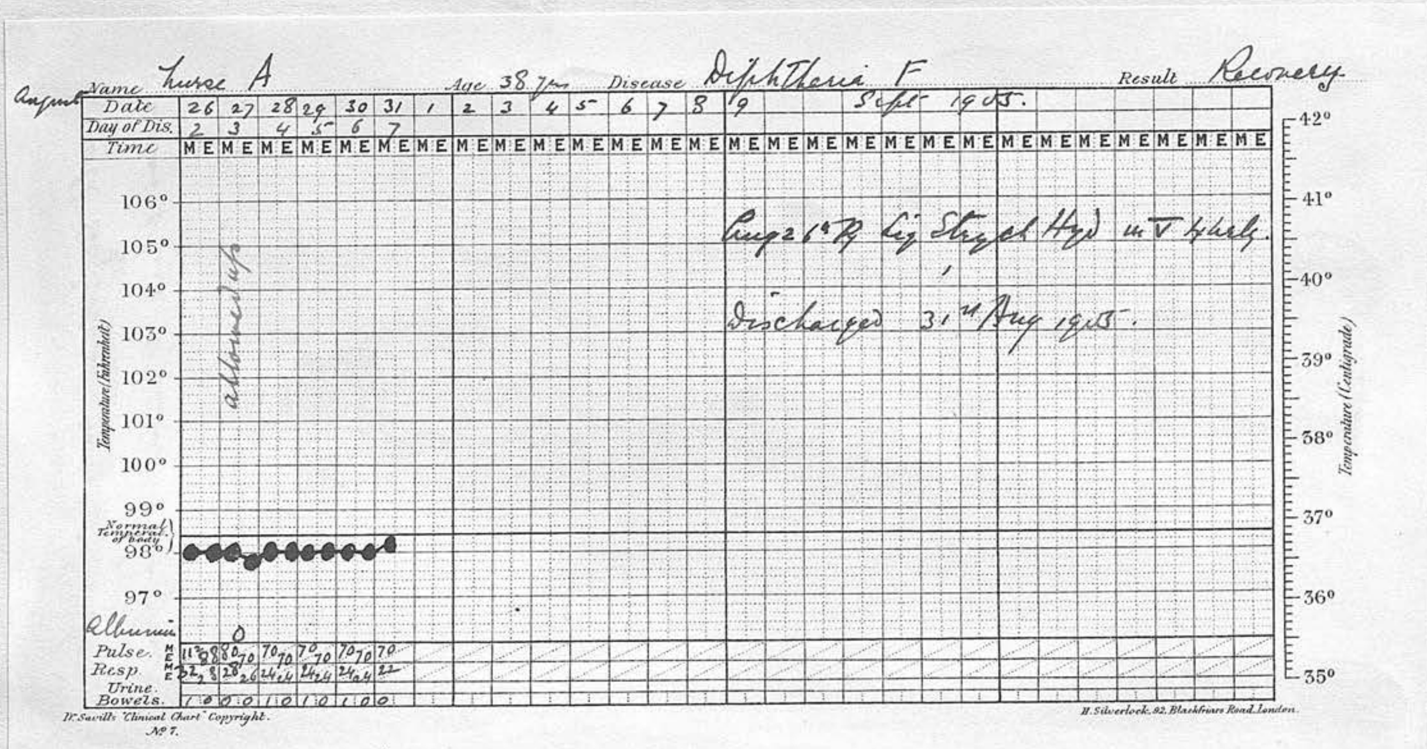
Case 8.


August
Name Nurse A
Age 38 yrs
Disease Diphtheria F
Result Recovery
Date 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9
Sept 1905.
Day of Dis. 2 3 4 5 6 7
Aug 26th Rx Liq Strych Hyd mV 4 hrly.
Discharged 31st Aug 1905.
allowed up
Albumin 0
Pulse.
Resp.
Urine.
Bowels.
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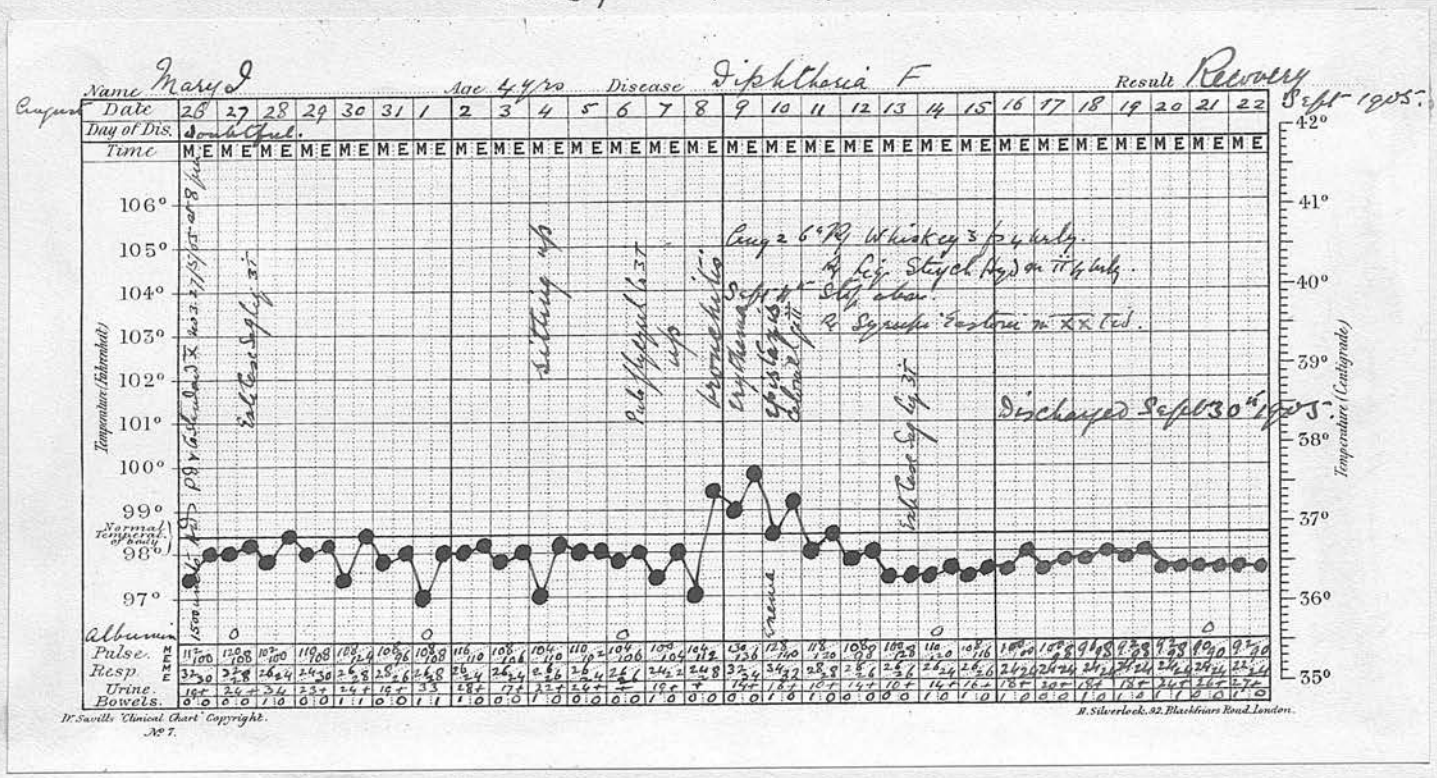
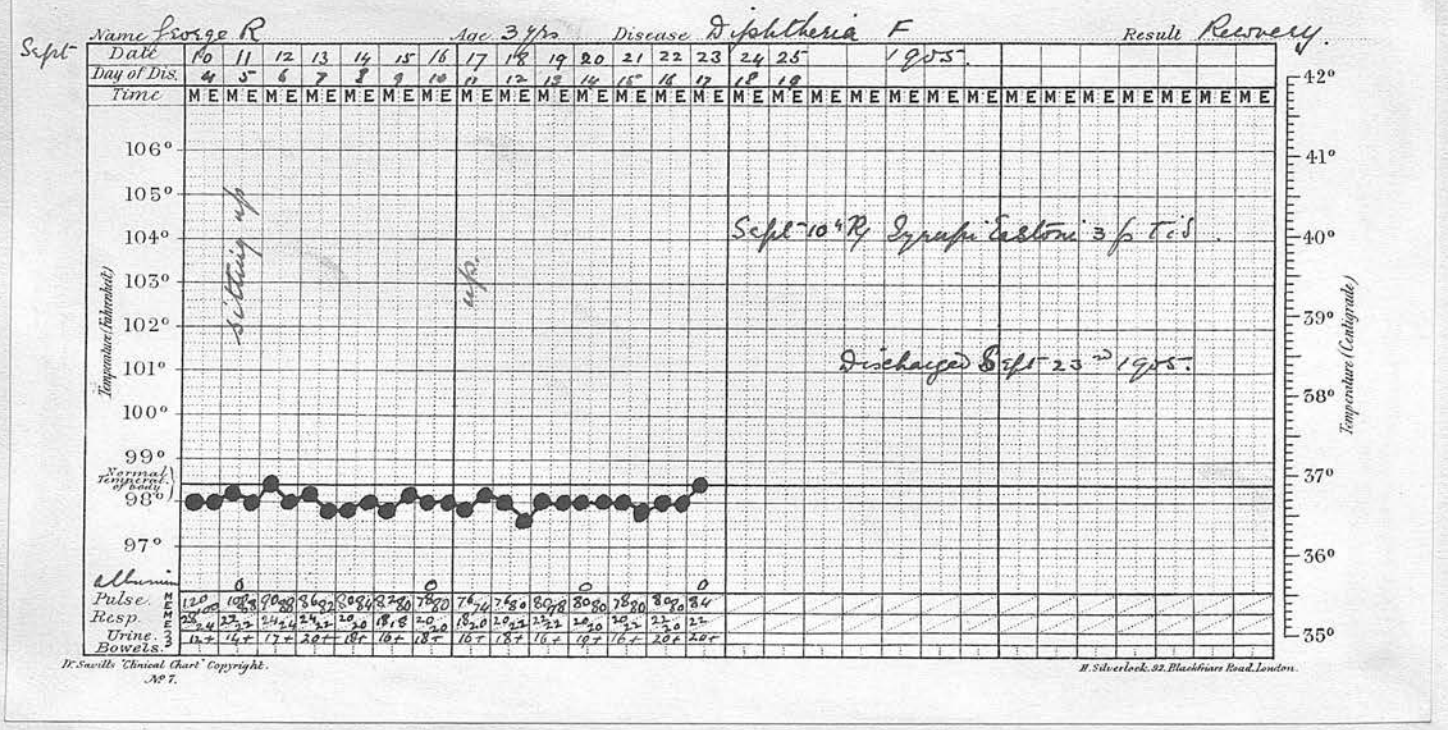
Case 7. A nurse from the poor house. Had been exposed to infection two days before. Appeared quite well; Fauces looked healthy. Numerous diphtheria bacilli were however obtained in the culture, made from the throat. On the 28th & 30th no diphtheria bacilli could be discovered in fauces. She was accordingly 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



Case 10.



Case 9. A poor house child. Fat and flabby looking. Fauces appeared to be healthy, but a culture shewed numerous diphtheria bacilli to be present.
On the 8th Sept appeared to have caught a cold with a little bronchitis. On the 9th the tongue was rather thickly furred and the fauces shewed 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 scarlatinal tongue nor was any desquamation visible. A little epistaxis occured 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.

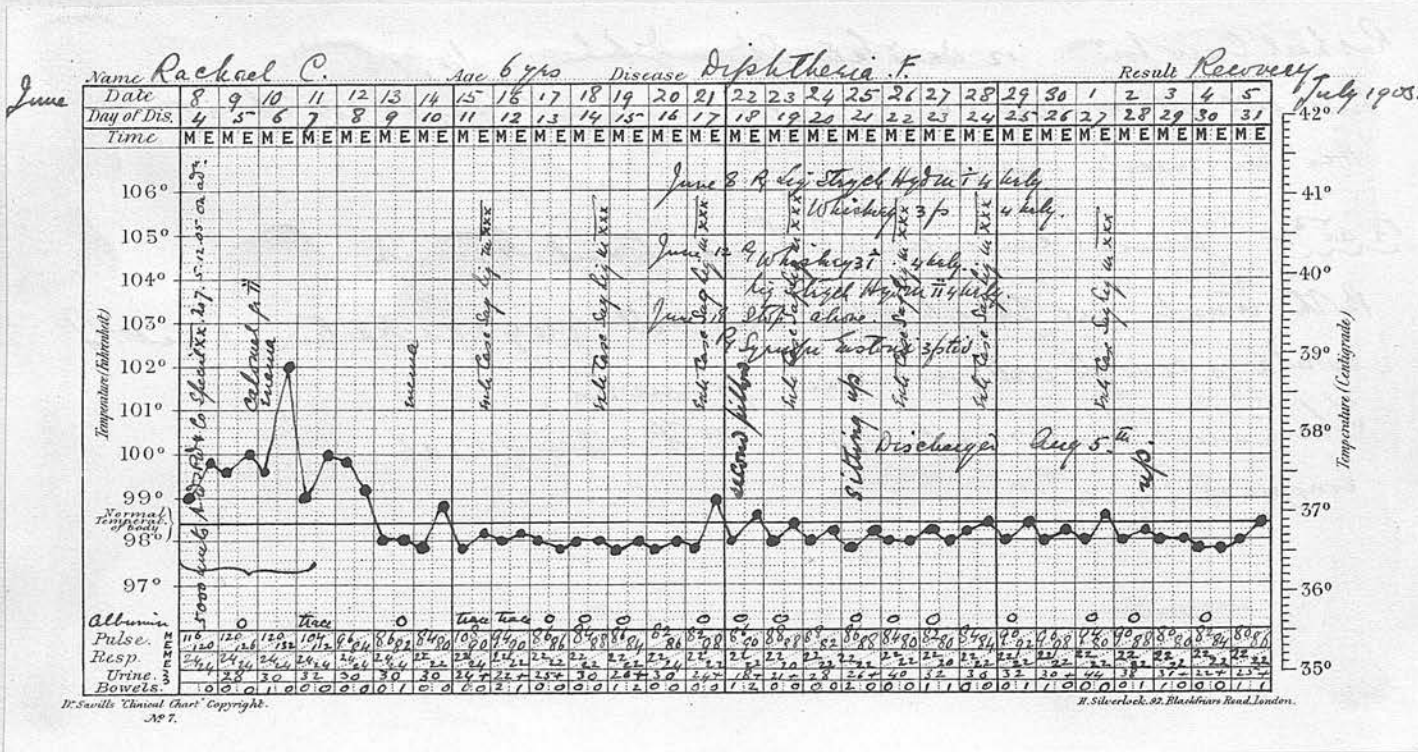
The ten cases above quoted were all treated after the same fashion. Great attention was paid to careful local

treatment, detailed later on, to liberal good diet, to tonics and to fresh air. In most cases the bacilli soon dis-appeared from the fauces, in a few they obstinately remained for two or three weeks. On the whole carbolic 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.

2. The next series of cases contains those faucial diphtheria of average severity and shewing the presence of membrane. 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

Case 1.


Name Rachael C.
Age 6 yrs
Disease Diphtheria F.
Result Recovery
July 1905.
June
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
Albumin
Pulse.
Resp.
Urine.
Bowels.
calomel
enema
sitting up
Discharged Aug 5th
up
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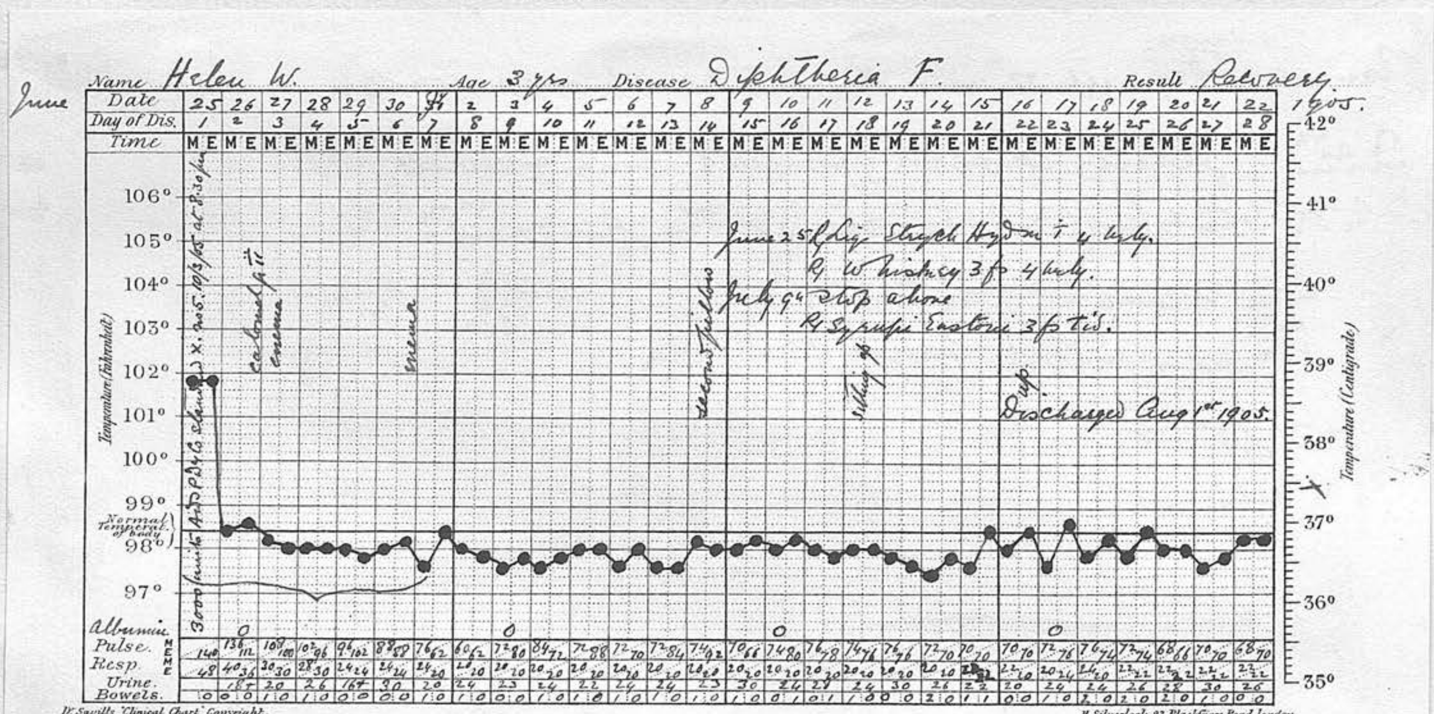
Case 2


Name Helen W.
Age 3 yrs
Disease Diphtheria F.
Result Recovery
1905.
June
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
Albumin
Pulse.
Resp.
Urine.
Bowels.
calomel
enema
sitting up
up
Discharged Aug 1st 1905.
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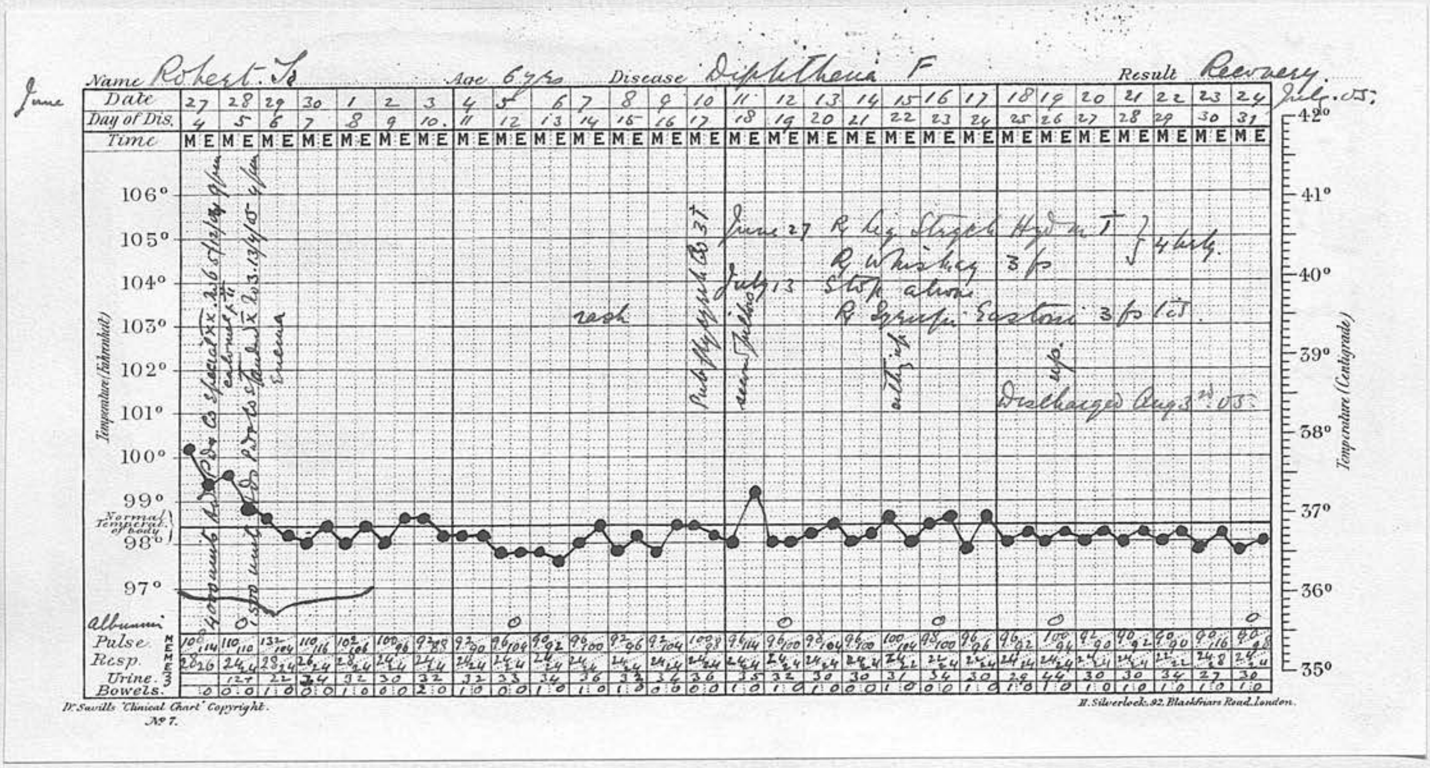
was furred. There was a slight foul smell about the mouth. General congestion of fauces tonsils uvula was present. Both tonsils were thickly covered with grey membrane. Part of the uvula was also similarly coated. Enlarged glands were present, behind the angle of the jaw, on each side. She was freely stimulated and fed. The throat cleared rapidly with one dose of 5000 units of antitoxin. With the exception of an occasional trace of albuminuria during the first 9 days, she made a slow but complete and uneventful recovery.

<u>Case 2.</u> 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 dry ish. Uvula, tonsils & surrounding parts congested. Thin grey membrane covered each tonsil. Numerous diphtheria bacilli present in fauces. 3000 units of antitoxin was given. The membrane entirely disappeared in 6 days. No complications set in. Her recovery was complete.

Case 3



Name Robert. S.
Age 6 yrs
Disease Diphtheria F
Result Recovery
June
July. 05.
Date
Day of Dis.
Time
106°
105°
104°
103°
102°
101°
100°
99°
Normal Temperat. of body
98°
97°
Temperature (Fahrenheit)
42°
41°
40°
39°
38°
37°
36°
35°
Temperature (Centigrade)
June 27 R Liq Stych Hyd m i } 4 hrly
R Whiskey 3 ss
July 13 Stop above
R Syrup Eastoni 3 ss t.d.s.
rash
Discharged Aug 3rd 05.
Albumin
Pulse
Resp.
Urine
Bowels
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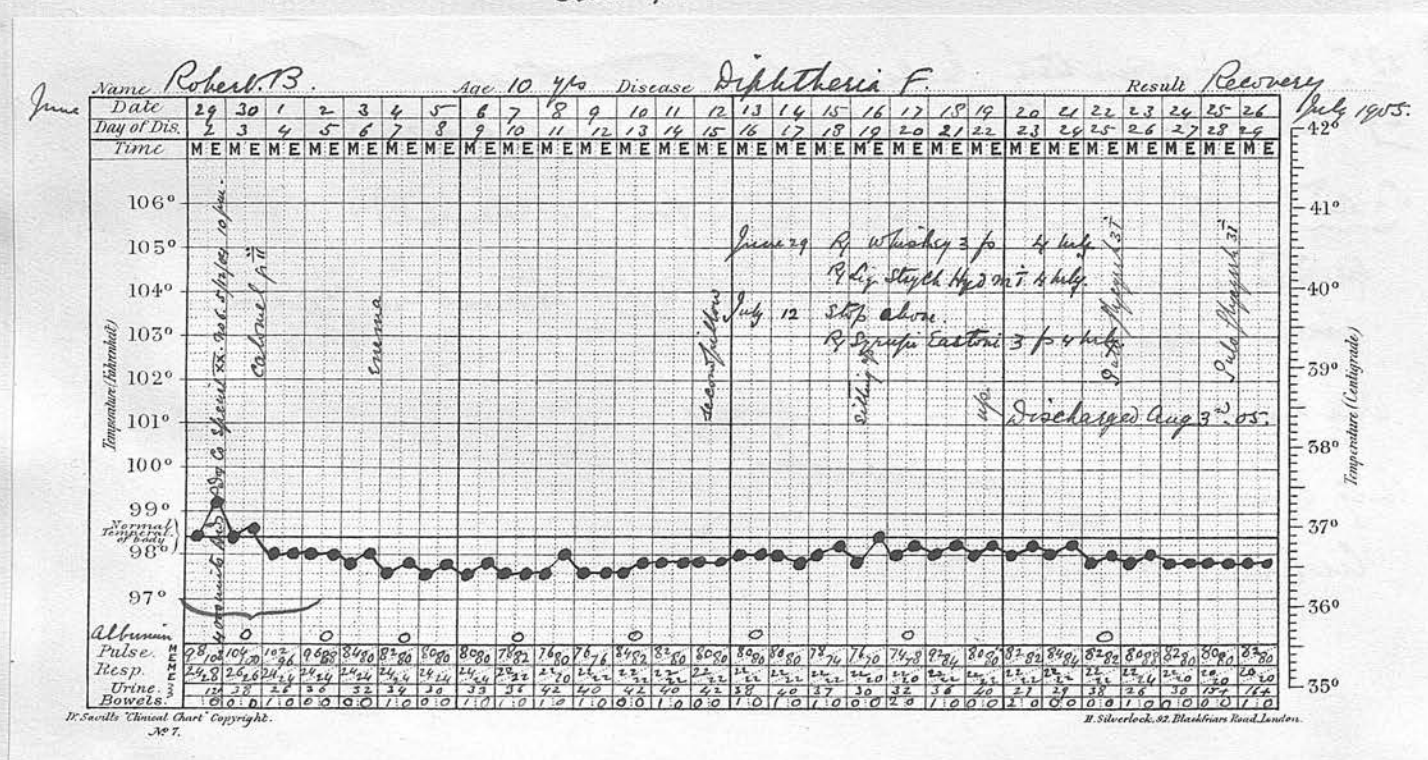
Case 4.



Name Robert. B.
Age 10 yrs
Disease Diphtheria F.
Result Recovery
June
July 1905.
Date
Day of Dis.
Time
106°
105°
104°
103°
102°
101°
100°
99°
Normal Temperat. of body
98°
97°
Temperature (Fahrenheit)
42°
41°
40°
39°
38°
37°
36°
35°
Temperature (Centigrade)
June 29 R Whiskey 3 ss 4 hrly
R Liq Stych Hyd m i 4 hrly
July 12 Stop above
R Syrup Eastoni 3 ss 4 hrly
Calomel
Enema
up
Discharged Aug 3rd 05.
Albumin
Pulse
Resp.
Urine
Bowels
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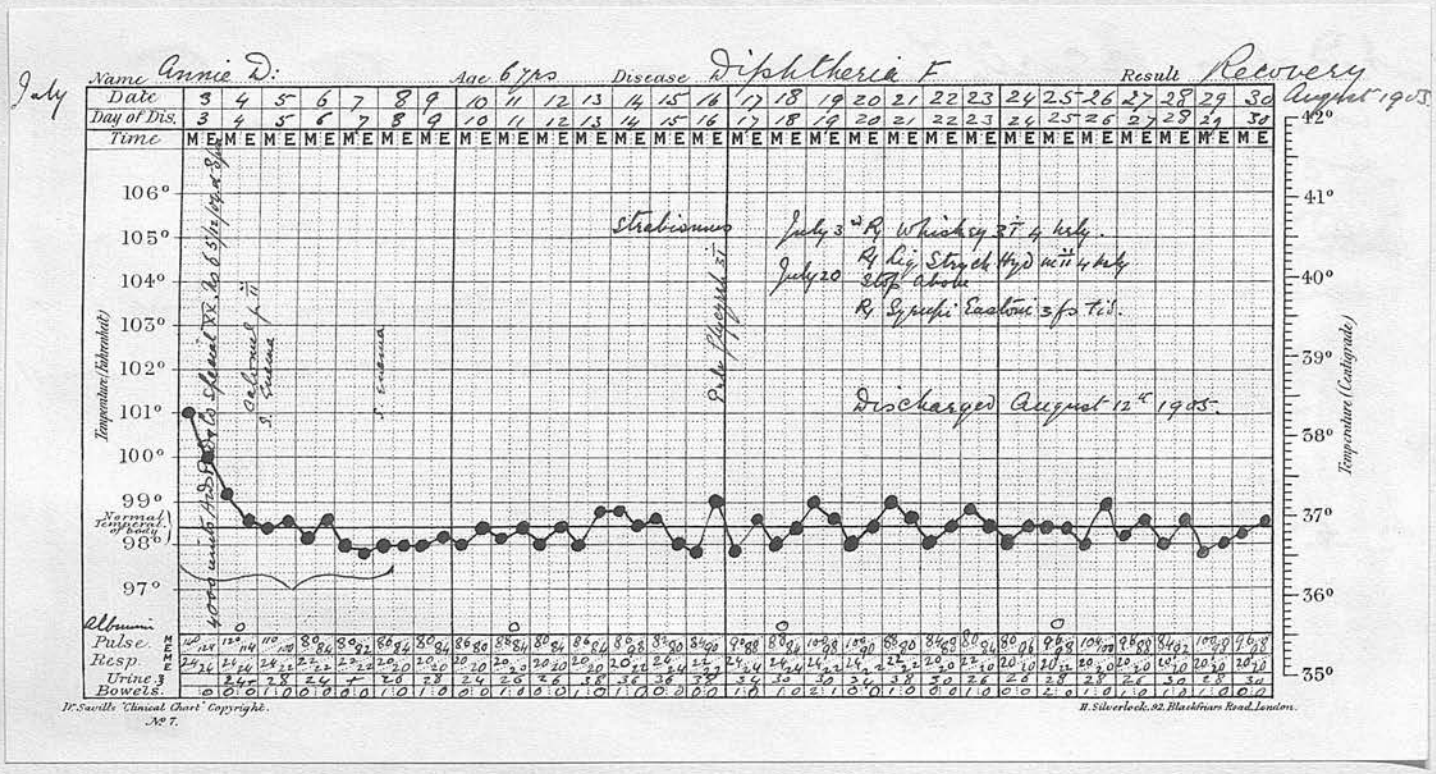
Case 3. On the 23rd June took a cold. On the 24th complained of sore throat. On the 26th the family doctor took a swab from throat. On the 27th, day of admission, a positive reisse was obtained from culture. Looked sharply ill on admission. Tongue dryish + thinly furred. Fauces tonsils and uvula shewed general congestion. There was a moderate amount of membrane on each tonsil. Numerous diphtheria bacilli were present in culture from fauces. 4000 units anti-toxin was given on admission and, the membrane being stationary the next day, a further 1500 was administered. The fauces then cleared rapidly and, with the exception of an erythematous antitoxin rash on 7th July, recovery was uneventful.

Case 4. On 28th June vomiting, headache, sore throat and shivering 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.


July
Name Annie D.
Age 6 yrs
Disease diphtheria F.
Result Recovery
August 1905
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal temperature of body
Albumin
Pulse
Resp.
Urine
Bowels
Strabismus
July 3rd R Whiskey 3ij 4 hrly.
R Liq Strych (Hyd) mx 4 hrly
July 20 Stop above
R Syrupi Easton 3ss t.i.d.
Discharged August 12th 1905.
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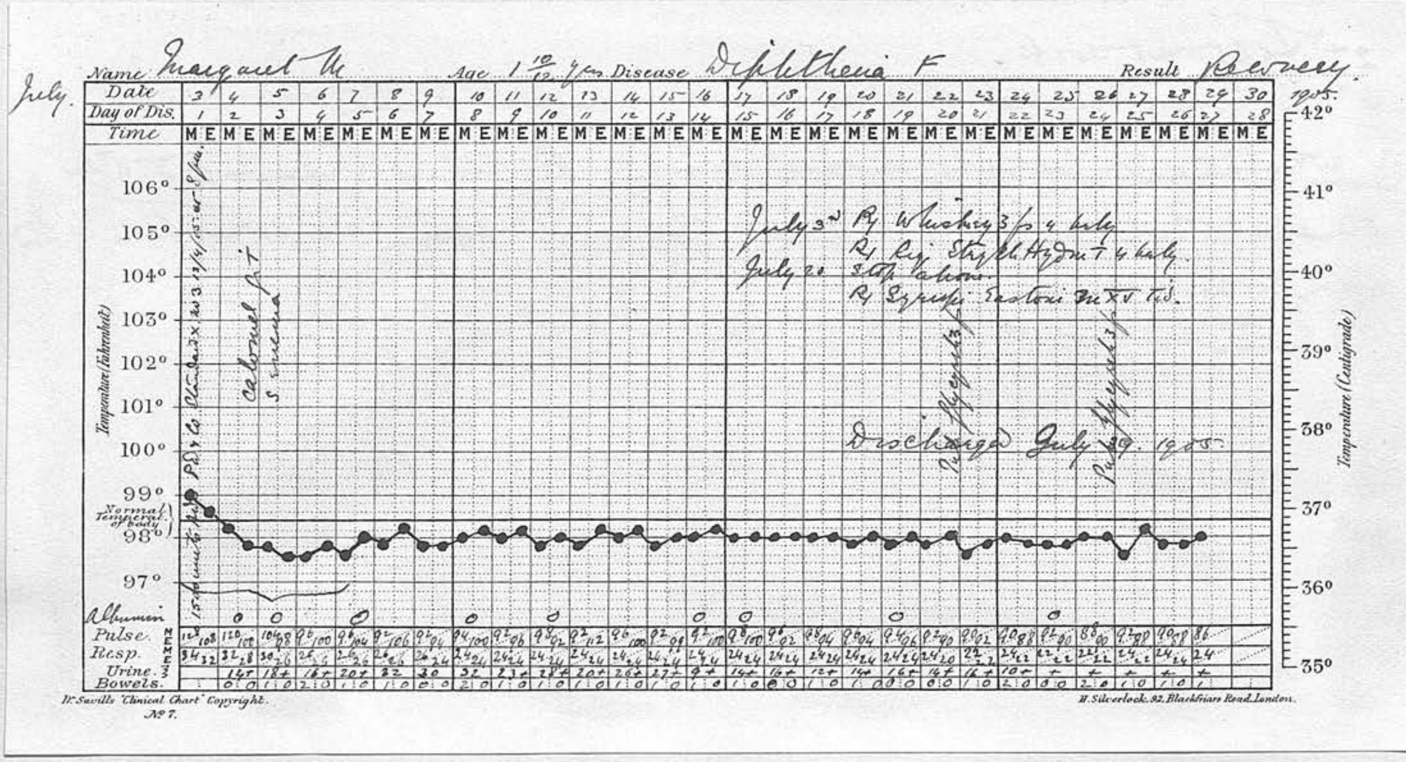
diphtheria bacilli. On 20th July slight weakness of left leg was noticed. This quite disappeared by 2nd August. Otherwise convalescence was uneventful.

Case 5. On 1st July complained of headache and sore throat. On admission looked sharply ill. Tongue dryish 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. Uvula clear. Numerous diphtheria bacilli in fauces. The fauces cleaned in 5 days after 4000 units of antitoxin. Slight right internal strab-ismus 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

Case 6.


July.
Name Margaret M.
Age 1 10/12 yrs
Disease Diphtheria F
Result Recovery
1905.
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
Albumin
Pulse.
Resp.
Urine.
Bowels.
July 3rd Rx Whiskey 3ss 4 hrly
Rx Liq Strych Hyd m i 4 hrly
July 20 Stop above
Rx Syrupi Eastoni m xv t.d.
Calomel gr i
S enema
Discharged July 29. 1905.
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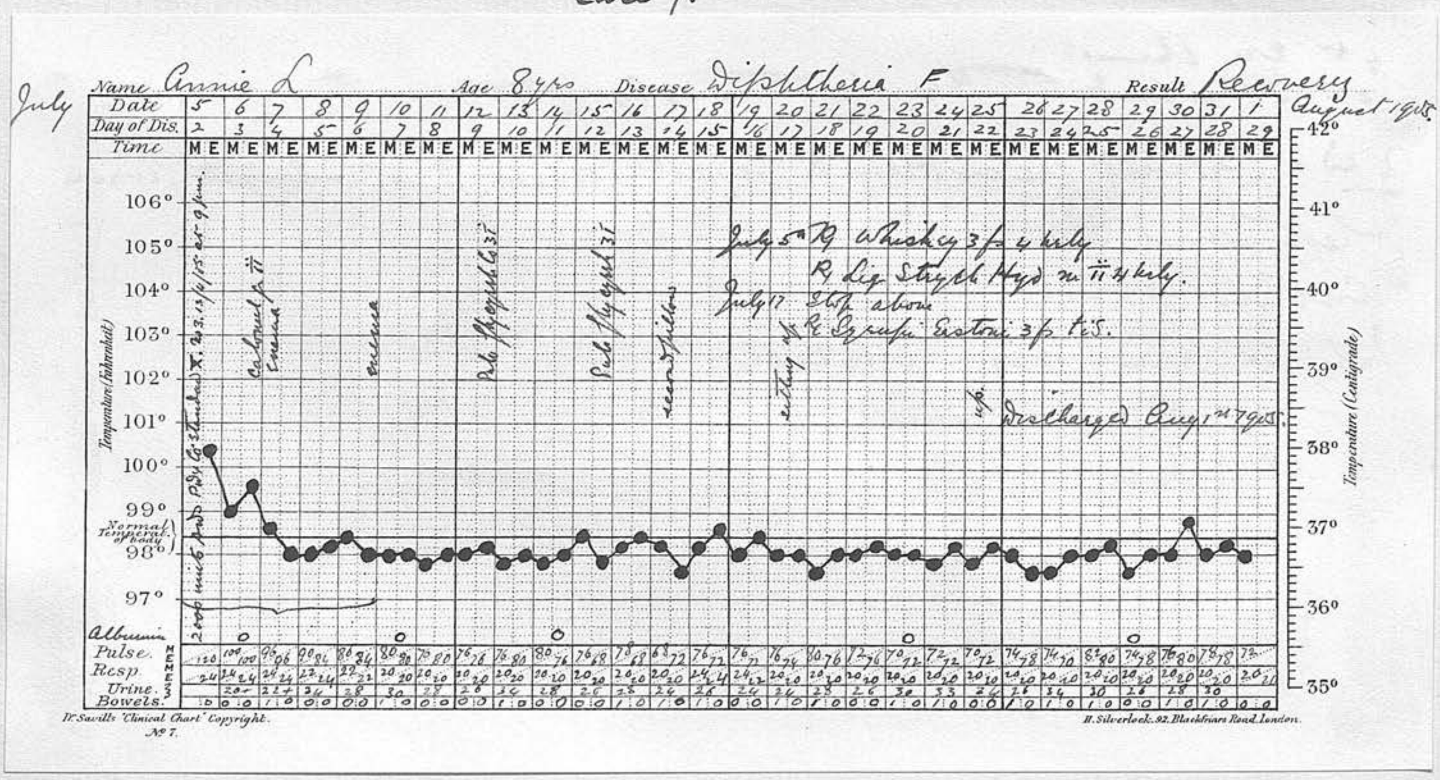
Case 7.


July
Name Annie L
Age 8 yrs
Disease Diphtheria F
Result Recovery
August 1905.
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
Albumin
Pulse.
Resp.
Urine.
Bowels.
July 5th Rx Whiskey 3ss 4 hrly
Rx Liq Strych Hyd m ii 4 hrly.
July 17 Stop above
Rx Syrupi Eastoni 3ss t.i.d.
Calomel gr ii
Enema
Enema
second pillow
sitting
up.
Discharged Aug 1st 1905.
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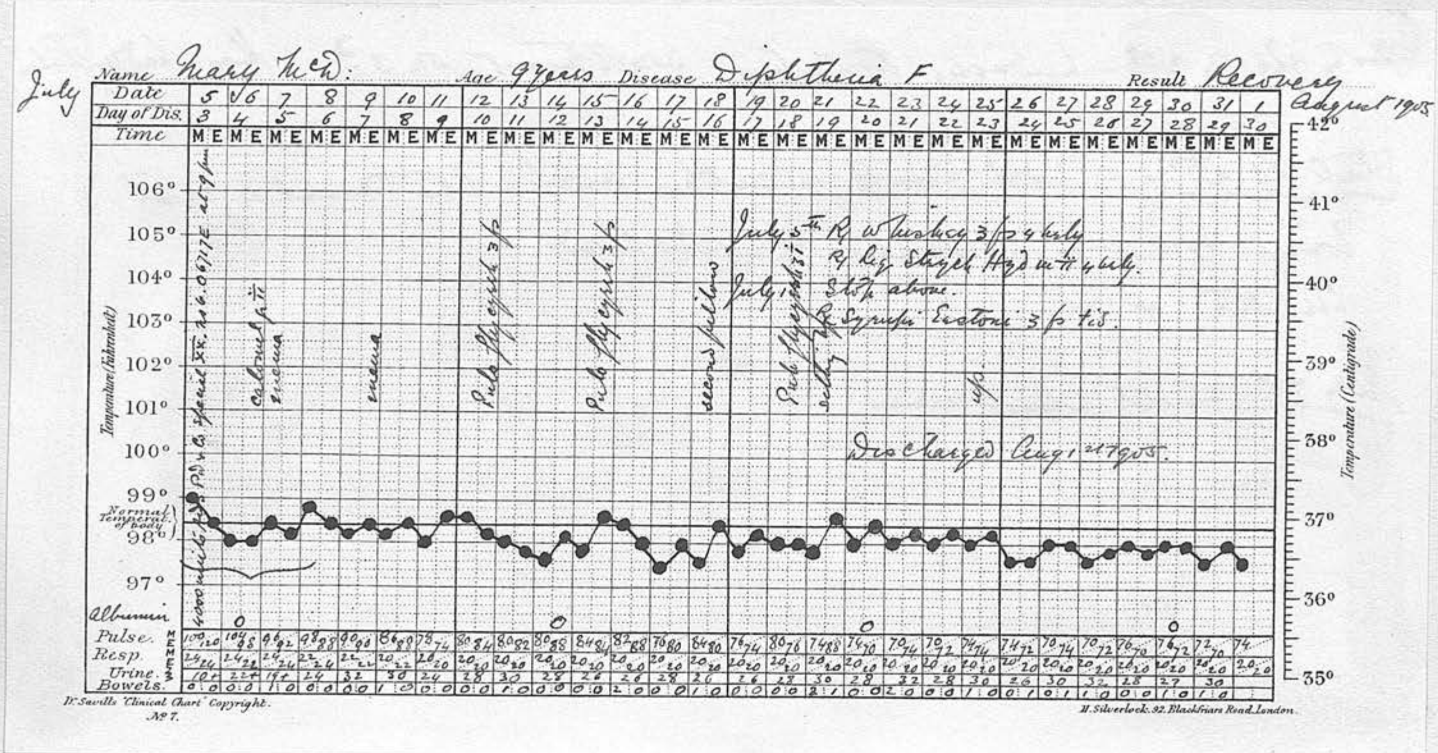
patch upon right tonsil. Uvula clear. Slight congestion of fauces. Numerous diphtheria bacilli discovered in fauces. Fauces rapidly cleaned after 1500 units antitoxin and recovery was rapid. No complications.

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. 2000 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 diphtheritic membrane was present on each tonsil and on the base of the uvula. Diphtheria bacilli were present. 4000 units antitoxin was given soon after admission. The

Case 8.


Name Mary McD.
Age 9 years
Disease Diphtheria F.
Result Recovery
July
August 1905
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
Albumin
Pulse.
Resp.
Urine.
Bowels.
July 5th R Whiskey 3 ss 4 hrly
R Liq. Strych Hyd m ii 4 hrly.
July 14th Stop above.
R Syrupi Eastoni 3 ss t.i.d.
Discharged Aug 1st 1905.
second pillow
up
enema
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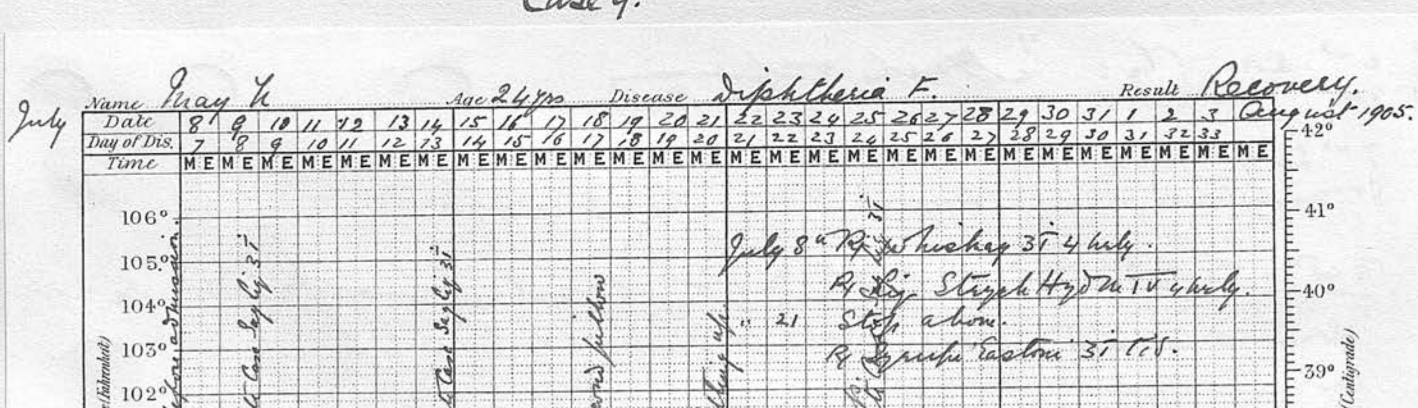
Case 9.


Name May K.
Age 24 yrs
Disease Diphtheria F.
Result Recovery.
July
August 1905.
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
Albumin
Pulse.
Resp.
Urine.
Bowels.
July 8th R Whiskey 3 i 4 hrly.
R Liq. Strych Hyd m iv 4 hrly.
" 21 Stop above.
R Syrupi Eastoni 3 i t.i.d.
Discharged Aug 2nd 05.
second pillow
sitting up
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No 7.
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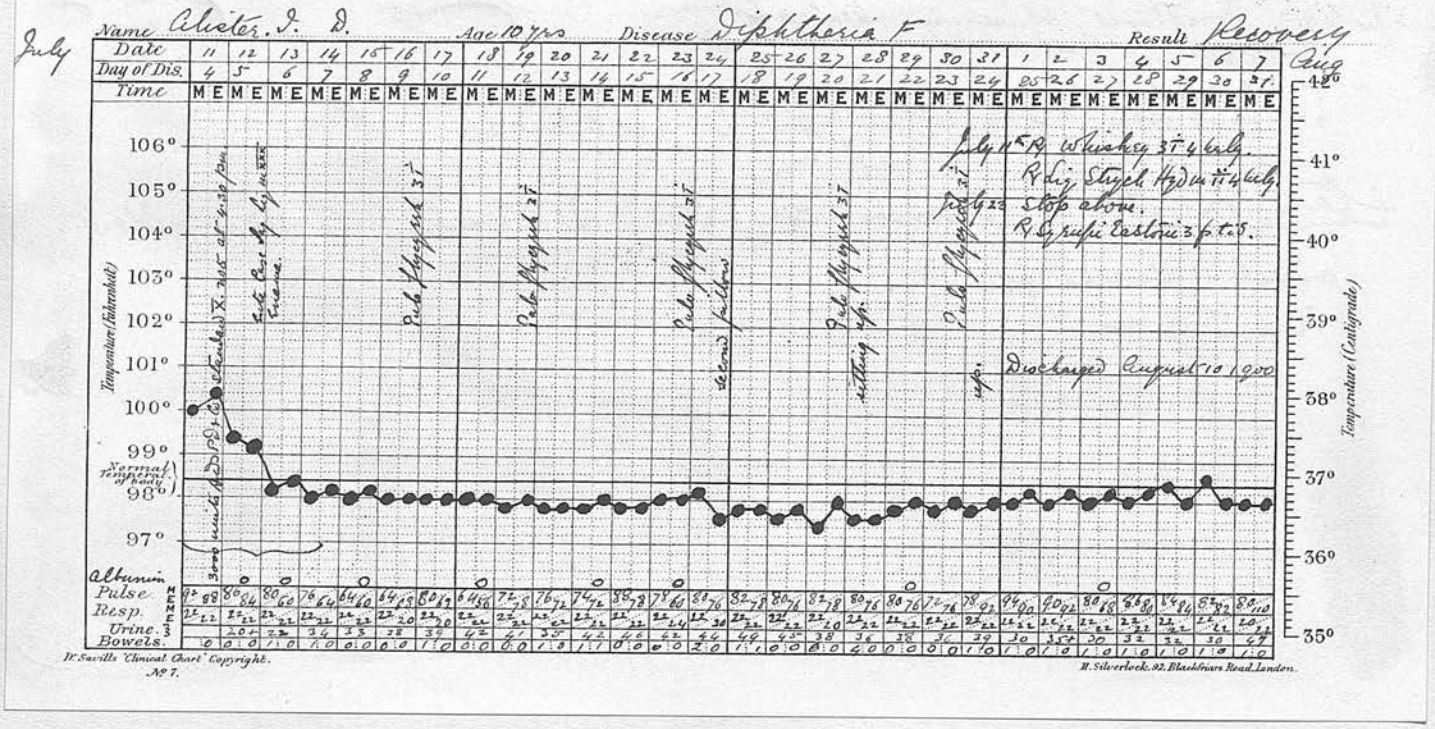
fauces cleaned rapidly under this dose and her ultimate recovery was excellent and uncomplicated.

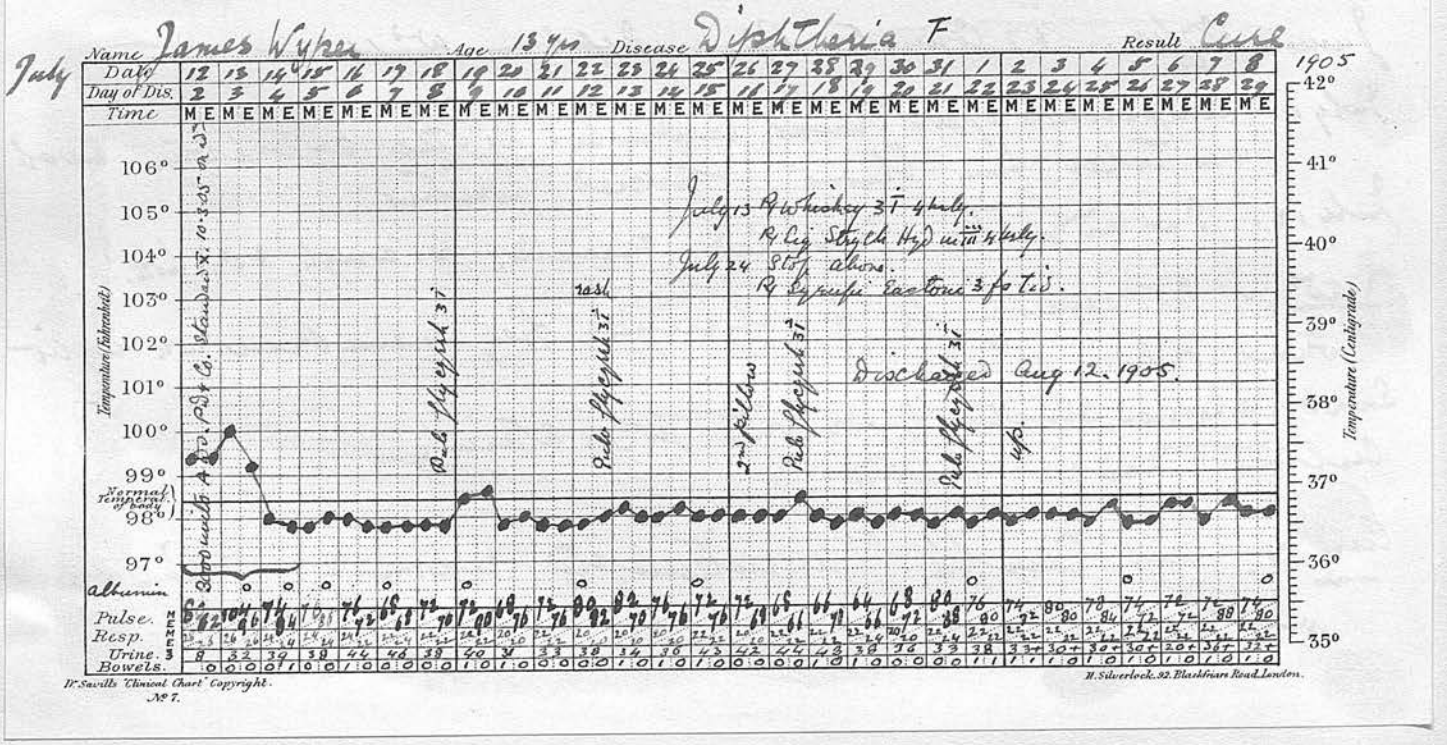
Case 9. 2nd July complained of sore throat, headache and shivering. On 3rd she took to her bed. On the 7th a swab was taken from the throat, found positive. On the 8th 2000 units antitoxin was administered and she was admitted soon after. She felt weak. Typical membrane was present upon the right tonsil 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 vomited. 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.



Case 11.

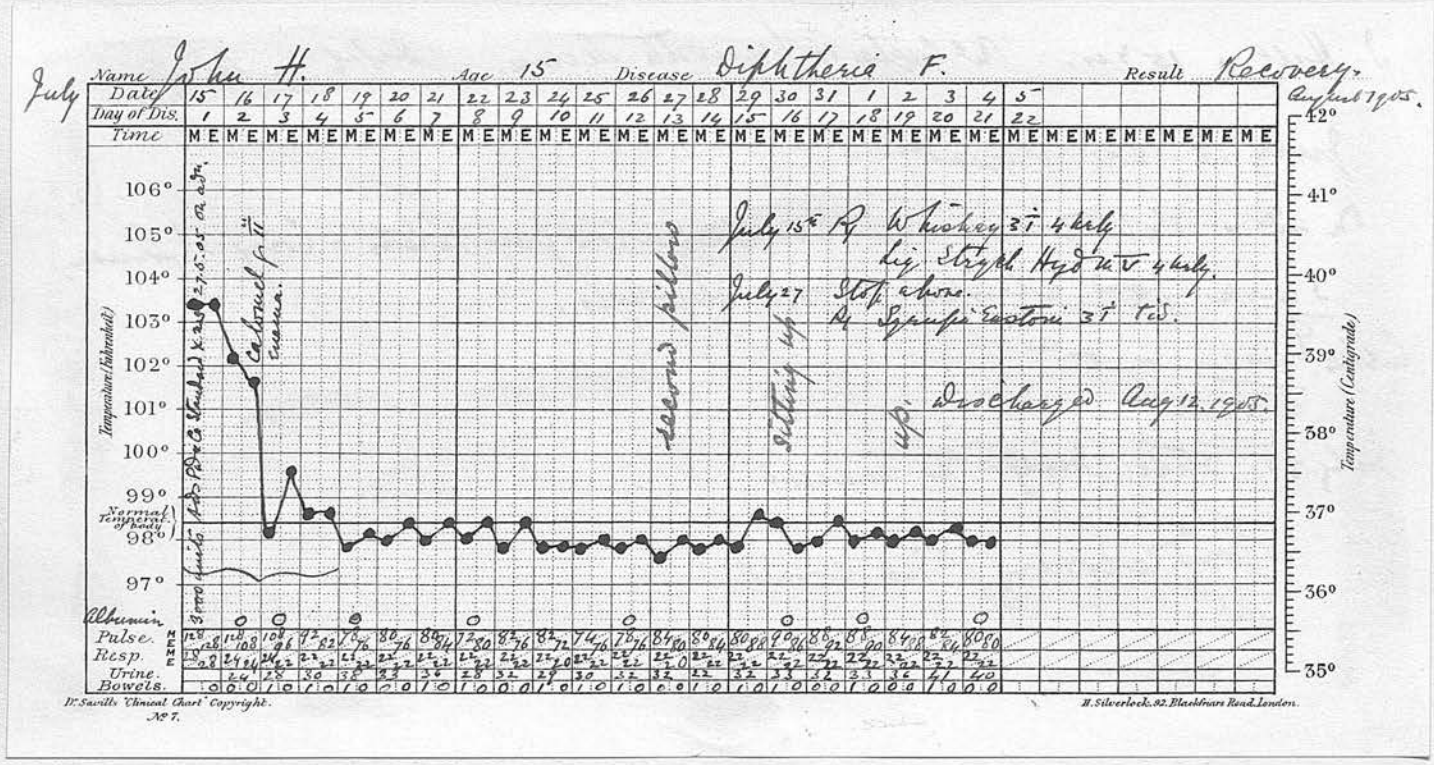


enlarged and covered with yellow membrane. Uvula & left tonsil clean. Numerous diphtheria bacilli present. 3000 units of antitoxin was given and the tonsil rapidly cleaned. Recovery was complete and excellent in every respect.

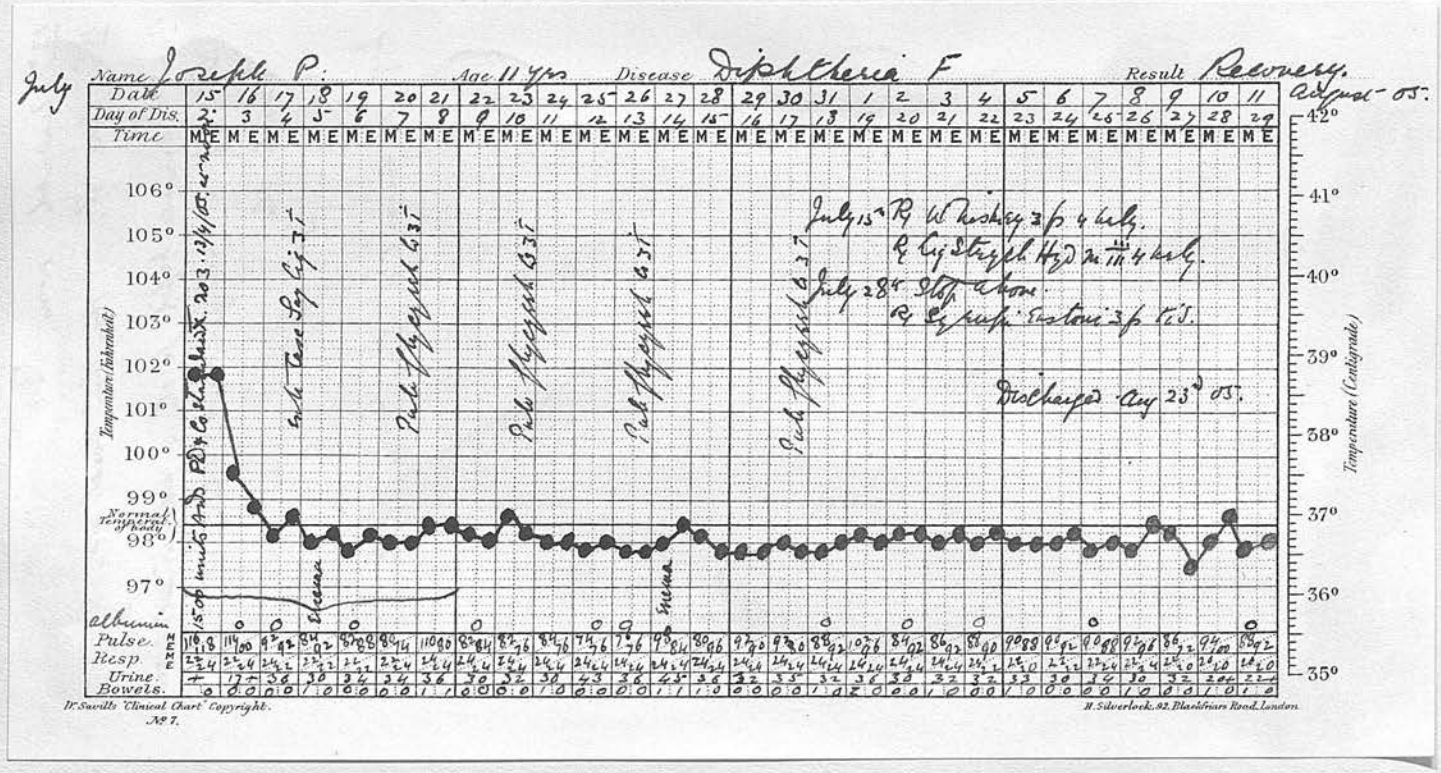
Case 11. July 11th complained of sore throat and head ache. A swab was taken from throat and proved positive. July 12th admitted seemingly not severely ill. Grey membrane was present on the right tonsil alone. Numerous diphtheria bacilli present. 3000 units antitoxin was administered and the tonsil soon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

Case 12. July 15th, day of admission, complained of sore throat & shivering. On admission was markedly feverish. Both tonsils congested and upon each were several coalescing grey yellow patches

Case 12.



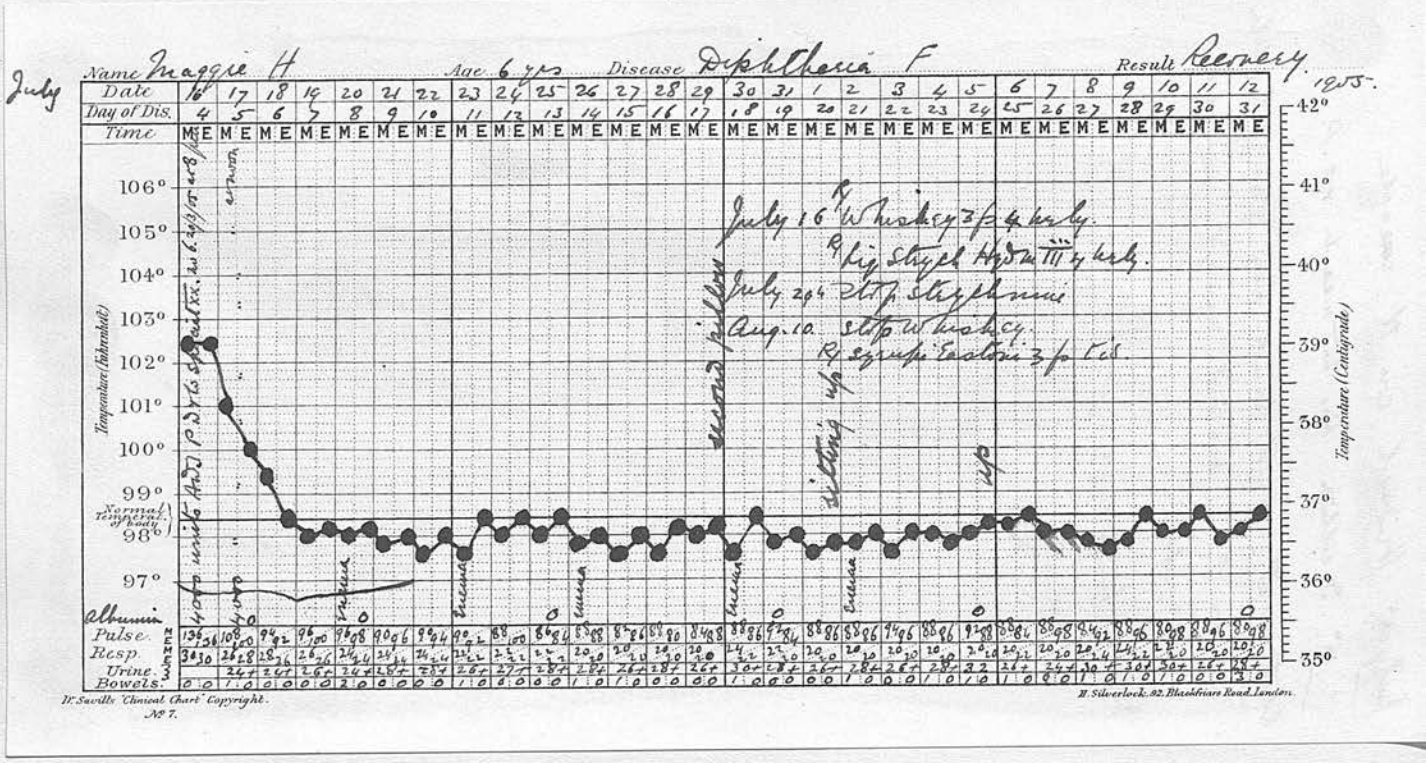
Case 13.



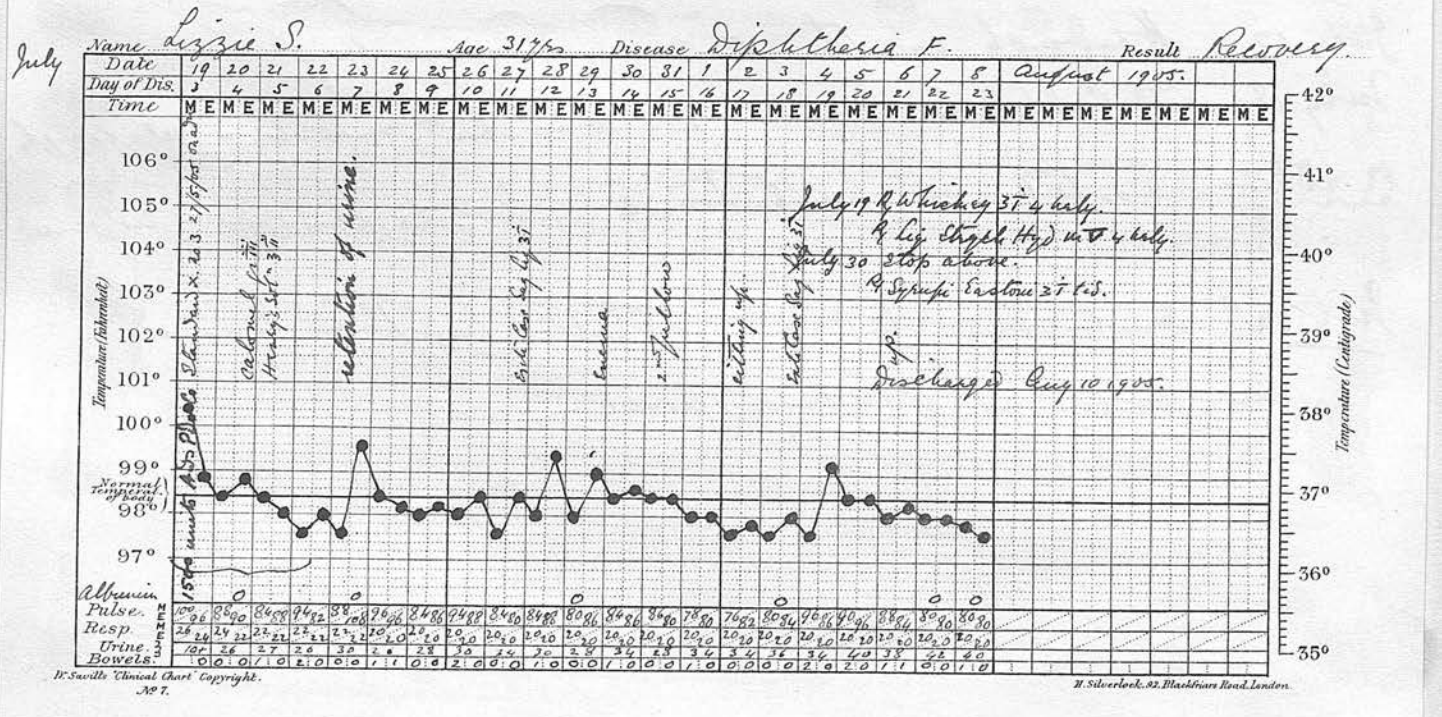
of membrane. Numerous diphtheria bacilli were present. 3000 units antitoxin was given on admission. Recovery was rapid and excellent.

Case 13. On 13th July headache and vomiting present. On 15th or day of admission sore throat began. Small diphtheritic patches of membrane were present upon each tonsil. Uvula 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 uvula, 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 large dose of antitoxin been given on admission. However recovery was complete.

Case 14.



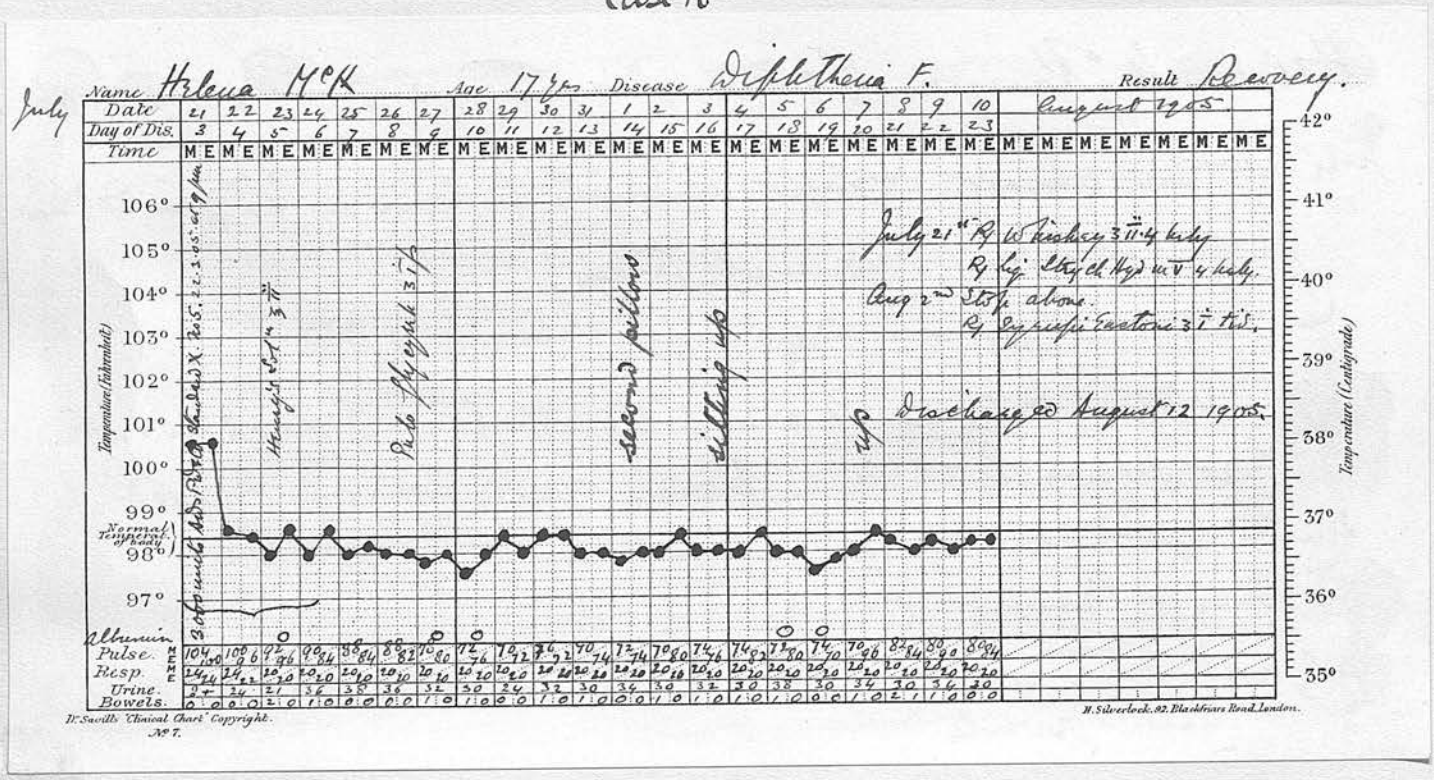
Case 15.



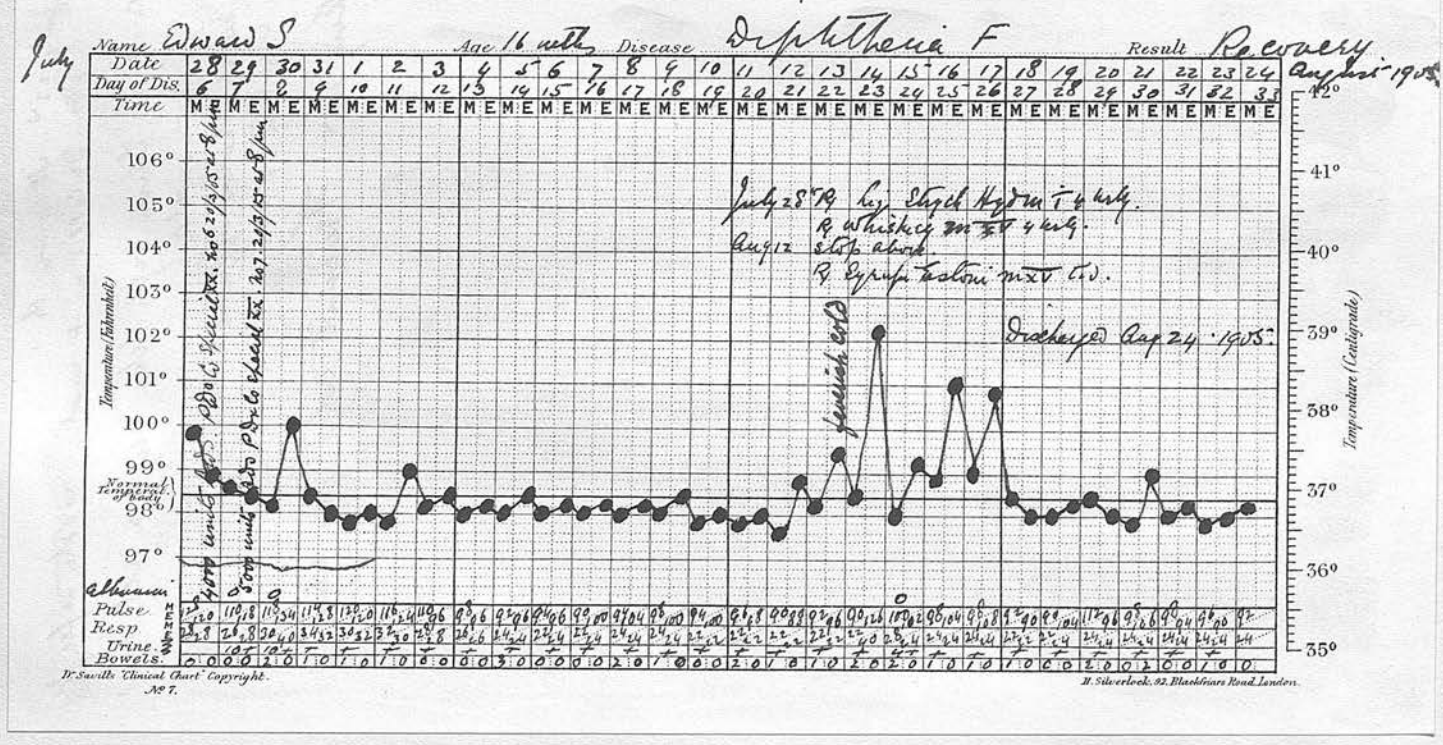
Case 14. On July 13th complained of sore throat headache and earache. July 14th was feverish and no better. On 15th a doctor was called in. On 16th was admitted ill & feverish. No rash. Each tonsil, but especially the right, has grey yellow patches of membrane upon it. Uvula clear. Numerous diphtheria bacilli present. 4000 units of antitoxin was given upon admission. A further 4000 units had to be given next morning, as the membrane shewed 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. Uvula free. Tongue dirty. 1500 units antitoxin rapidly cleaned tonsils. Proved a very neurotic patient. Her recovery was rapid and complete.

Case 16



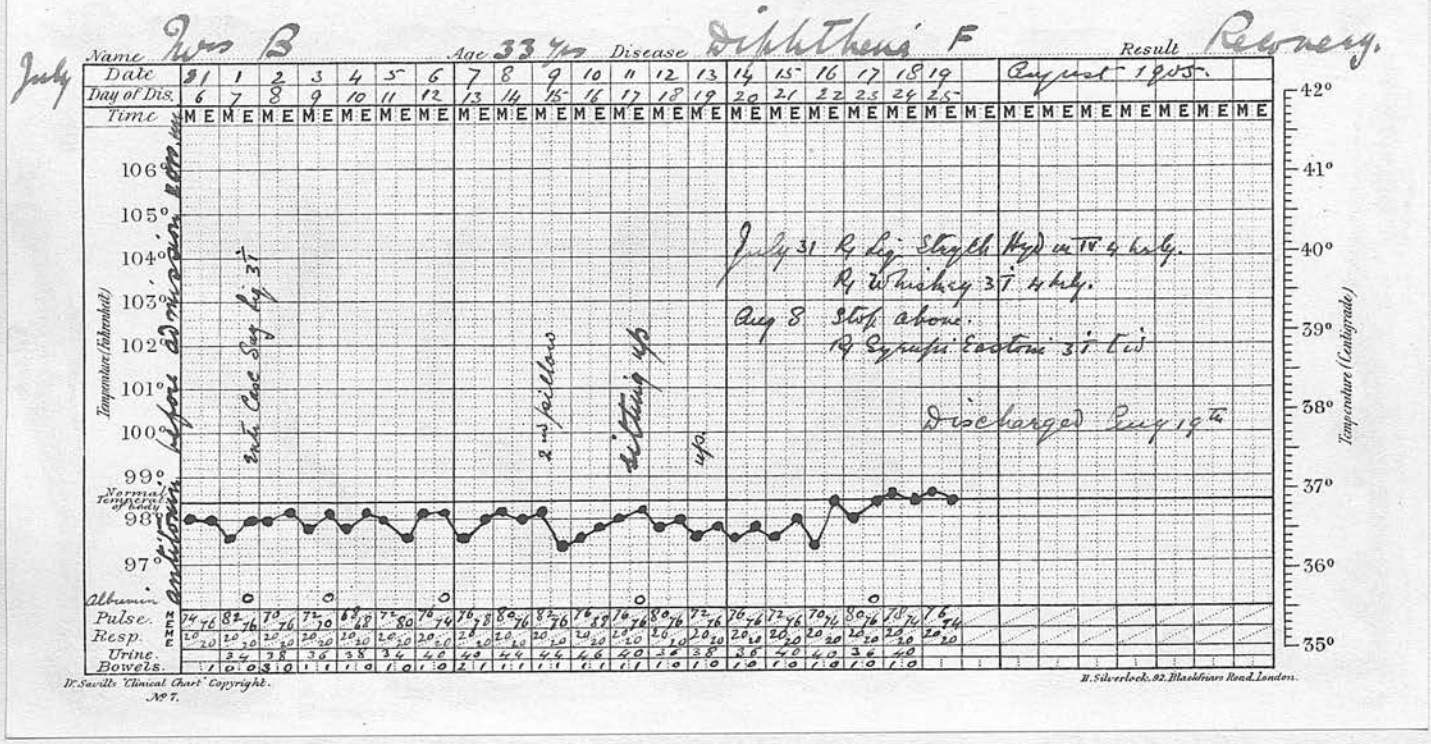
Case 17.



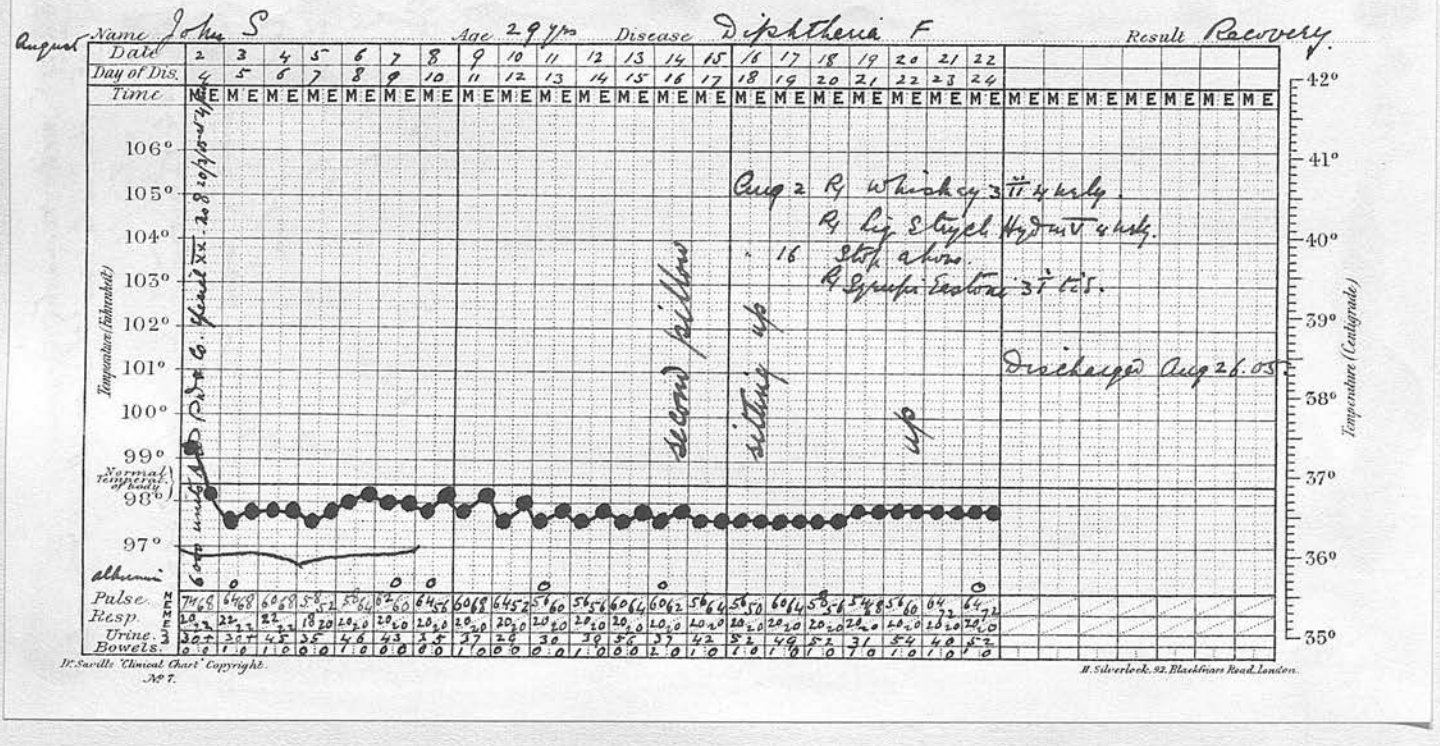
Case 16. July 19th complained of sore throat and headache. July 20th called in a doctor who diagnosed diphtheria. July 21st admitted a little feverish, tongue dirty, uvula clear, typical diphtheritic membrane covering each tonsil and passing back on to posterior pharyngeal wall. Numerous diphtheria bacilli present. 3000 units antitoxin given soon after admission. Fauces cleaned rapidly. She made an excellent and rapid recovery.

Case 17. Appeared ill, said to have sore throat on July 23rd. Doctor called in on July 28th. Admitted same day with thin diphtheritic 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 was therefore administered, whereupon the membrane rapidly disappeared. The child contracted a feverish cold on 13th August otherwise convalescence was uninterrupted and excellent.

Case 18



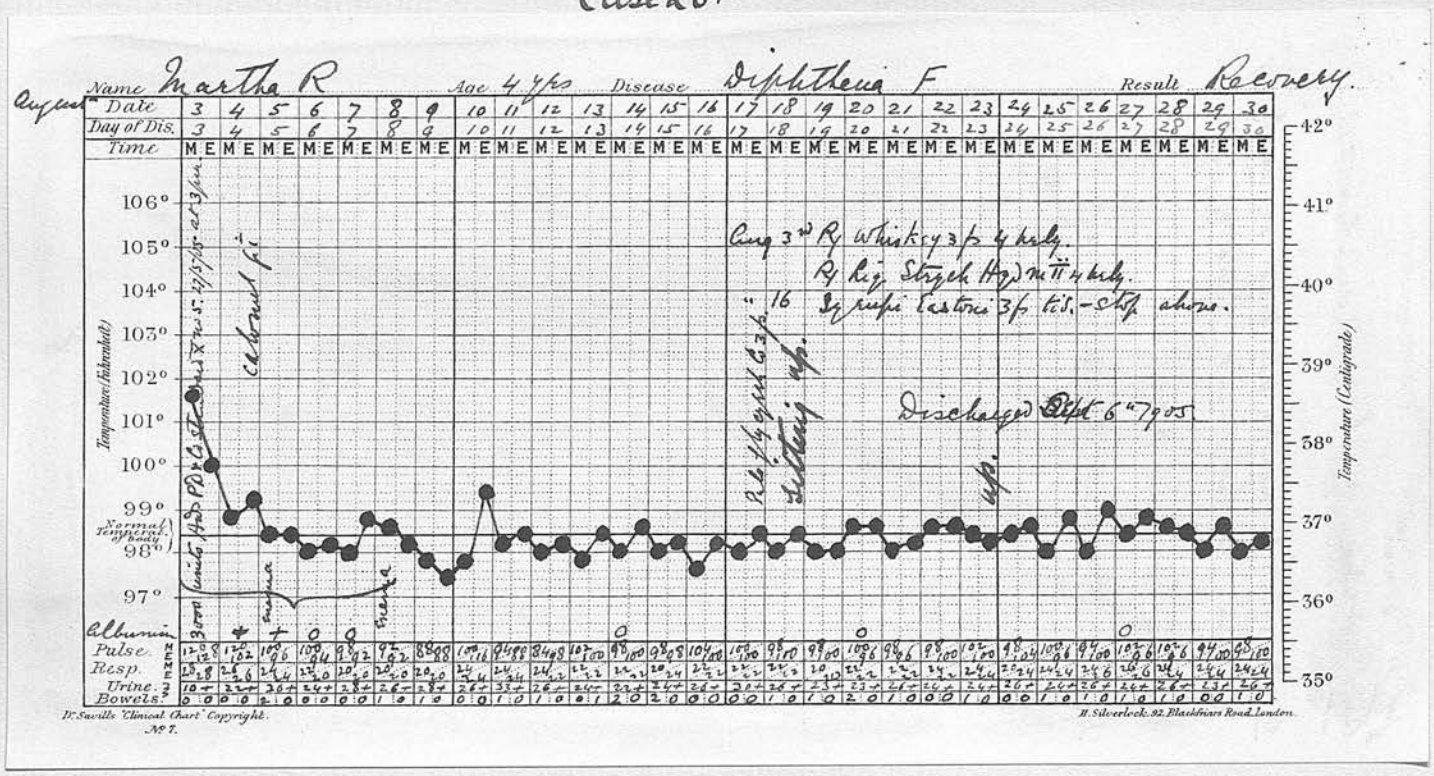
Case 19.



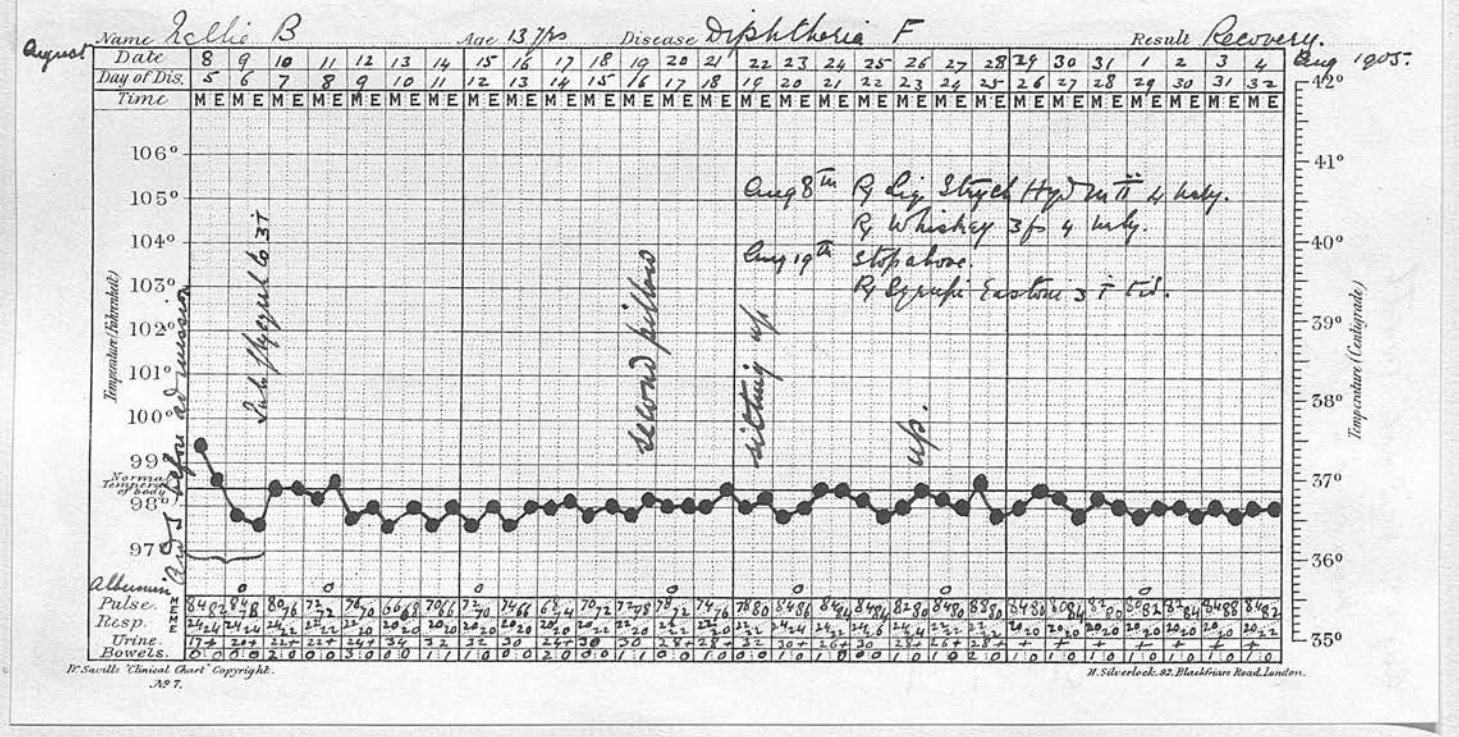
Case 18. July 26th feverish, headache & nausea. 27th sore throat. 28th membrane noticed and antitoxin given. Admitted on July 31st, feeling weak and tired. Membrane was just disappearing from tonsils. No further dose of antitoxin was given. August 1st no sign of membrane. Recovery was good and rapid.

Case 19. July 29th nausea & vomiting. July 30th headache and sore throat. Admitted Aug 2nd, looking pale and somewhat poisoned. Lips cracked and dry. Uvula and tonsils inflamed. False membrane, covering uvula and spreading along soft to hard 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 antitoxin soon after admission. After this the membrane ceased to advance and soon began to recede. He made a good recovery.

Case 20.



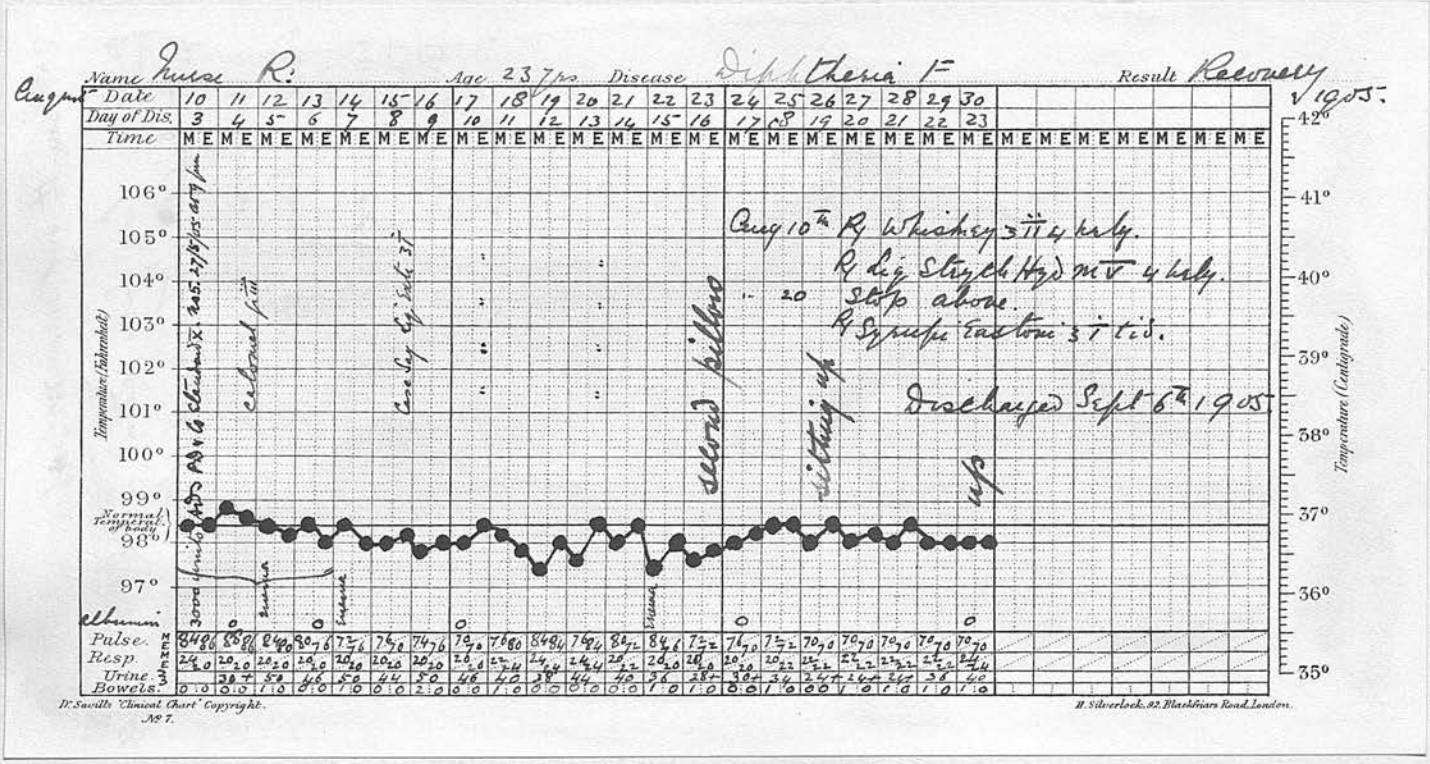
Case 21.



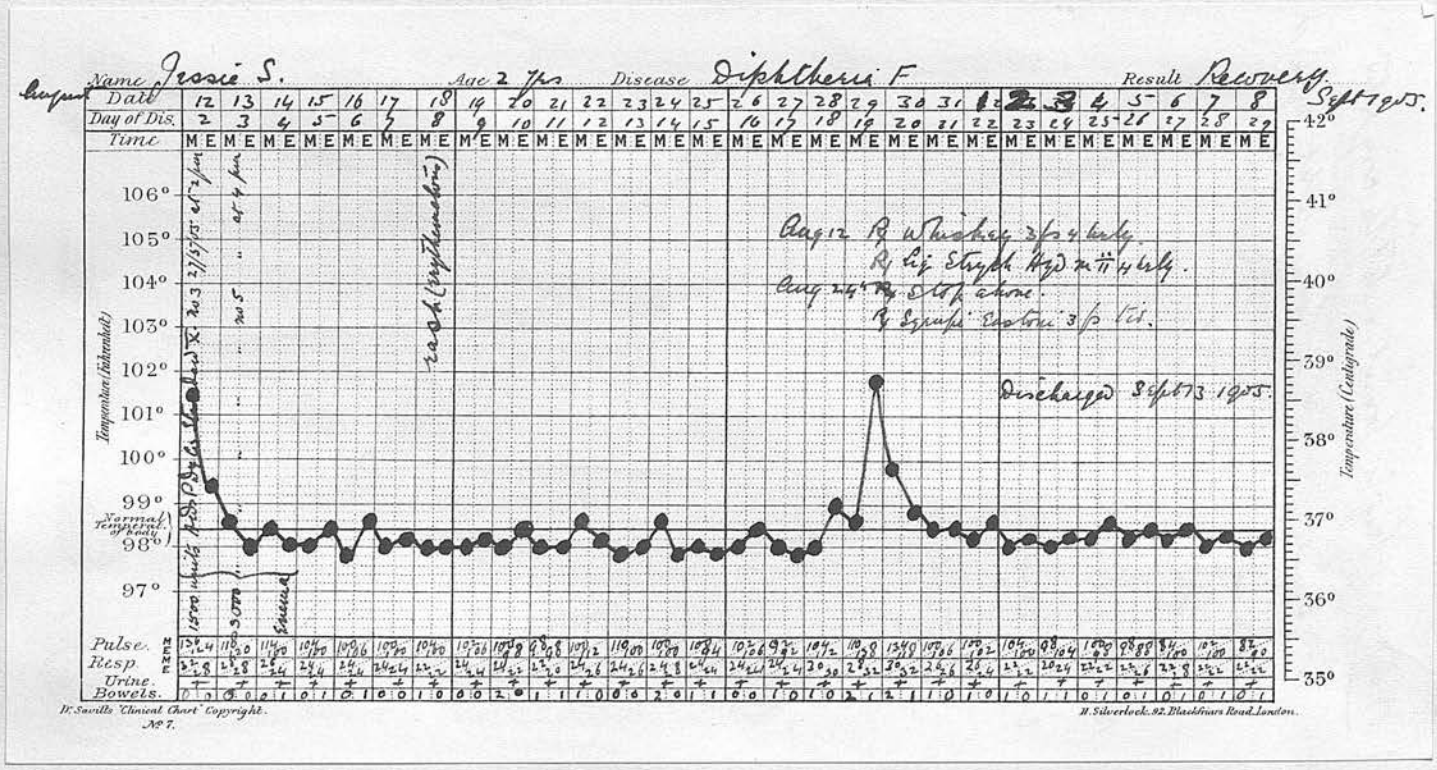
Case 20. July 31st vomited. Aug. 1st complained of headache and sore throat. Admitted on August 3rd sharply ill. A moderate amount of false membrane covered left tonsil and back of pharynx. General faucial congestion. Diphtheria bacilli were numerous in culture from fauces. 3000 units antitoxin administered soon after admission. No further dose had to be administered. She 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. No 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.



Case 23.

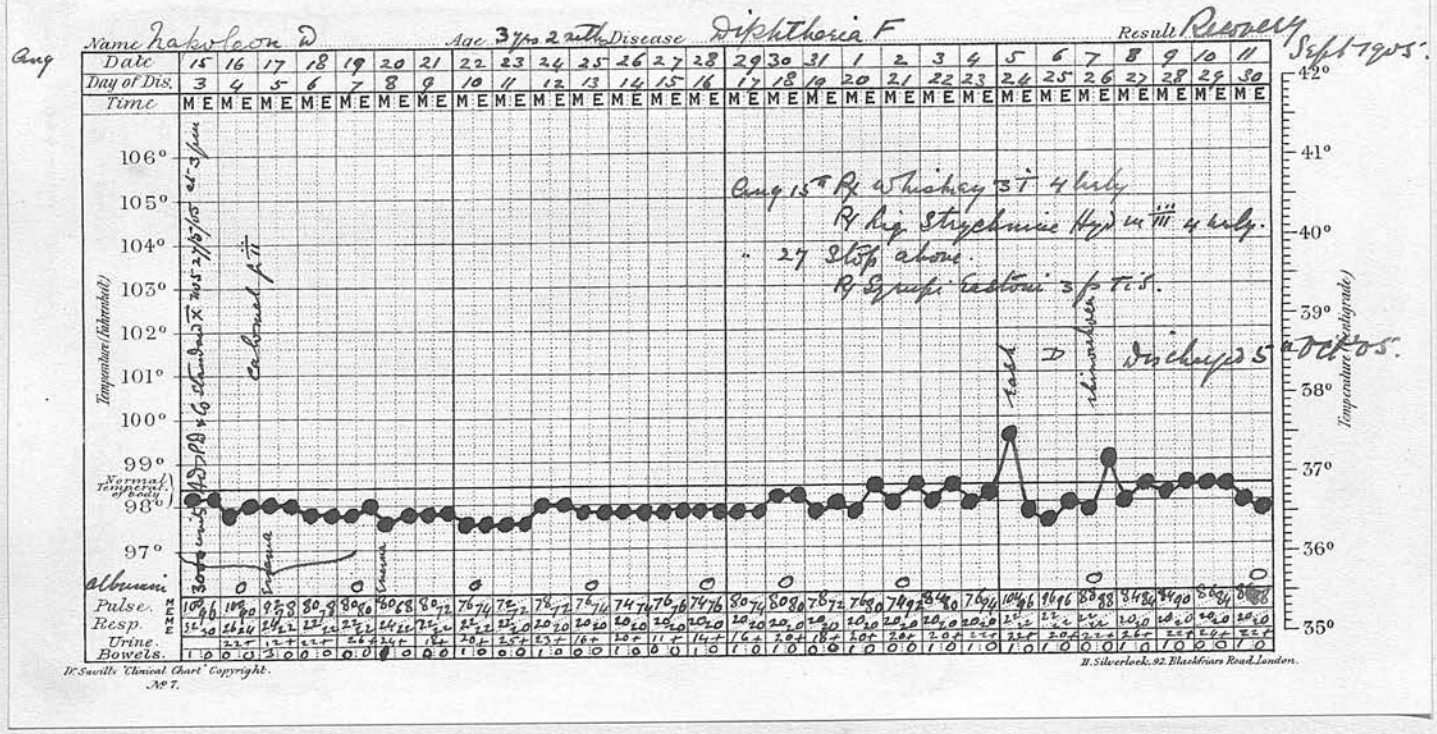


Case 22. A city hospital nurse. Sore throat began on 8th Aug. Warded on 10th pale and ill looking. Tonsils inflamed, slightly enlarged and partially covered with grey false membrane. Evil smell from mouth. 3000 units of antitoxin was found sufficient to clean the tonsils. Her recovery was uninterrupted and complete.

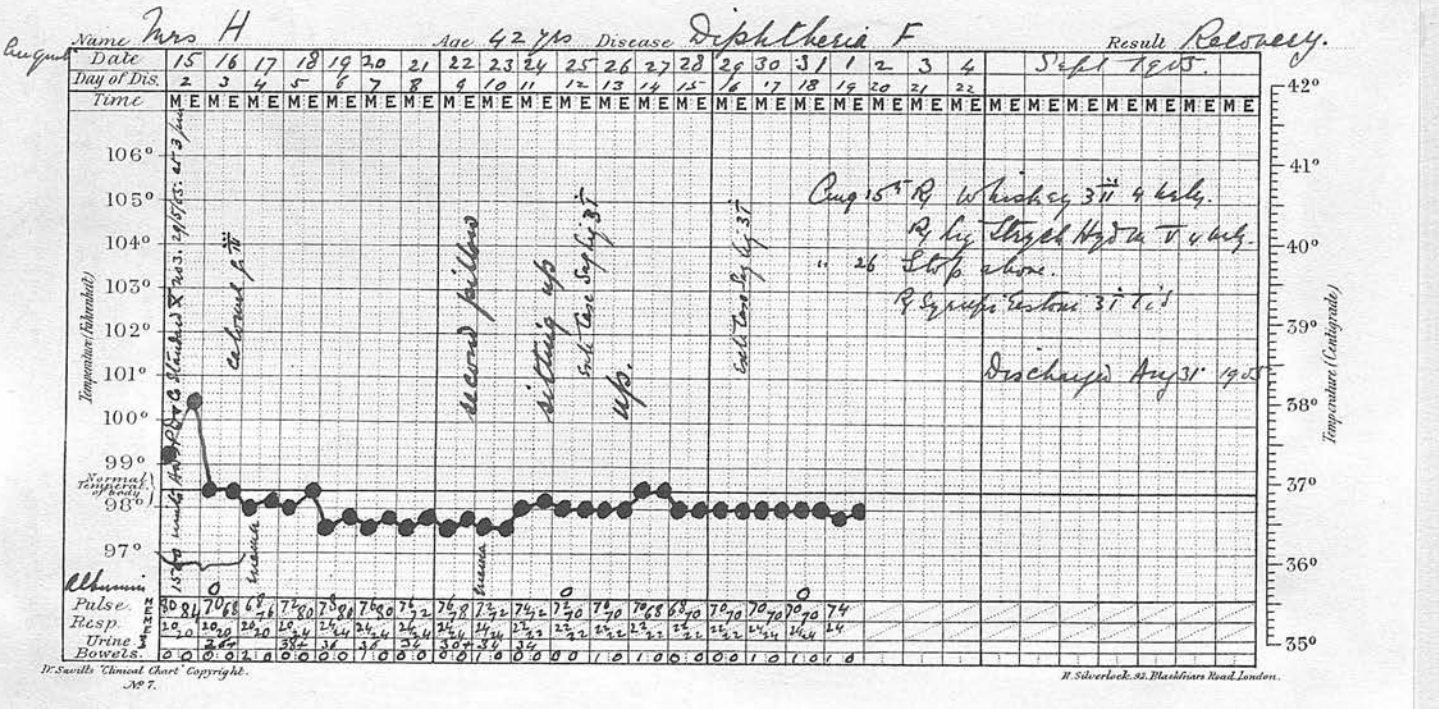
Case 23. Taken ill on 11th August with vomiting and headache. Admitted next day feverish and ill. Right tonsil inflamed and covered with small, grey white, loose patches of membrane. Numerous diphtheria bacilli present. 1500 units of antitoxin was given on admission. Next day, the membrane having spread 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 felt out of sorts and feverish. Aug 13th sore throat, nausea and

Case 24.



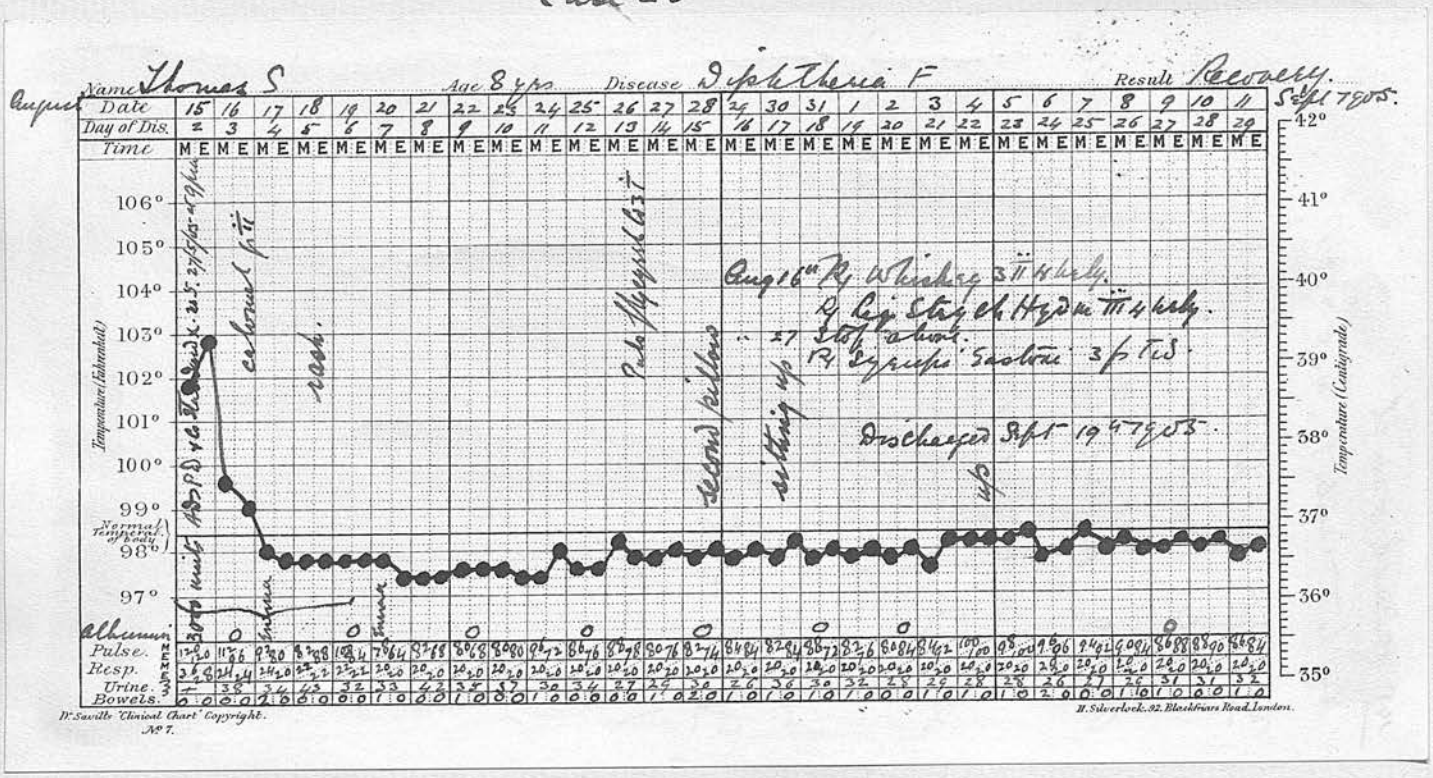
Case 25.



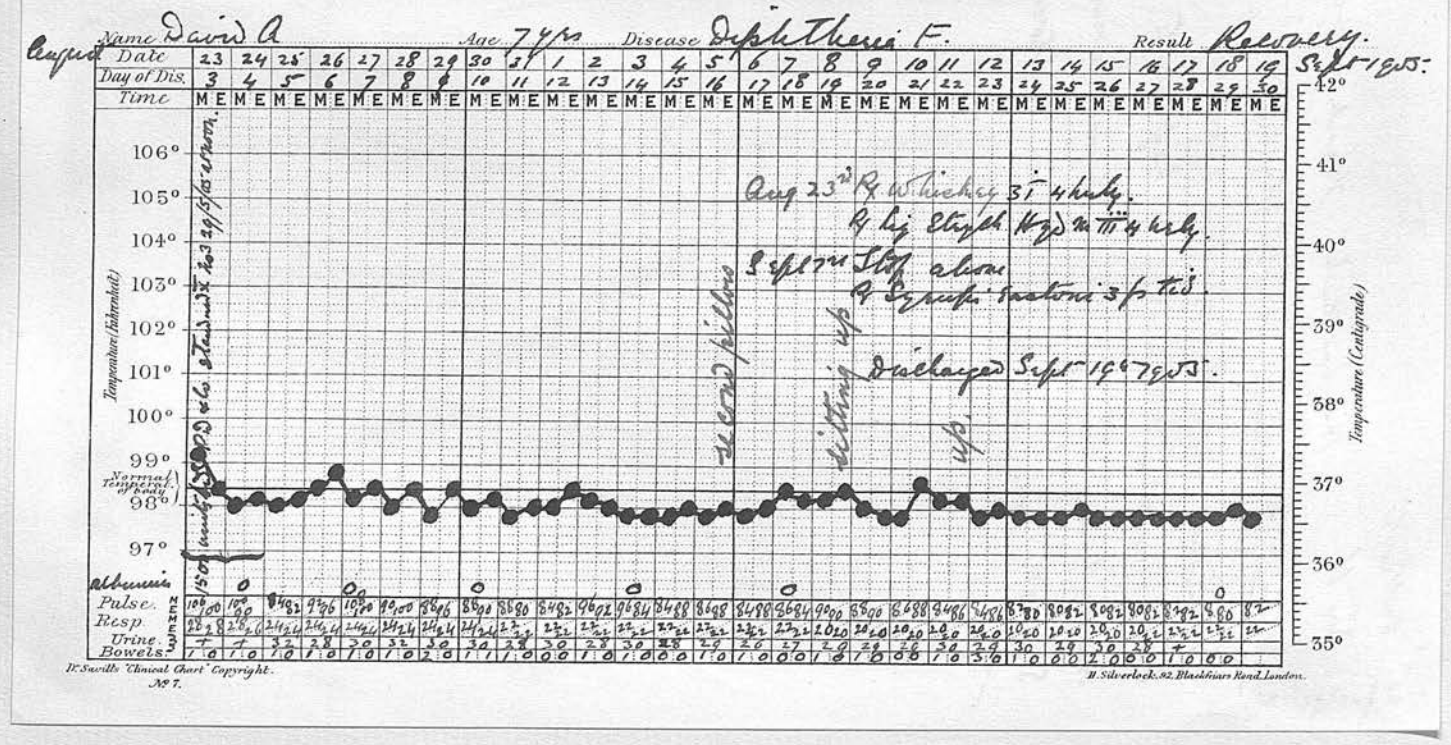
vomiting present. Admitted on 15th Aug dull and depressed looking. No rash. Grey membrane was present upon each tonsil on a congested base. Numerous diphtheria bacilli present. 3000 units antitoxin was administered with success, the membrane gradually disappearing from tonsils. He progressed well until 5th Sept, when an erythematous rash appeared on back. On 6th rash was faintly punctate all over body, face excluded. On 6th rhinorrhoea began. On 9th slight desquamation was noticed on fingers. On 13th slight desquamation appeared on body. Tongue atypical. No constitutional symptoms. For the sake of safety he was isolated. Was discharged well on Oct 5th.

Case 25. Aug 14th sore throat, shivering, head-ache nausea and vomiting present. Has had diphtheria three times already. Aug 15th admitted with typical grey membrane on left tonsil upon an inflamed base. 1500 units antitoxin rapidly cleaned the tonsil. Her convalescence was uninterrupted, but she complained of general weakness for some months after dismissal.

Case 26



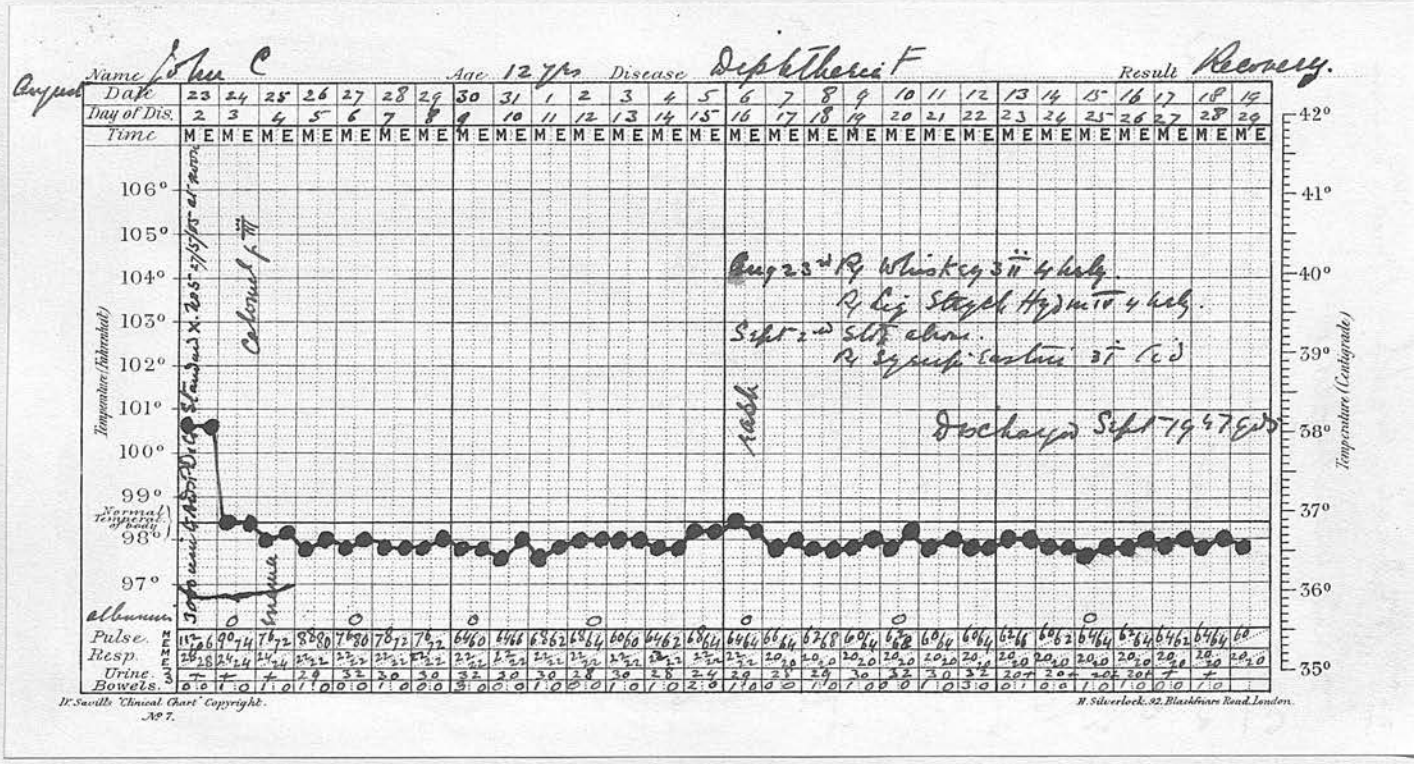
Case 27.



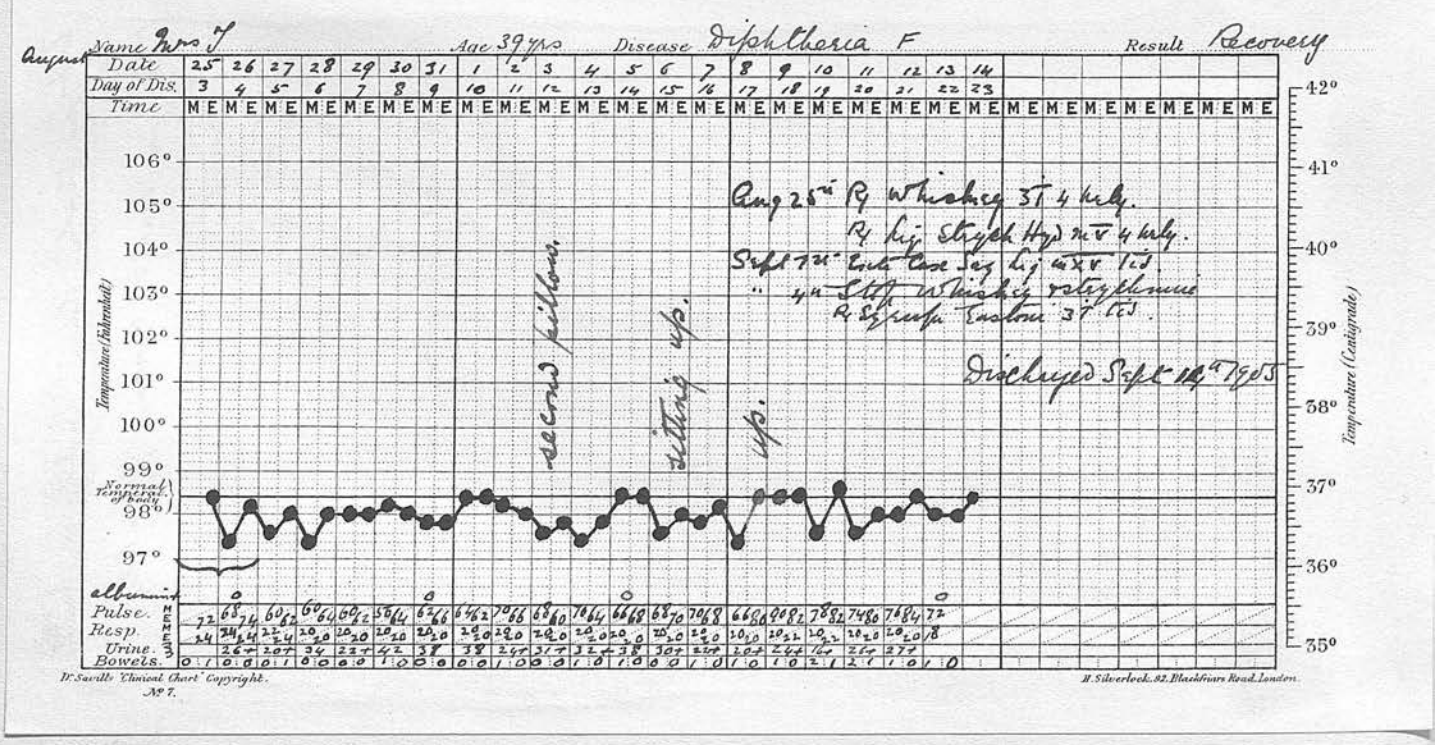
Case 26. Aug 14th headache and sore throat Aug 15th admitted - feverish and ill, right tonsil freely patched with membrane. 3000 units antitoxin administered soon after admission. Tonsil gradually cleaned no further dose being necessary. on Aug 18th some septic spots appeared on face and left arm. A 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 shewed general congestion. Tonsils slightly enlarged. A little membrane present on posterior pharyngeal wall. A good deal of dirty muco purulent deposit about fauces. Tongue furred and fairly moist. 1500 units antitoxin was administered on admission. Recovery rapid.

Case 28.



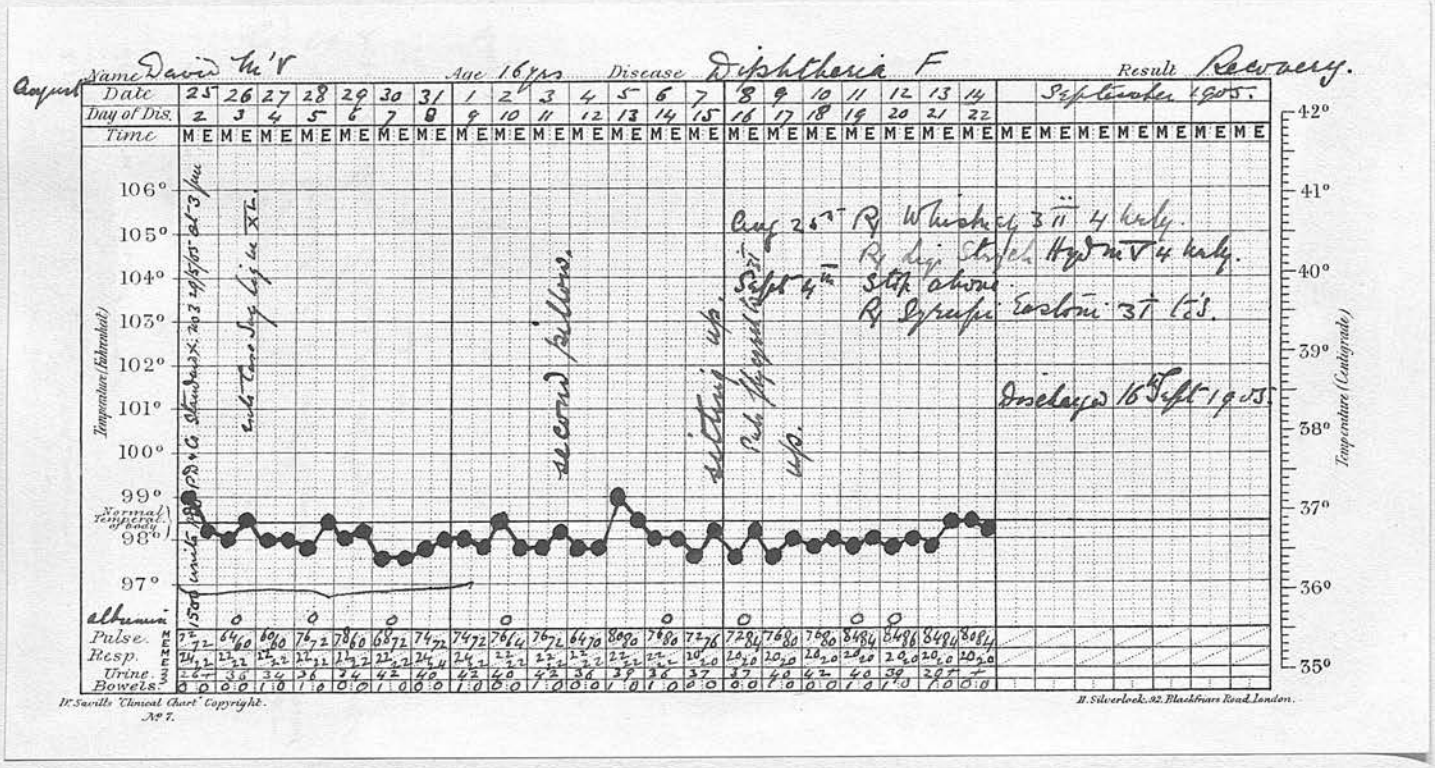
Case 29.



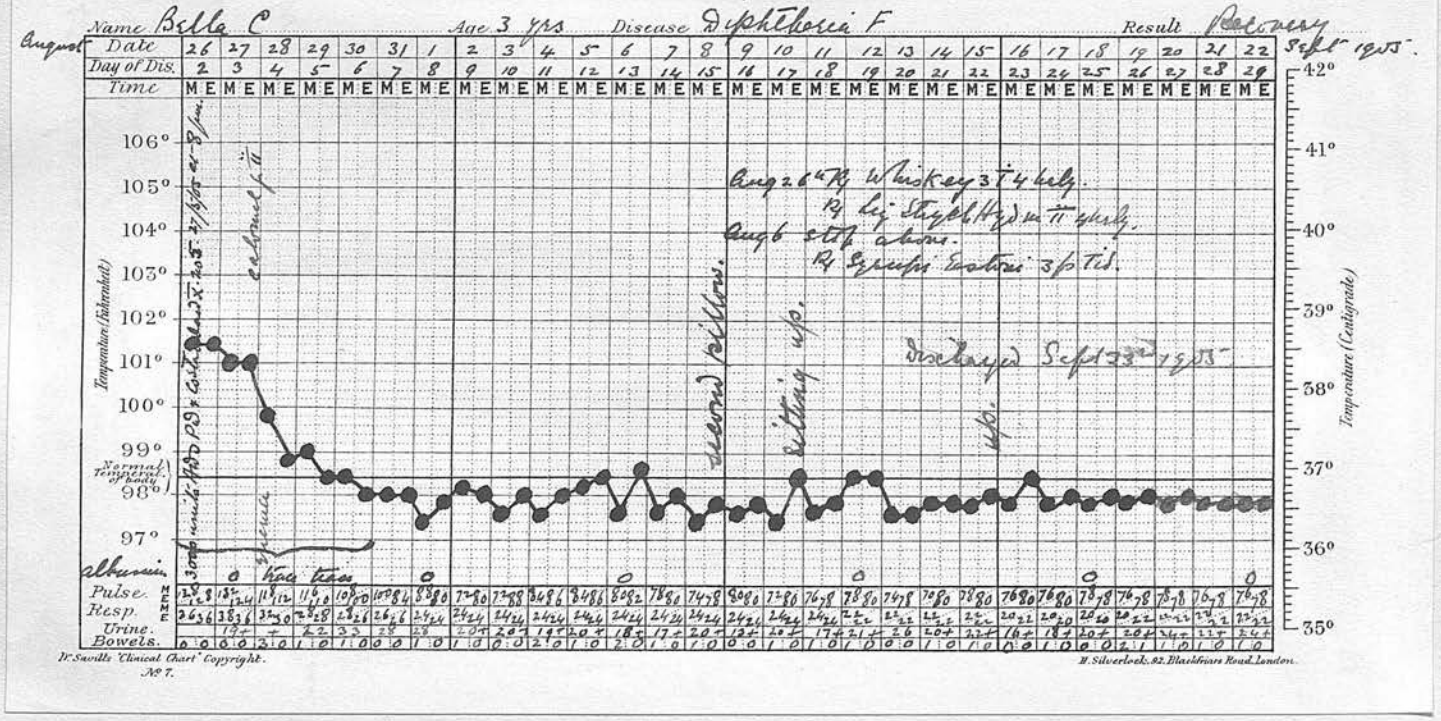
Case 28. 22nd Aug headache, sore throat nausea and vomiting present. 23rd August admitted sharply ill, tongue dry and furred, fauces congested, both tonsils enlarged and a fair amount of membrane upon each. Uvula clear. Enlarged glands at the angle of the jaw upon each side. A disagreable smell rose 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. Good and rapid recovery.

Case 29. Aug 22nd headache, shivering, sore throat and nausea present. Aug 25th admitted weak and run down, tongue dirty, some sordes on teeth, pharynx contains some muco pus. Remains of diphtheritic patching present on right tonsil. No antitoxin was given. She made a rapid and complete recovery.

Case 30.



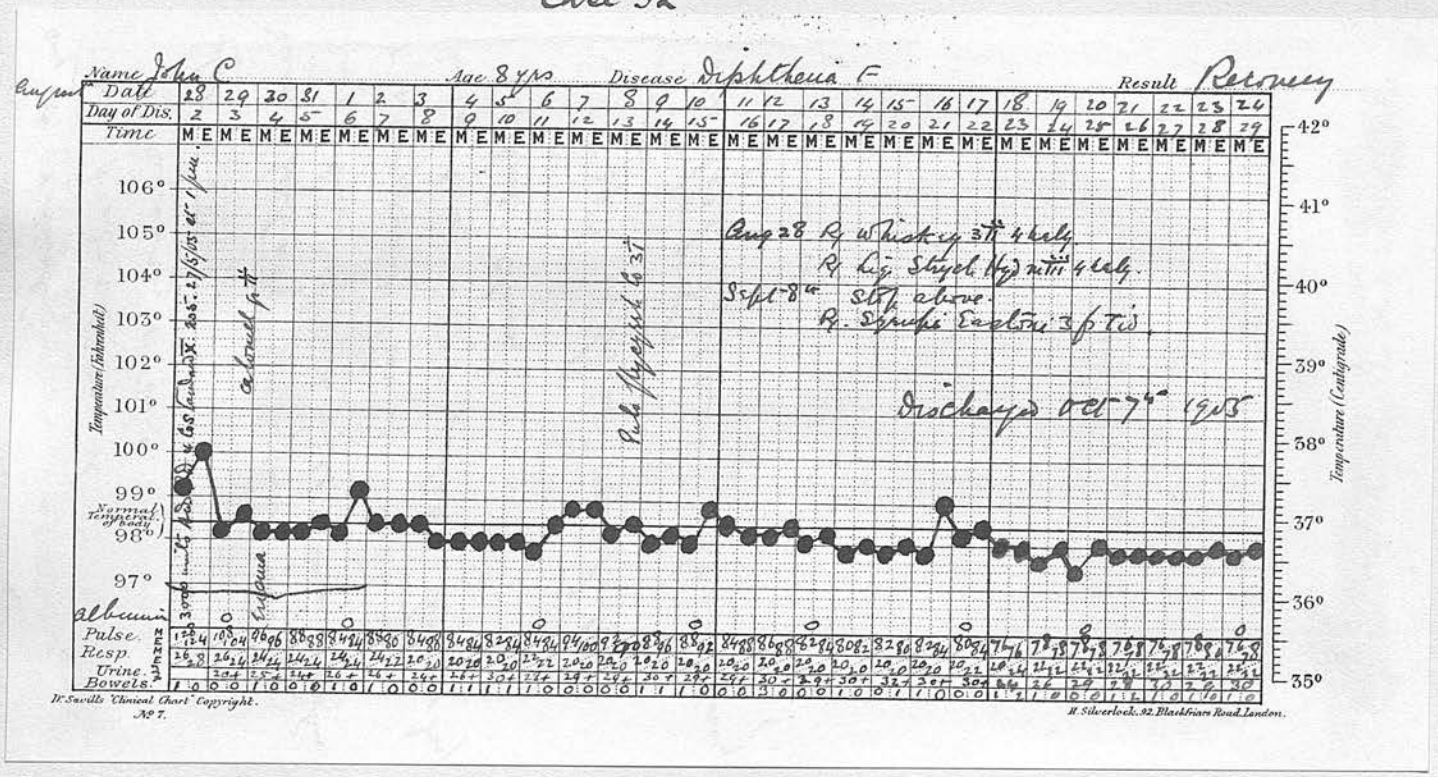
Case 31.



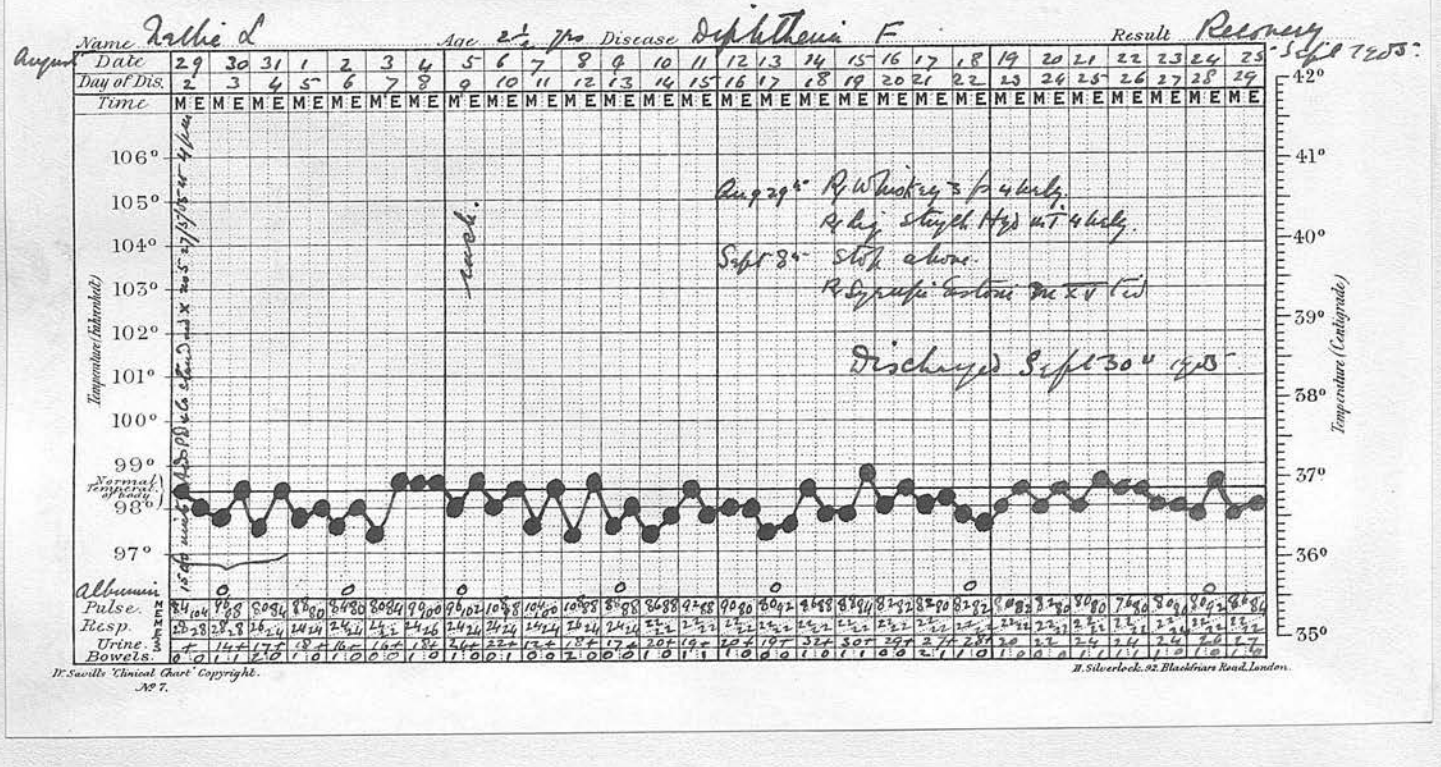
Case 30. Aug 23rd took a cold with headache and shivering. 24th sore throat. 25th Aug admitted slightly ill. Right tonsil inflamed and covered with typical grey membrane. Left tonsil and uvula clear. Tongue furred and rather dry. 15000 units antitoxin was given on admission. Next day only a speck or 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. Feverish and sharply 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. Good recovery made.

Case 32



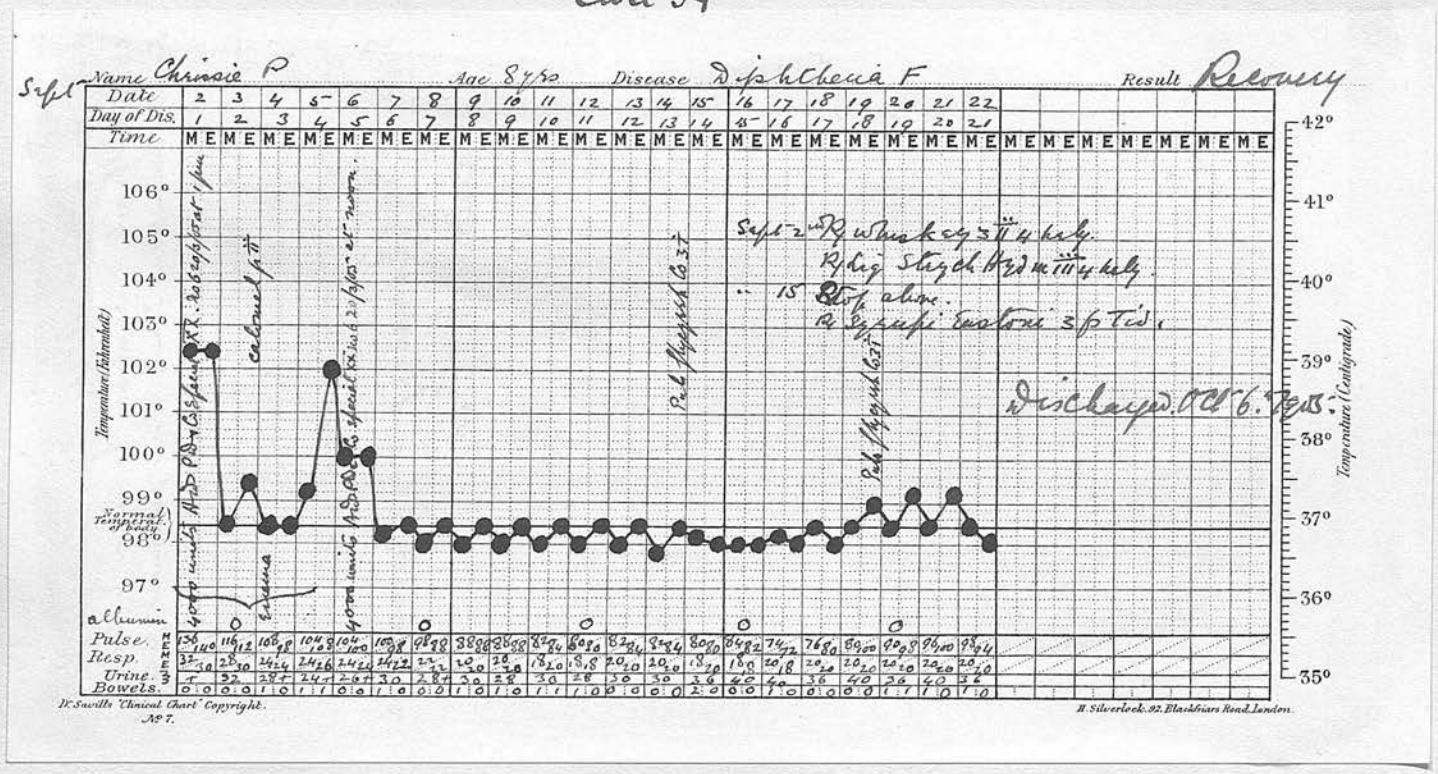
Case 33



Case 32. Aug 25th vomited. 27th complained headache and sore throat. 28th admitted slightly ill, tongue dryish and furred, each tonsil partially covered with membrane. Some congestion and enlargement of tonsils. Uvula clear. 3000 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. No rash. 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. She made an excellent recovery.

Case 34



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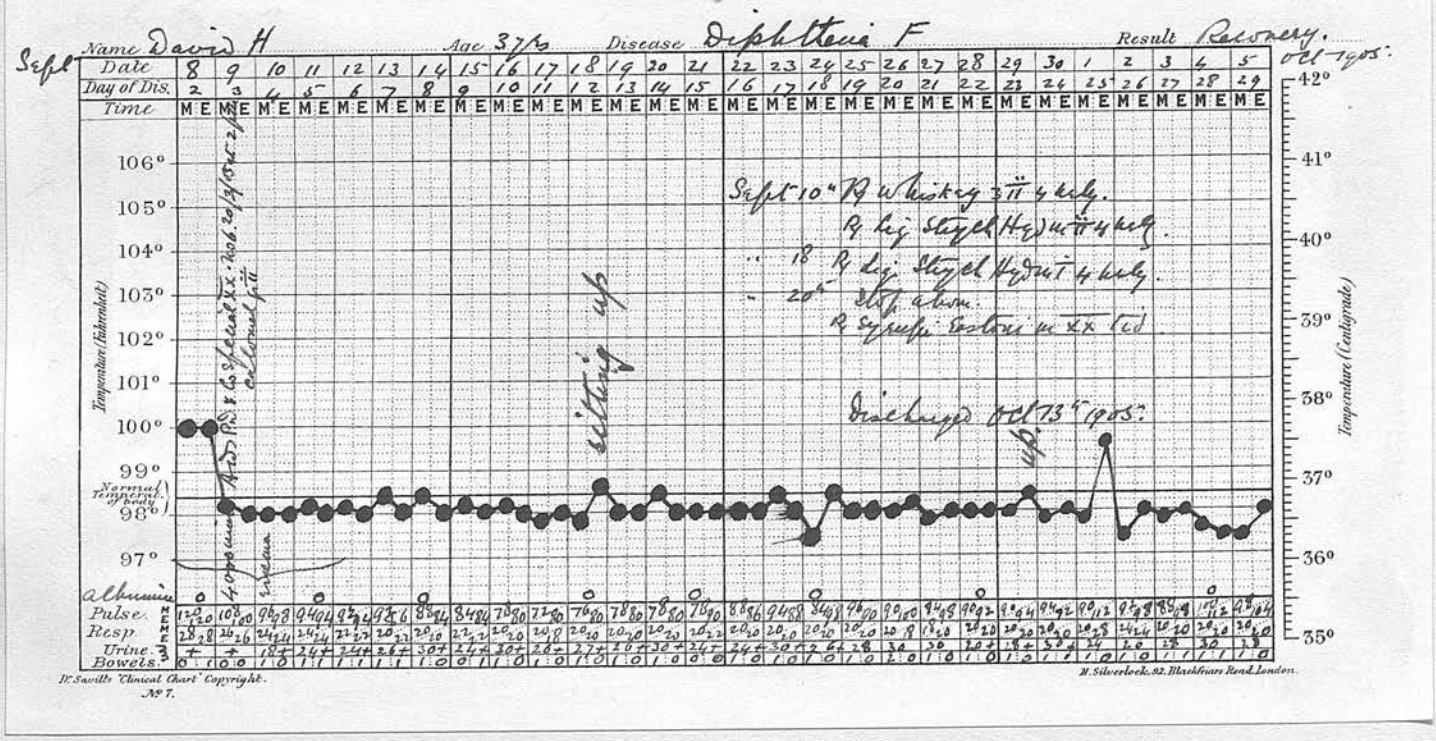
Case 35



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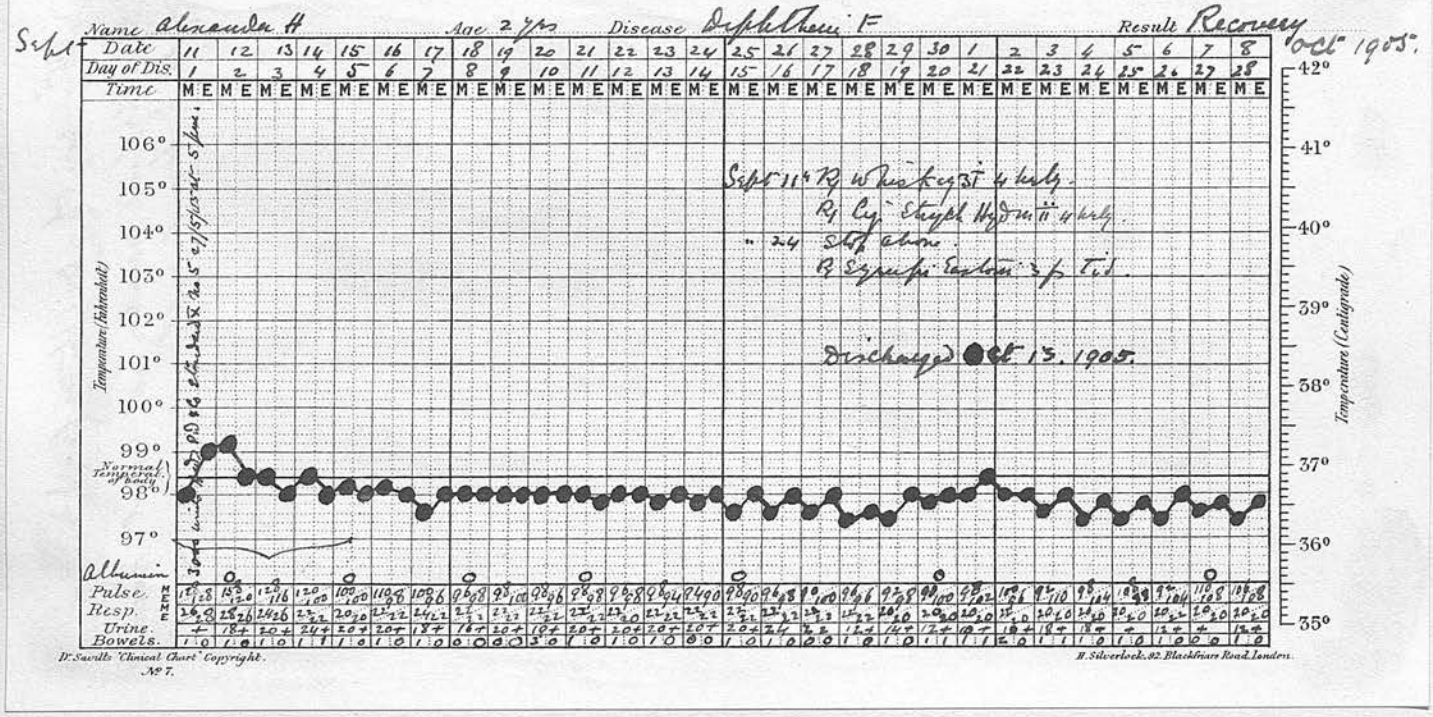
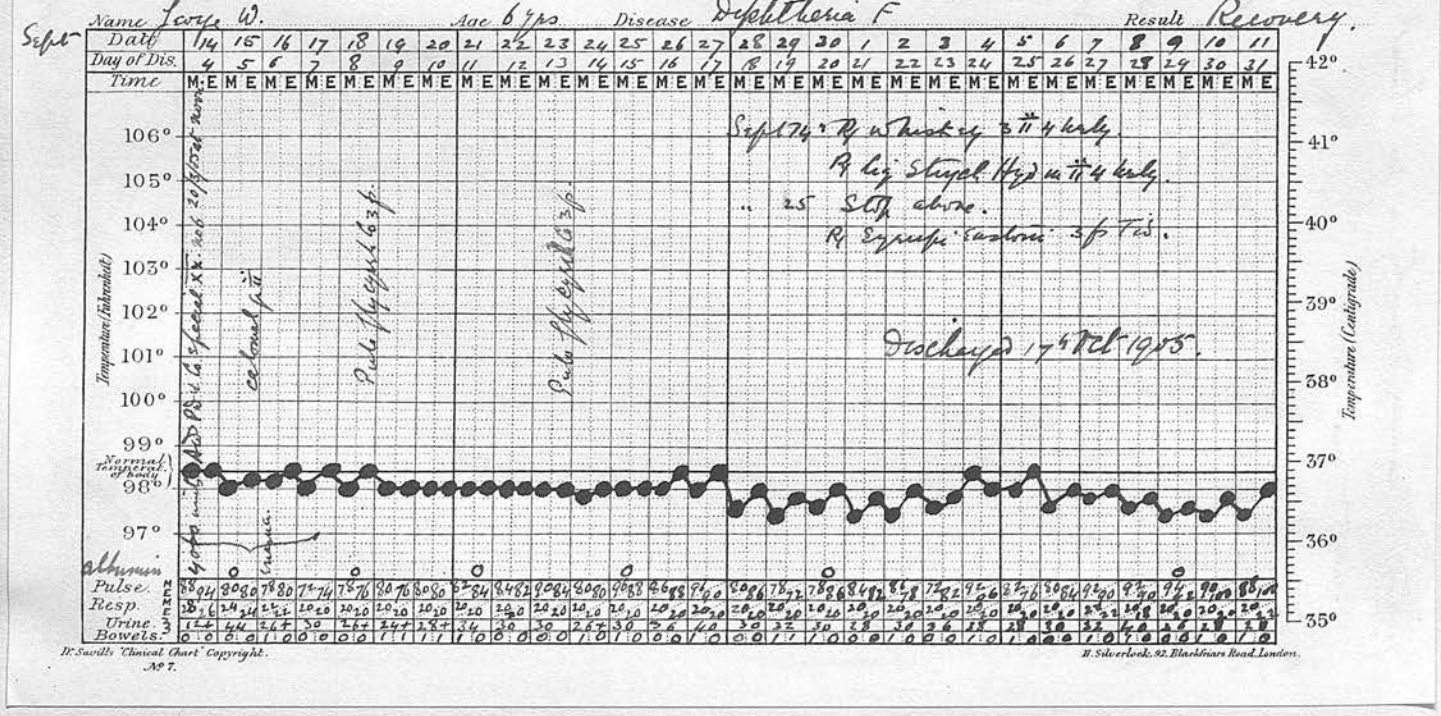
Case 34. Sept 2nd, day of admission, sore throat noticed. Sharply ill, face flushed, nostrils red and angry looking, no nasal discharge, tongue thinly furred and dryish, both tonsils enlarged and congested. On the right a thin film of membrane has appeared. 4000 units of antitoxin was given on admission. On the morning of 5th Sept the tonsils were clear of membrane. Her temperature rose that evening and on 6th Sept fresh 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 had spread; 4000 units of antitoxin was then given and the membrane thereupon disappeared. Further progress most satisfactory.

Case 36



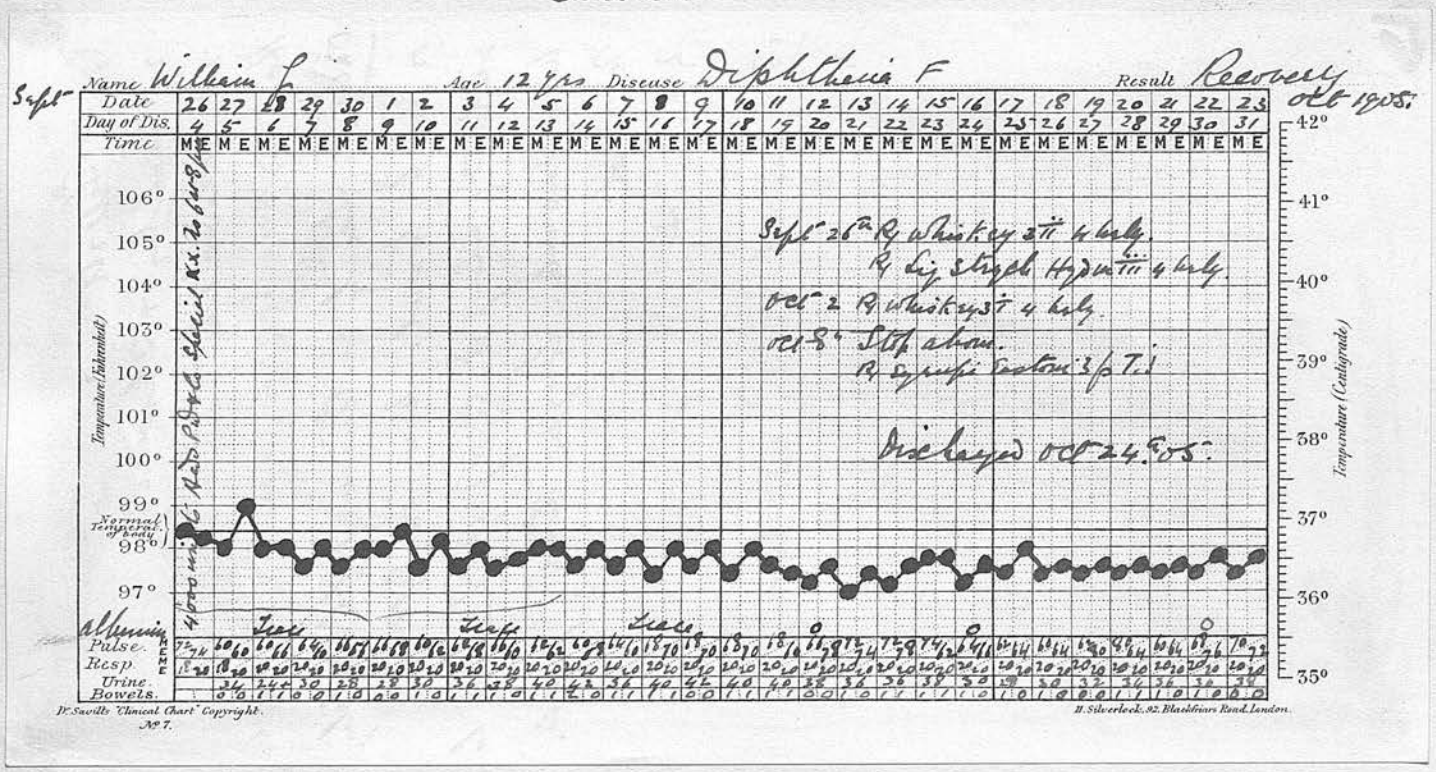
Case 37.



Case 36. On Sept 11th, the day of admission, first fell ill with sore throat. Typical membrane present on each tonsil. Each tonsil was enlarged and congested. 3000 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 furred and rather dry. Fauces congested. Typical grey membrane upon each tonsil. Uvula clear. No diphtheria bacilli were found in the nasal discharge. Numerous diphtheria bacilli were however found in the fauces. 4000 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


Name William L
Age 12 yrs
Disease Diphtheria F
Result Recovery
Sept
Oct 1905.
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperature of Body
Sept 26th R Whiskey 3ii 4 hrly.
R Liq Strych Hydrochl iii 4 hrly.
Oct 2 R Whiskey 3i 4 hrly
Oct 8 Stop above.
R Syrup Senega 3ss T.i
Discharged Oct 24. 05.
Albumin
Pulse.
Resp.
Urine.
Bowels.
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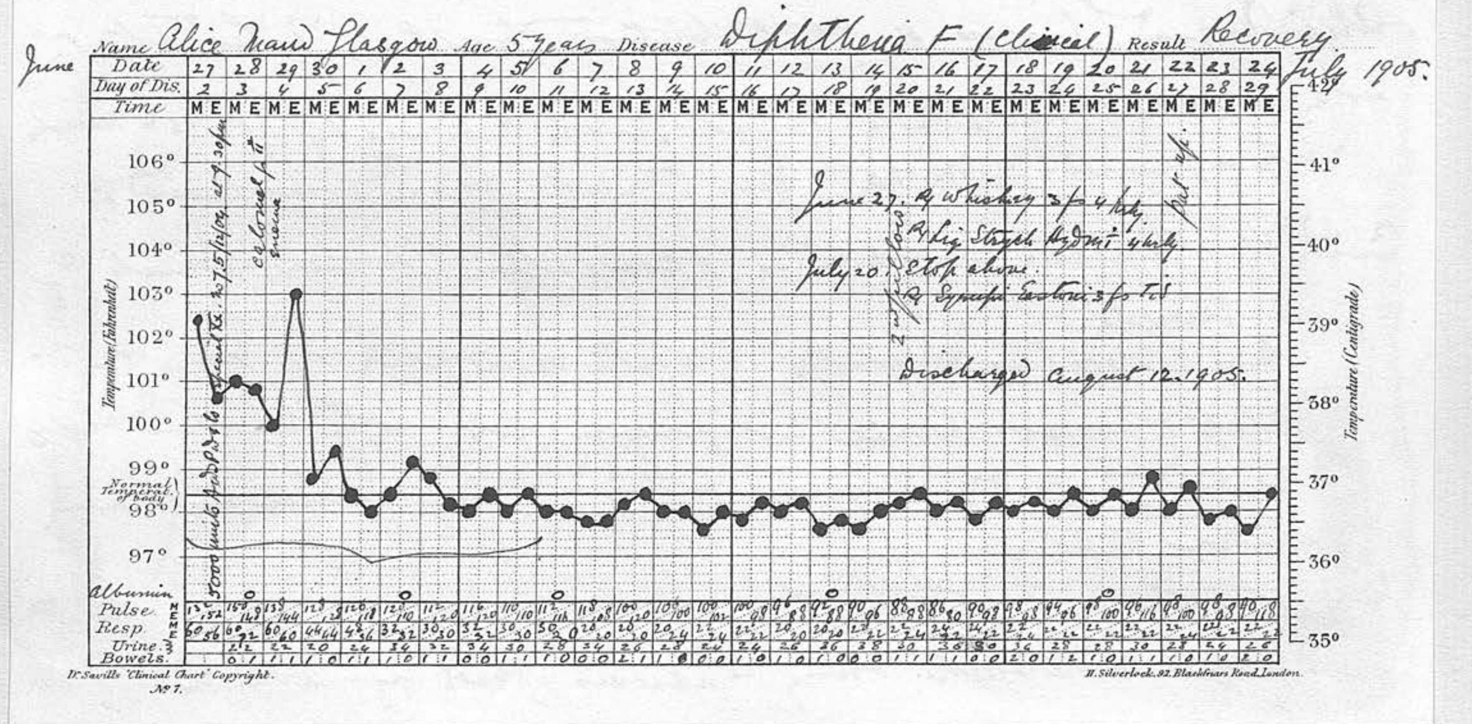
Case 38. 23rd Sept first fell ill. 24th was feverish and vomited. 25th complained of headache. Admitted on 26th with fairly extensive diphtheritic patching on each tonsil. On the left side it extended along the edge of the soft palate on to the base of the uvula. Tongue thickly furred. 4000 units of 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.

3. Case 1. On June 14th developed measles. On 25th June sore throat complained of. Admitted

Case 1.


June
Name Alice Maud Glasgow Age 5 years Disease Diphtheria F (Clinical) Result Recovery
July 1905.
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Normal Temperat. of body
Temperature (Centigrade)
June 27. R̸ Whiskey ʒ i 4 hrly
R̸ Liq Strych Hyd m i 4 hrly
July 20. Stop above
R̸ Syrupi Eastoni ʒ i T.i.d.
Discharged August 12. 1905.
Albumin
Pulse
Resp
Urine ʒ
Bowels
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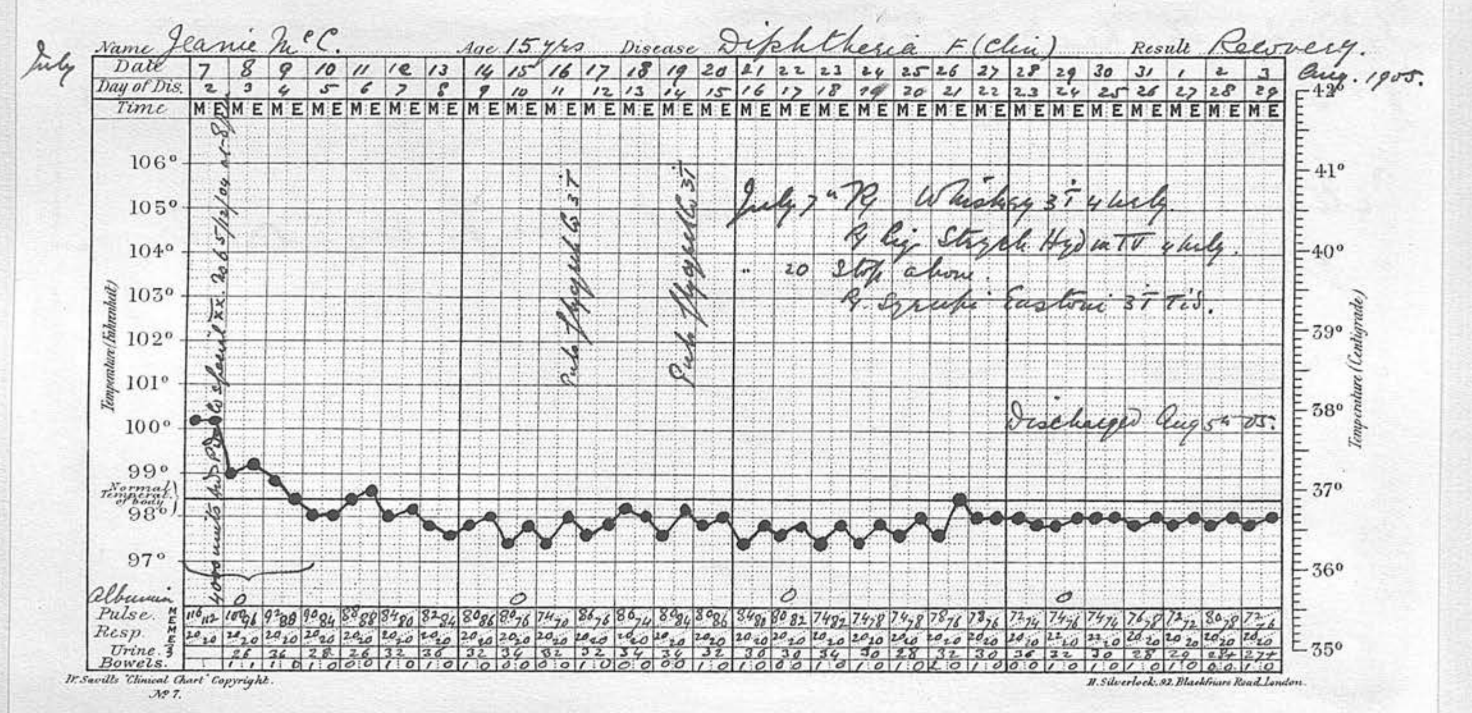
Case 2.


July
Name Jeanie McC. Age 15 yrs Disease Diphtheria F. (Clin) Result Recovery.
Aug. 1905.
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Normal Temperat. of body
Temperature (Centigrade)
July 7th R̸ Whiskey ʒ i 4 hrly
R̸ Liq Strych Hyd m i 4 hrly
" 20 Stop above
R̸ Syrupi Eastoni ʒ i T.i.d.
Discharged Aug 5th 05.
Albumin
Pulse
Resp
Urine ʒ
Bowels
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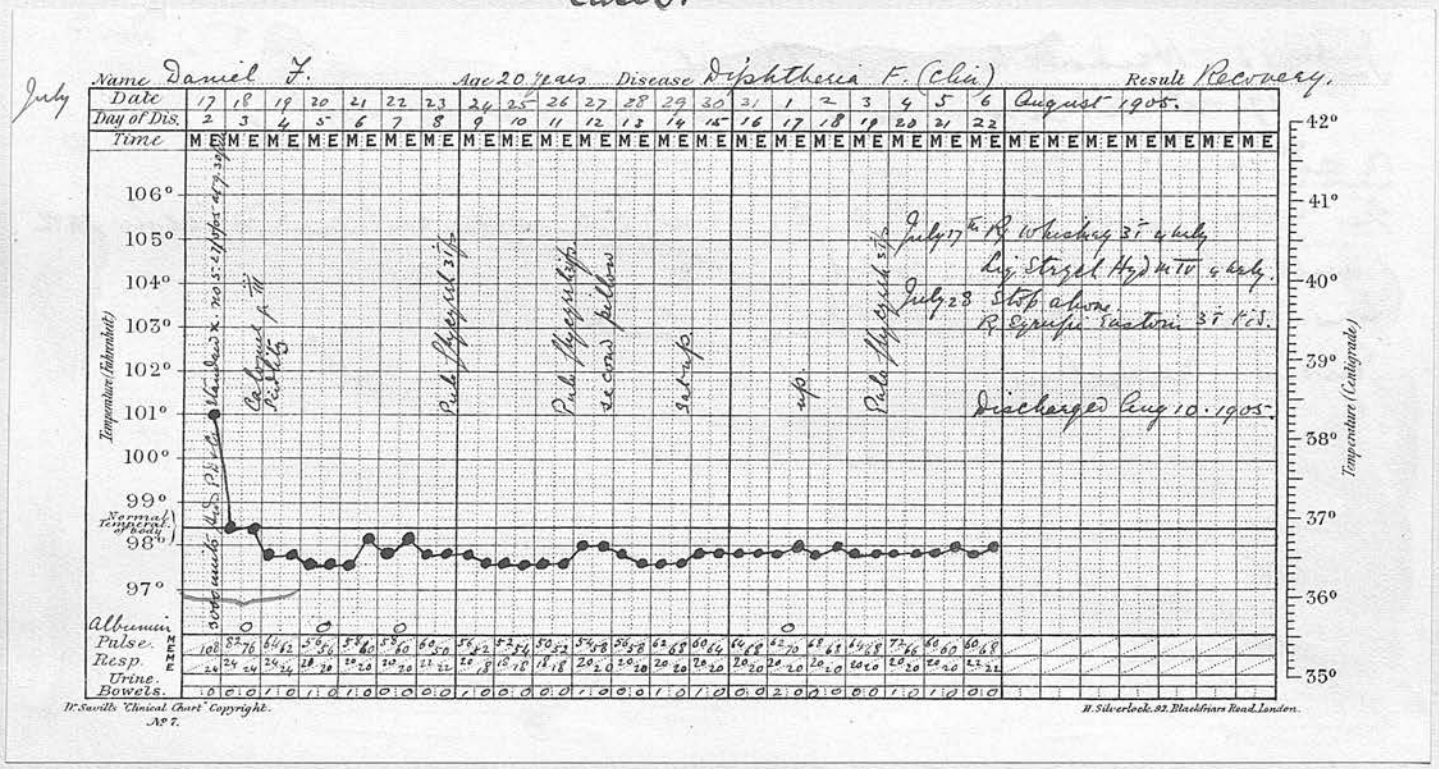
27th June with general stomatitis and congestion of fauces. White membranous patches present on tonsils uvula and soft palate. Lips dry and cracked. Breathing rapid with grunting expiration. No physical signs of pneumonia discovered. 5000 units antitoxin given soon after admission. No diphtheria bacilli found. Stomatitis was not got rid of until 10th July and the patches of membrane 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. Has had diphtheria twice. admitted on July 7th, sharply ill, typical diphtheritic smell proceeding from mouth, typical membrane on each tonsil. Fauces are congested and tongue furred. On three occasions negative smears were obtained. She improved rapidly after 4000 units of antitoxin and made an excellent recovery.

Case 3.


Name Daniel F. Age 20 years Disease Diphtheria F. (Clin.) Result Recovery.
July
August 1905.
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperature of Body
Albumen
Pulse.
Resp.
Urine.
Bowels.
July 17th R Whiskey 3i 4 hrly
Liq Strych Hyd m iv 4 hrly.
July 28 Stop above.
R Syrupi Tolutani 3i t.i.d.
Discharged Aug 10. 1905.
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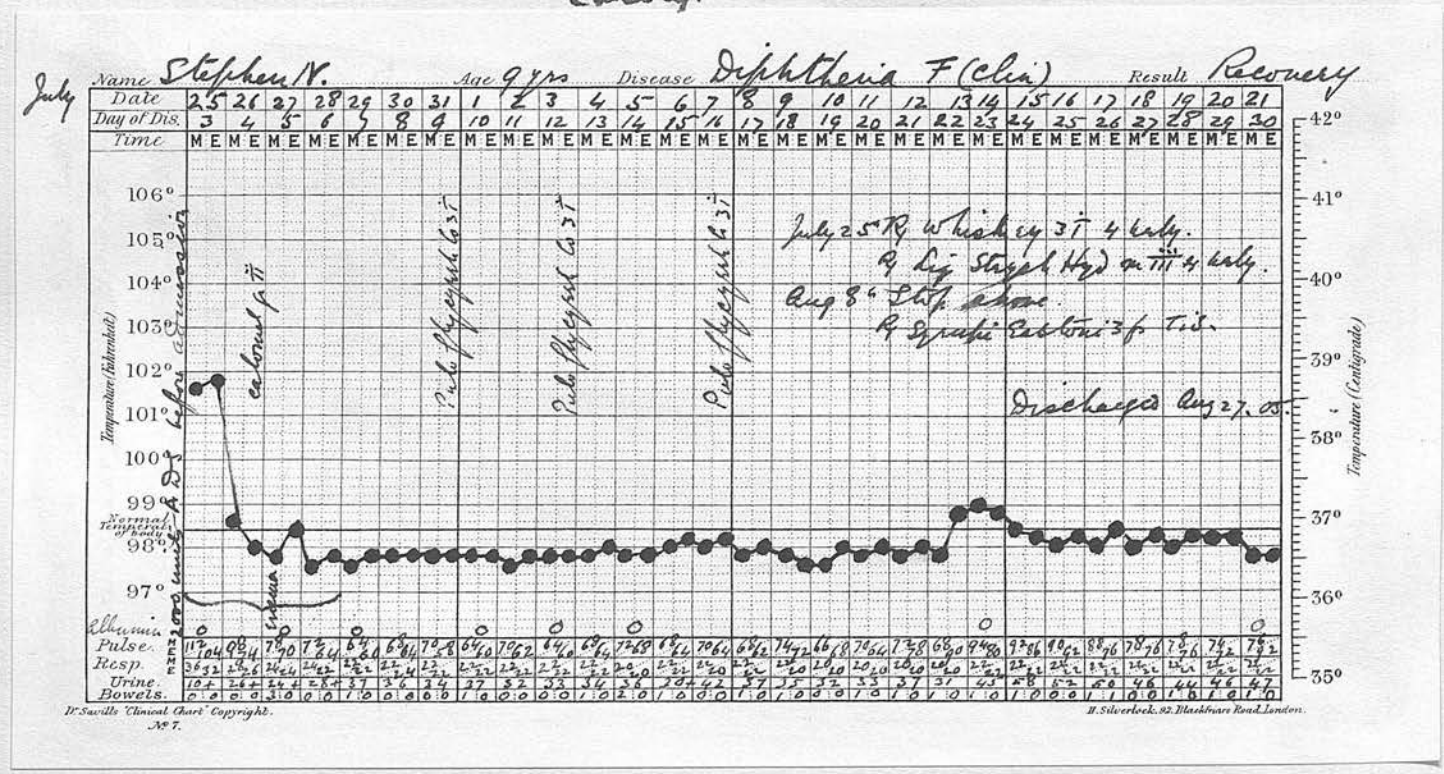
Case 4.


Name Stephen N. Age 9 yrs Disease Diphtheria F (Clin.) Result Recovery
July
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperature of Body
Albumen
Pulse.
Resp.
Urine.
Bowels.
July 25th R Whiskey 3i 4 hrly.
R Liq Strych Hyd m iii 4 hrly.
Aug 8th Stop above.
R Syrupi Tolutani 3ss t.i.d.
Discharged Aug 27. 05.
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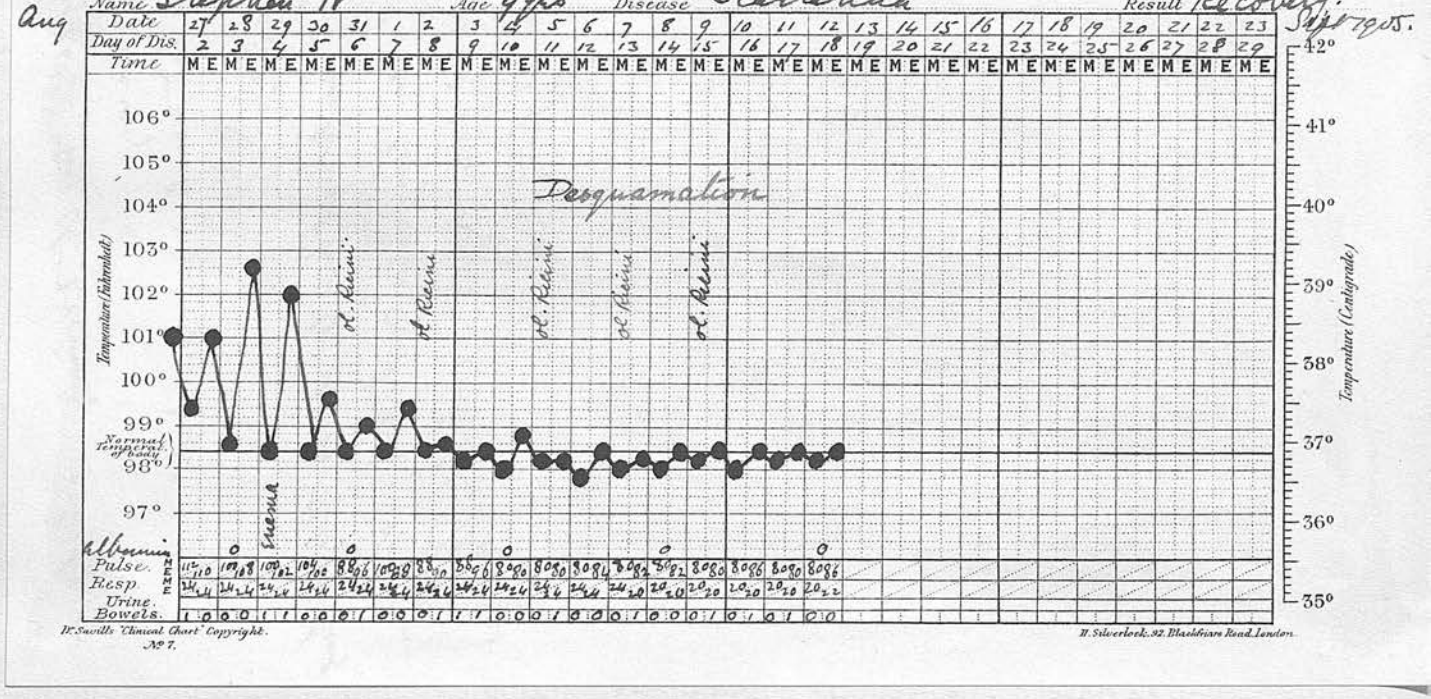
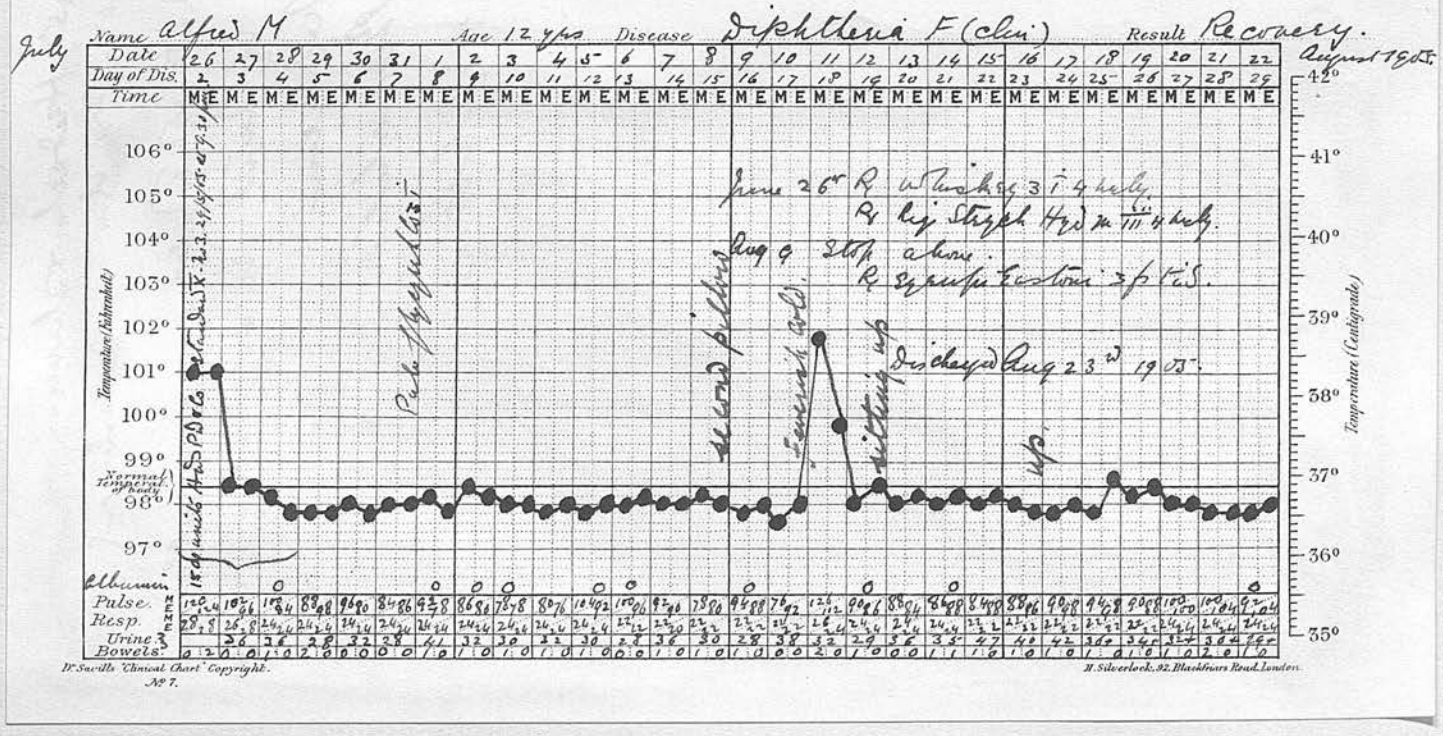
Case 3. July 16th complained of headache and sore throat. July 17th admitted feverish, typical membrane on right tousil and a small patch upon left. Smelt like a diphtheria. Some enlarged glands at the angle of the jaw on each side. No diphtheria organisms could be found after repeated examinations. The tousils after 3000 units of antitoxin had been injected rapidly cleaned. 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. Tousils and uvula clear. Evil 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 punctate

Case 4 (continued)



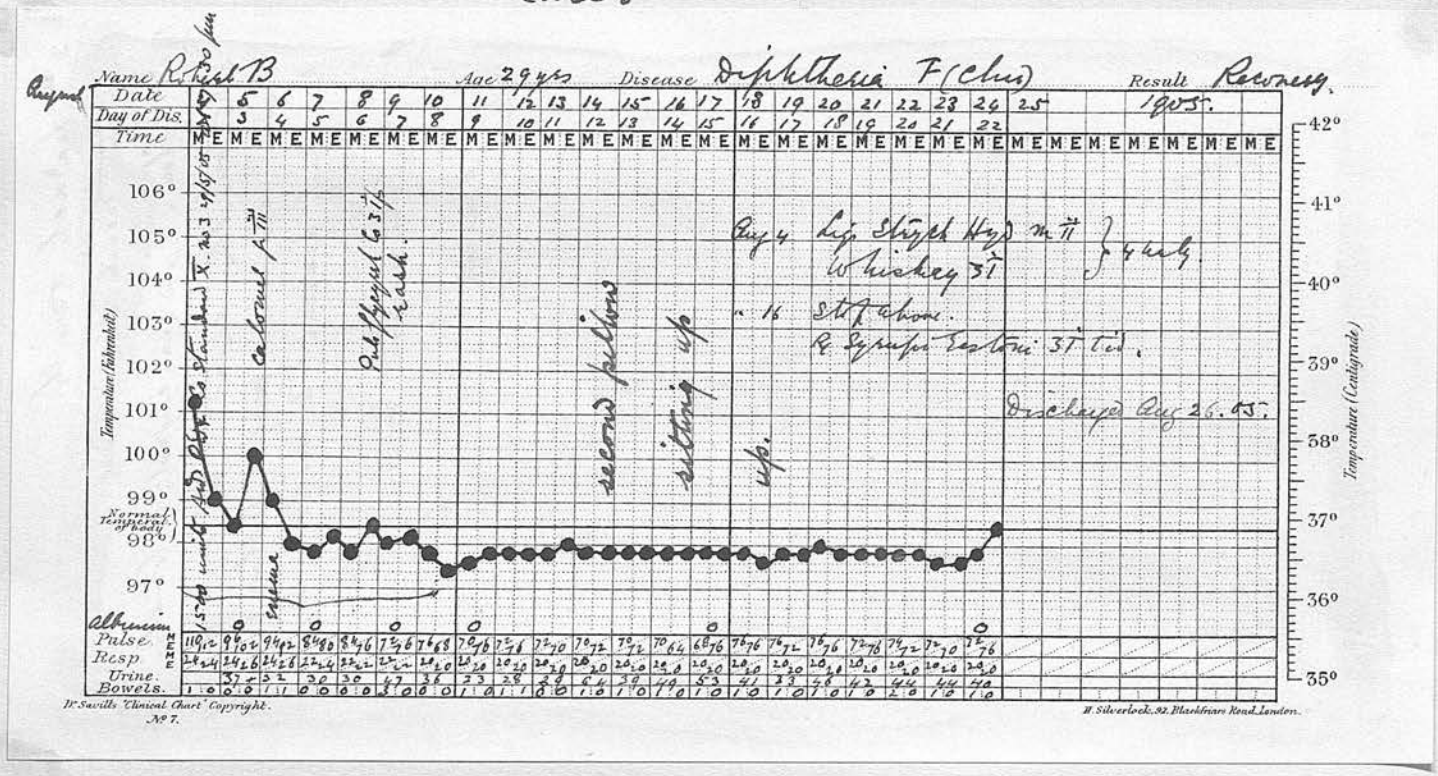
Case 5



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 5. 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


Name R. Rich B
Age 29 yrs
Disease Diphtheria F (clin)
Result Recovery.
1905.
Aug 4 Liq. Strych Hyd m ii } 4 hrly.
Whiskey 3i
" 16 Strychnine.
R Syrup Iodini 3i tid.
Discharged Aug 26. 05.
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperature of body
Pulse
Resp.
Urine
Bowels.
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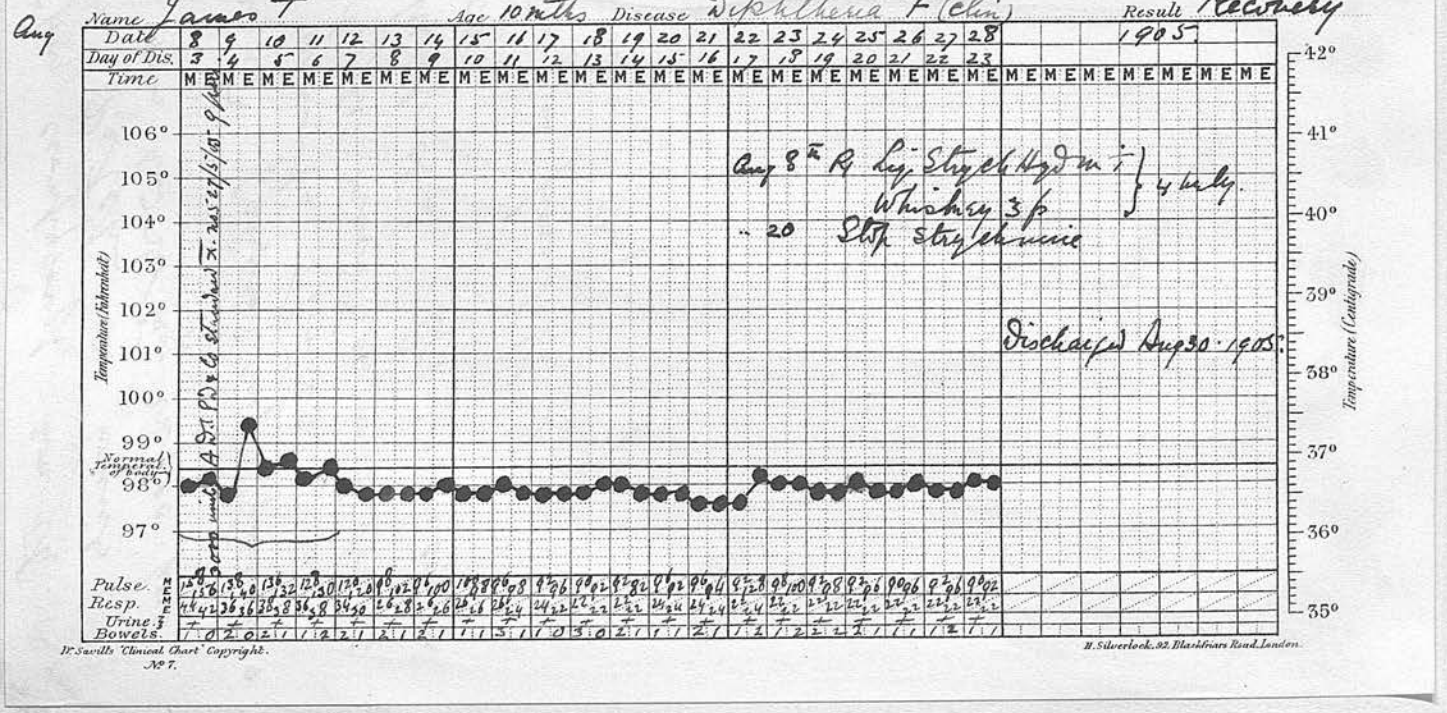
Case 7.


Name James T
Age 10 mths
Disease Diphtheria F (clin)
Result Recovery
1905.
Aug 8th R Liq. Strych Hyd m i } 4 hrly.
Whiskey 3 p
" 20 Strychnine
Discharged Aug 30. 1905.
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperature of body
Pulse
Resp.
Urine
Bowels.
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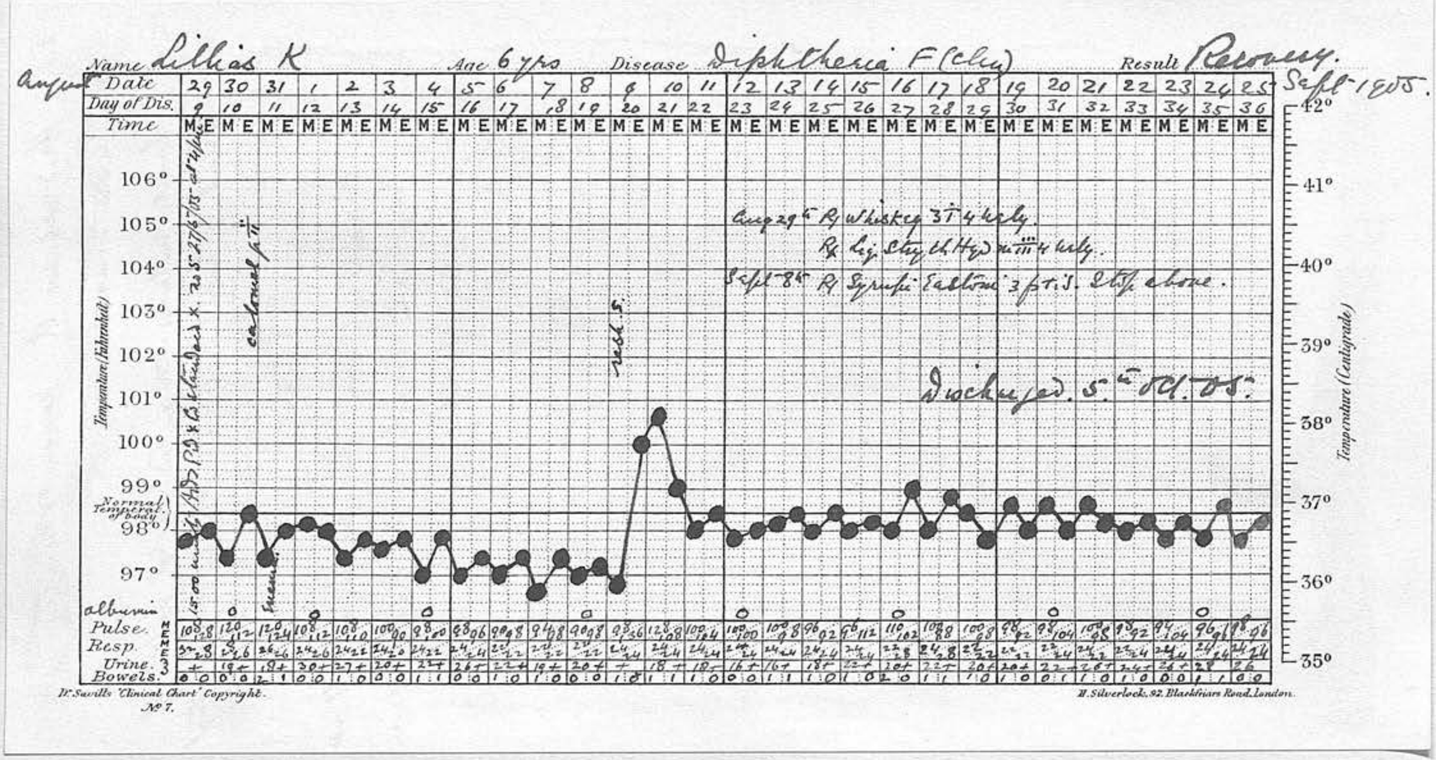
Case 6. August 3rd complained of head ache and sore throat. Admitted Aug 4th feverish. Diphtheritic membrane involved that part of the fauces on each side, lying behind the tonsils. The tonsils themselves, though inflamed, were free from membrane. No diphtheria bacilli could be found. 1500 units of antitoxin was injected and was followed by fairly rapid cleaning of fauces. 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 each tonsil. Uvula clear. 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 head-ache and nausea. Vomited. Admitted on

Case 8


Name Lillias K
Age 6 yrs
Disease Diphtheria F (Clin)
Result Recovery.
August
Sept 1905.
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
albumin
Pulse.
Resp.
Urine.
Bowels.
calomel
rash
Discharged 5th Oct. 05.
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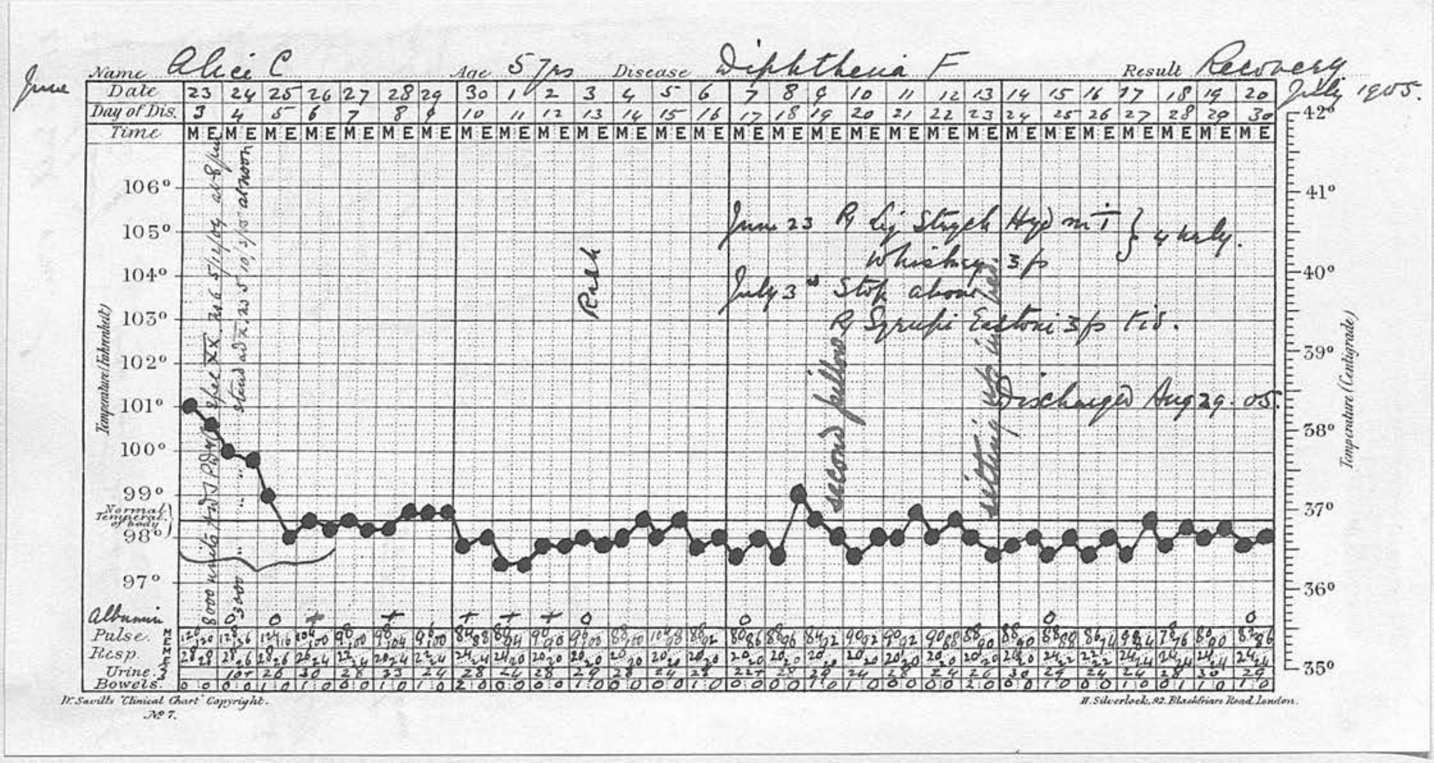
Aug 29th with enlarged congested tonsils. There was slight patching of right tonsil and of base of uvula, of a diphtheritic appearance. Mouth smelt like a diphtheria. 1500 units of antitoxin was injected and was followed by a rapid cleaning of the fauces. On Sept 9th an antitoxin rash of scarlatinal 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 faucial diphtherias of severe type. In each patient the organism of diphtheria was found present in the fauces.

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

Case 1.



June
Name Alice C
Age 5 yrs
Disease Diphtheria F
Result Recovery
July 1905.
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
June 23 R Liq Strych Hyd m i } 4 hrly.
Whiskey 3 j
July 3rd Stop above
R Syrupi Eastoni 3 j t.i.d.
Discharged Aug 29. 05.
Rash
second pillow
sitting up in bed
Albumin
Pulse.
Resp.
Urine.
Bowels.
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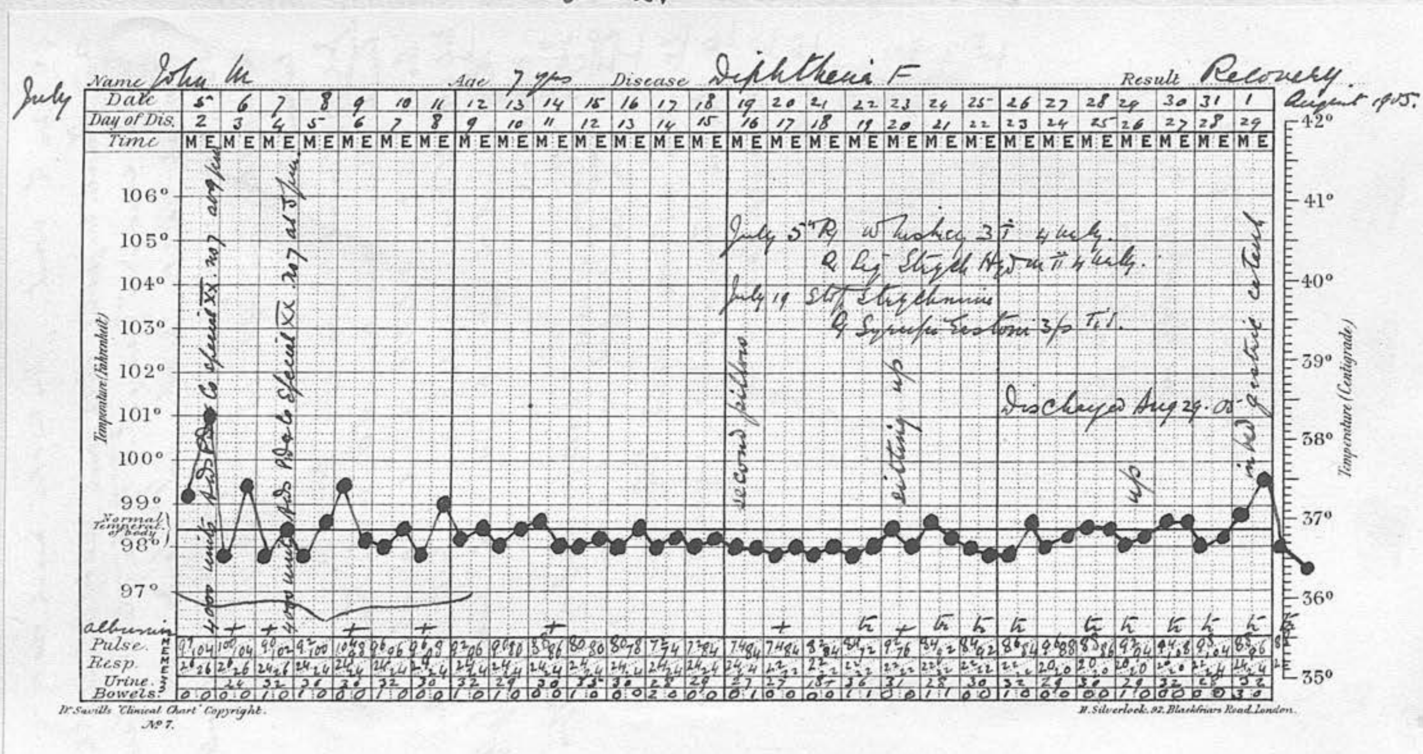
furred. A large amount of membrane was present on each tonsil and uvula. It extended forward on the right side on to the soft palate. Did not swab off easily. Smell from mouth very disagreable. 8000 units of antitoxin was given soon after admission. Next morning as the membrane had not receded and as the general symptoms had not improved a further dose of 3000 units was administered. The fauces then rapidly cleaned. From 22nd June to 2nd July there was copious albumin in 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, fauces congested,

Case 2.



July
Name John M
Age 7 yrs
Disease Diphtheria F
Result Recovery
August 1905.
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
second pillow
sitting up
Discharged Aug 29. 05
up
albumin
Pulse.
Resp.
Urine.
Bowels.
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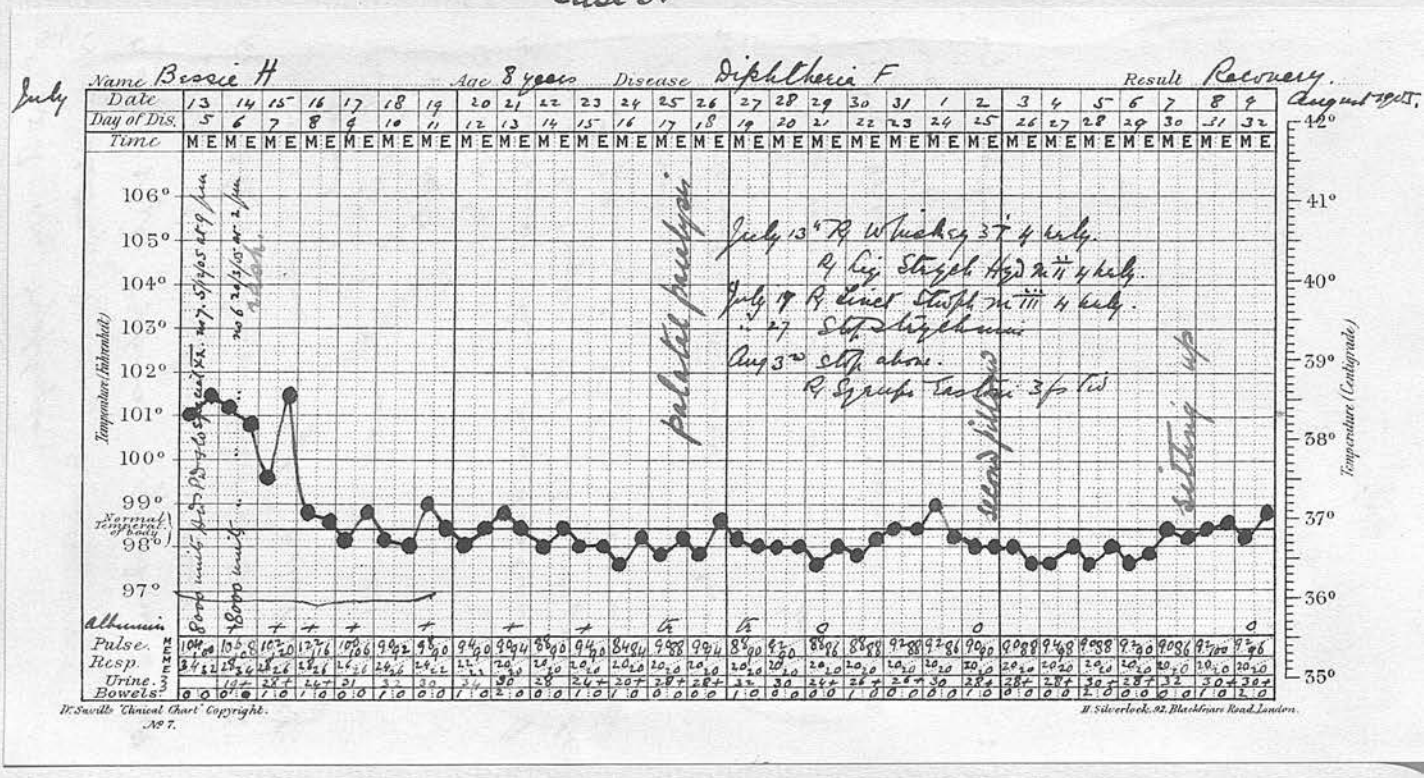
Each tonsil covered with diphtheritic membrane uvula clear. Enlarged glands in neck. Evil smell from mouth. 4000 units antitoxin given. July 6th albumin copious in urine, no blood. July 7th membrane, stationary on 6th, had now spread to uvula, 4000 units antitoxin again given. July 9th membrane thinner, glands in neck more enlarged. July 12th membrane had disappeared. Aug 3rd albumin disappeared from urine. Aug 6th Diplopia, slight palatal paralysis. Aug 14th Pulse became feeble and intermittent. Vomited once or twice. Pallid. Freely stimulated. Aug 15th pulse better. Aug 19th palatal paralysis more marked. Pulse good. Aug 26th palatal paralysis disappeared. On Aug 29th his fauces being clear of diphtheria bacilli, he was removed to his home. Always subject to gastric catarrh, he had two attacks of this disorder while in hospital, on Aug 1st and Aug 26th. His pulse was regular and good when he left.

Case 3. July 9th complained of sore throat, vomited. July 10th feverish. July 13th nose bled.

Case 3.



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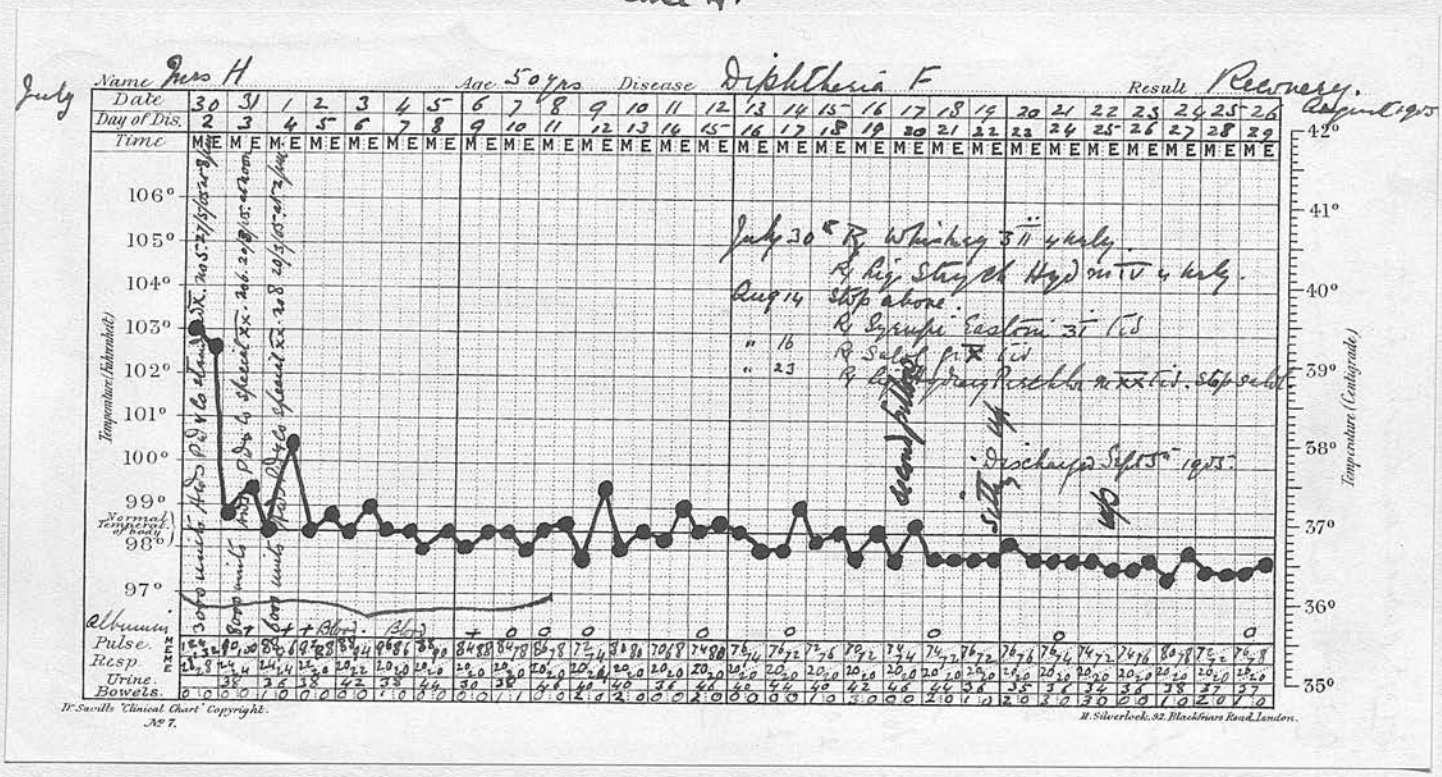
Admitted on 13th feverish, pale and poisoned. Slight dyspnoea present. Very offensive odour in breath. Thin yellow discharge from right nostril, which did not contain diphtheria bacilli. Right side of naso-pharynx, tonsil and uvula blocked with membrane. Some membrane on left tonsil. Marked enlargement of glands in neck. In her case 16,000 units of antitoxin, given in two doses, cleared the fauces of membrane. July 14th an erythematous antitoxin like rash appeared on legs. Very restless, given 15 gr. Na Br 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. July

Case 4.



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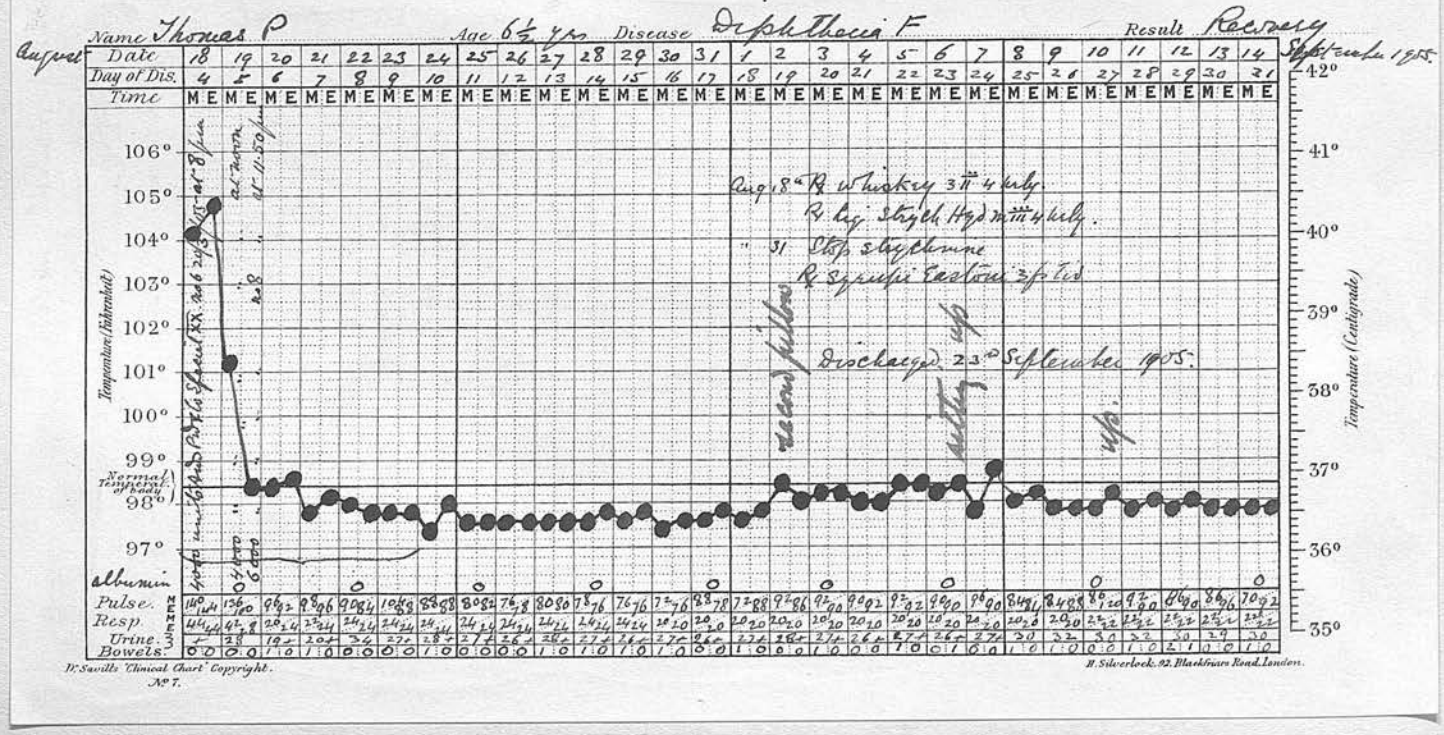
Case 5.



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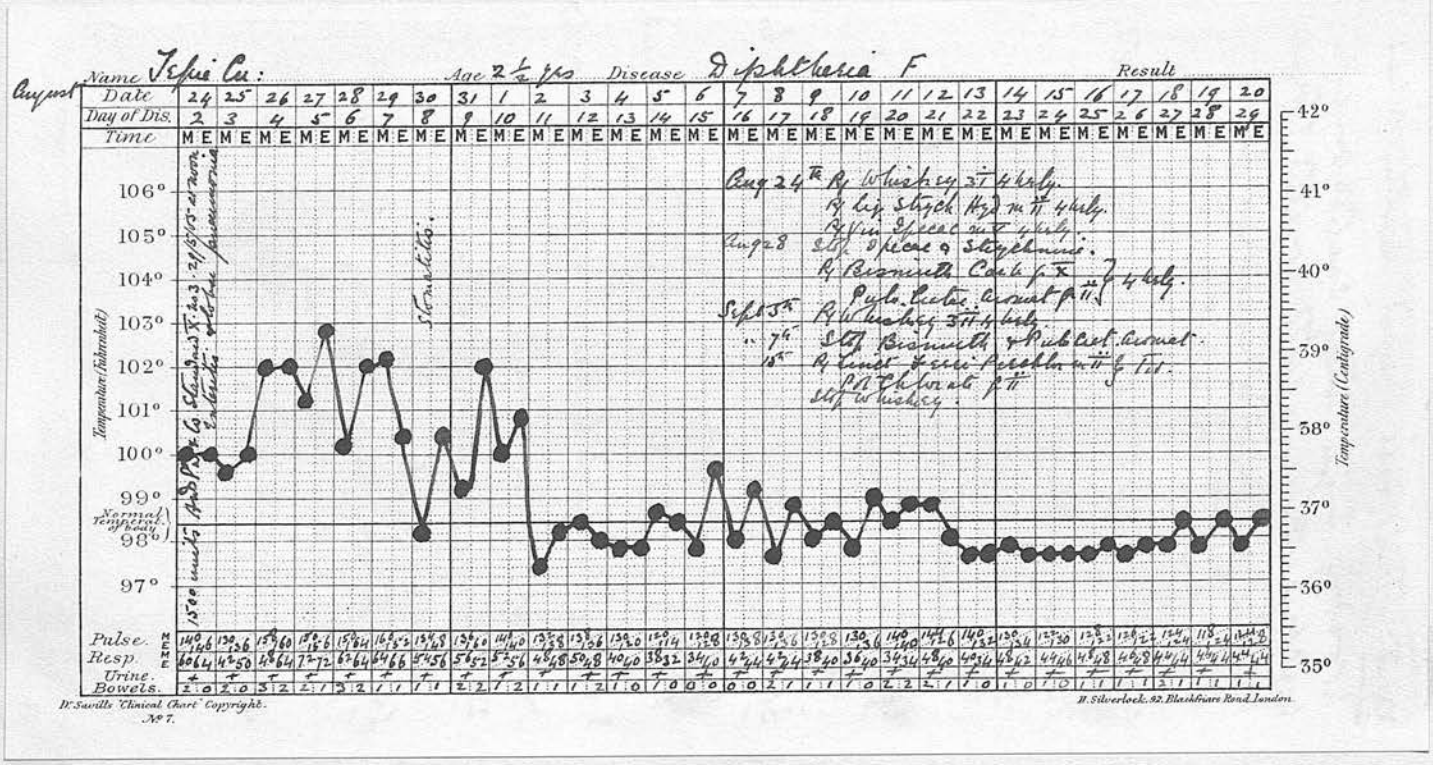
30th admitted with pyrexia. Small amount of membrane on left tonsil and on base of uvula. 3000 units of antitoxin given. July 31st very sharply ill, most disagreable smell from mouth. Blood and albumin in urine. 8000 units of antitoxin given. Membrane had spread to hard palate. Aug 1st Membrane stationary, 6000 units of antitoxin given. She 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 Liq Hydrarg Perchlor internally. This case would probably have been fatal had it not been caught early.

Case 5. Aug 15th complained of headache and sore throat. 17th vomited. Admitted on 18th markedly feverish, fauces congested, each tonsil thickly coated with membrane. Enlarged glands in neck. Evil smell from mouth. Aug 19th tongue dry and raw. Tonsils almost meeting in mid line. Aug 20 membrane disappearing and general condition much improved after 14,000 units

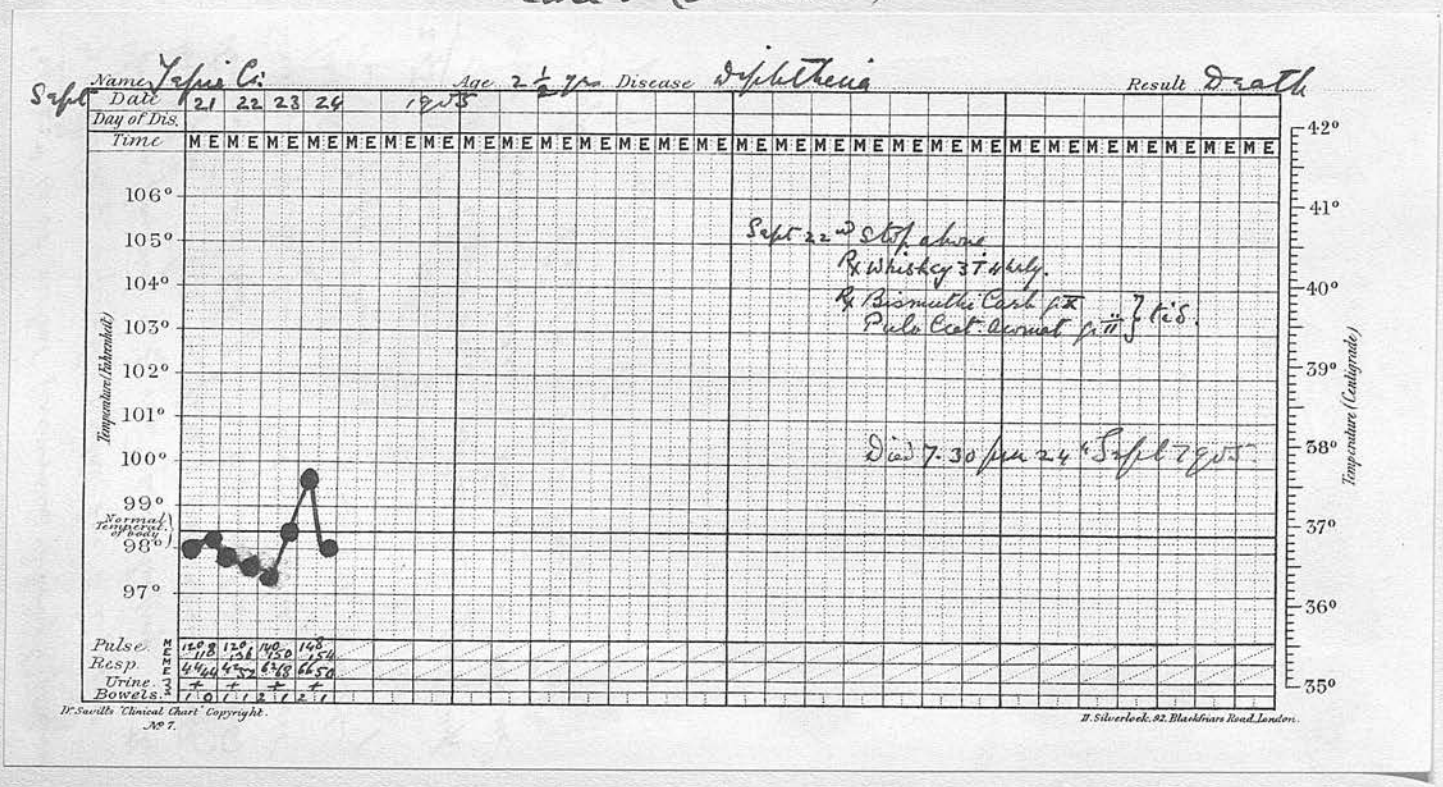
of antitoxin had been given in three doses. For three weeks he was a good deal prostrated, the pulse being soft and feeble, he then picked up slowly and made a satisfactory recovery.

Case 6. Poor house child. very badly nourished. Pale and ill, breathing rapid. Skin hot and dry. Lips cracked. Tongue dry and thickly furred. Fauces congested. Tonsils enlarged. On right a very small particle of membrane seen. Enteritis and lobar pneumonia left lung lower lobe, present. Given 1500 units antitoxin. Fauces cleared under this dose. Aug 26th Put on a diet of boiled milk and lime water. Aug 29th whole of left lung solid. Aug 30th crisis during night. Temperature rose again. Right cheek hard and swollen. A small ulcer situated on the inside of cheek. Swabbed with Tinct Myrrh. Aug 31st Face worse, ulcer swabbed with 5% sulphurous acid. Sept 2 very weak, local conditions improved. Sept 6th recrudescence of ulcerative stomatitis, sulphurous acid again used. Sept 15th had improved a little.

Case 6.



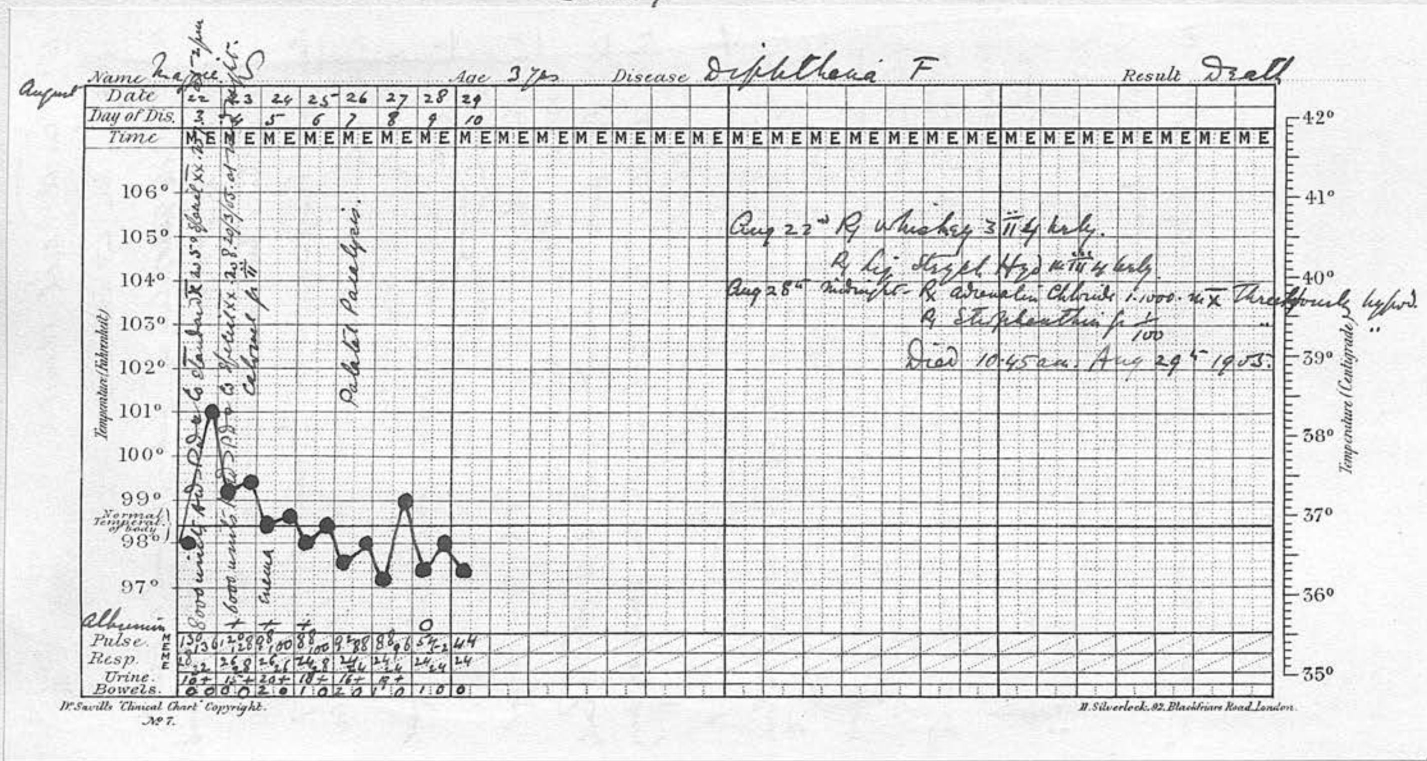
Case 6 (continued)



Sept 19th paroxysmal cough, no whoop or vomiting, had developed. Sept 23rd 10.45 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 Peptonised milk 3iv three hourly with whiskey 3i. 24th 1.45 pm a similar collapse took place. She revived after getting up some thick mucus. 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 enteritis gave considerable trouble. Complexion fair.

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

Case 7.



Name
Age 3 yrs
Disease Diphtheria F
Result Death
August
Date
22
23
24
25
26
27
28
29
Day of Dis.
3
4
5
6
7
8
9
10
Time
M E
106°
105°
104°
103°
102°
101°
100°
99°
Normal Temperat. of body
98°
97°
Temperature (Fahrenheit)
42°
41°
40°
39°
38°
37°
36°
35°
Temperature (Centigrade)
Albumin
Pulse.
Resp.
Urine.
Bowels.
Palatal Paralysis.
Enema
Aug 22nd R whiskey ʒ ii 4 hrly.
Died 10.45 am. Aug 29th 1905.
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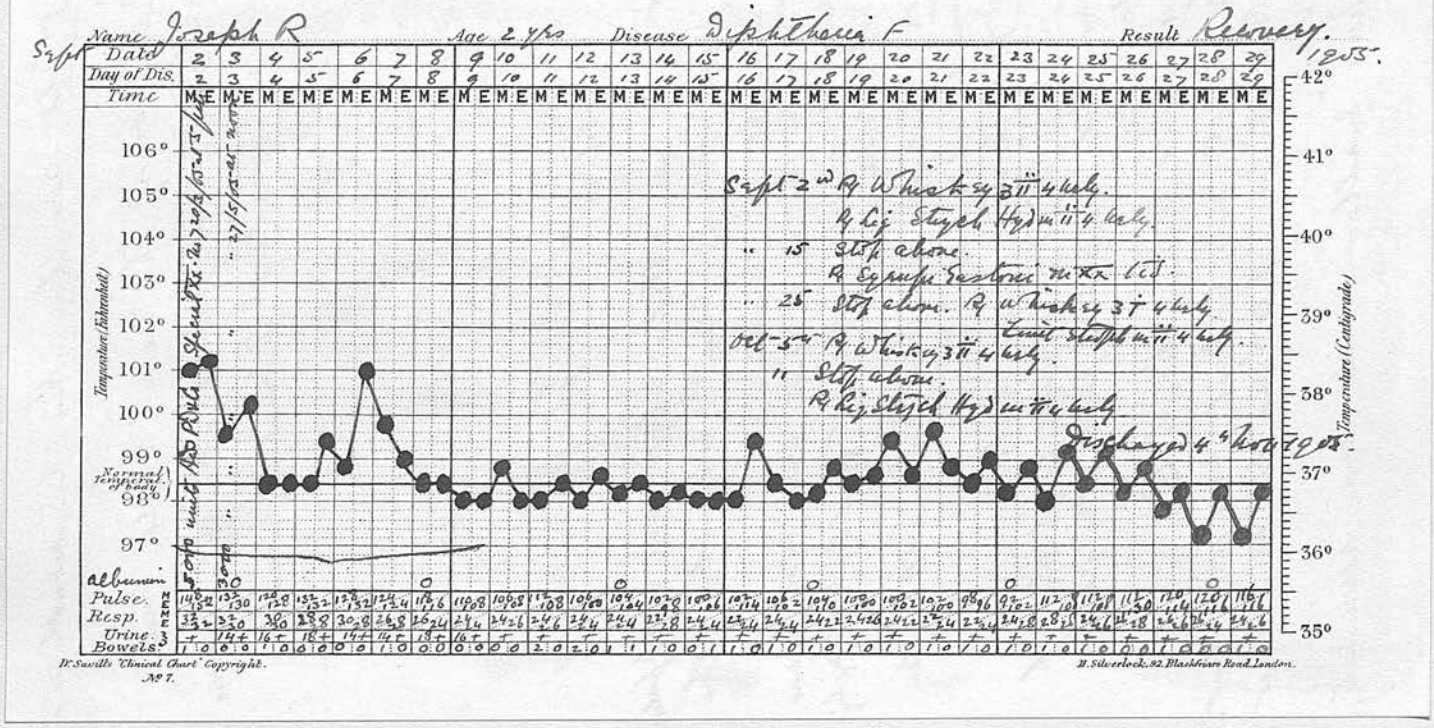
thin, pale and poisoned. Whole naso-
-pharynx blocked with membrane on a
bleeding base. Aug 24th 12,000 units
of antitoxin has been given. Membrane
coming away in large lumps. Colour
better. Aug 25th Pulse becoming feeble,
sometimes intermittent. Some nausea.
Aug 26th Palatal paralysis present. Aug
27th Paler, hands cold, pulse weaker.
Aug 28th Failing slowly, bad colour. Pulse
slow and feeble. No vomiting. at midnight
she seemed to be gradually dying. Pulse
slow and almost imperceptible at wrist.
Strychnini Hyd gr $\frac{1}{60}$ hypodermically produced
no effect. Adrenalin chloride (1 in 1000) m x
given hypod: three hourly. The first
injection rendered the pulse more
palpable at wrist for 30 minutes after
use, otherwise produced no apparent
effect. Strophanthini gr $\frac{1}{100}$ hypod: three hourly
was quite ineffective. She sighed 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.
The extremities were cold and the eyes a

Case 8



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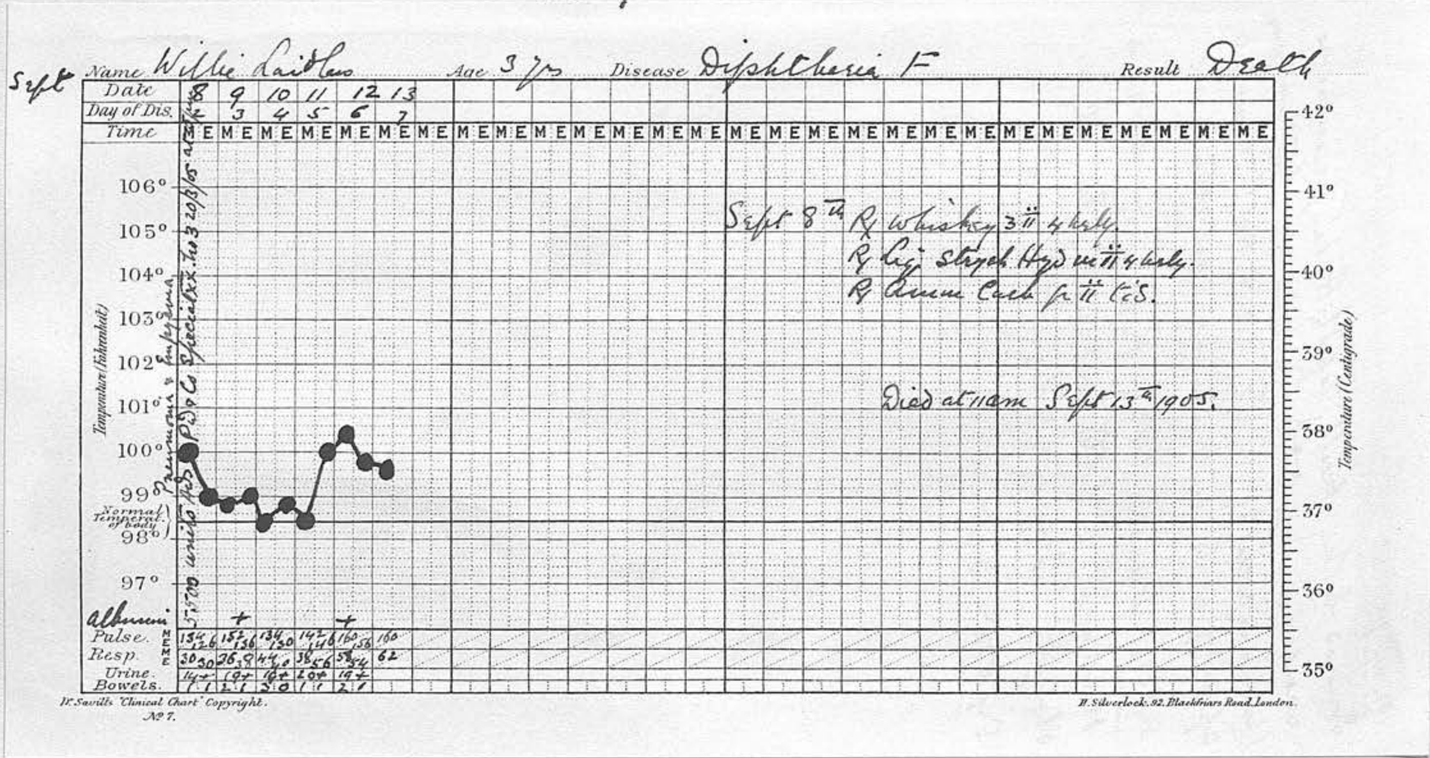
little vacant. Nutrient and stimulant enemata were given three hourly. At 7.30 am vomited. Pulseless at wrist. 10.45 am, 29th Aug, died. A typical case of heart failure. Nothing was of any lasting benefit in opposing this. She was a fair complexioned child.

Case 8. Sept 1st Complained sore throat. Sept 2nd admitted severely ill. Tonsils enlarged and congested. Right covered with membrane. Left partially covered. Uvula clear but oedematous. On same day was admitted patients 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 20 some bronchial catarrh. Sept 25th pulse weak, extremities cold, no vomiting and no restlessness. Freely stimulated with good result. Sept 28th Vomited. Pulse feeble. Colour good. Respirations sighing.

Case 9.


Sept Name Willie Laidlaw Age 3 yrs Disease Diphtheria F Result Death
Date 8 9 10 11 12 13
Day of Dis. 2 3 4 5 6 7
Time M E M E M E M E M E M E
106° 105° 104° 103° 102° 101° 100° 99° 98° 97°
Normal Temperat. of body
Temperature (Fahrenheit)
Albumin + +
Pulse 134 126 152 136 134 130 142 146 160 156 160
Resp. 30 30 26 38 44 40 38 56 58 54 62
Urine 14 + 19 + 16 + 20 + 19 +
Bowels 1 1 2 1 3 0 1 1 2 1
Pneumonia & Empyema
Sept 8th Rx Whiskey ʒii 4 hrly.
Rx Liq. Strych. Hyd. mii 4 hrly.
Rx Ammon Carb. gr ii t.i.d.
Died at 11 am Sept 13th 1905.
42° 41° 40° 39° 38° 37° 36° 35°
Temperature (Centigrade)
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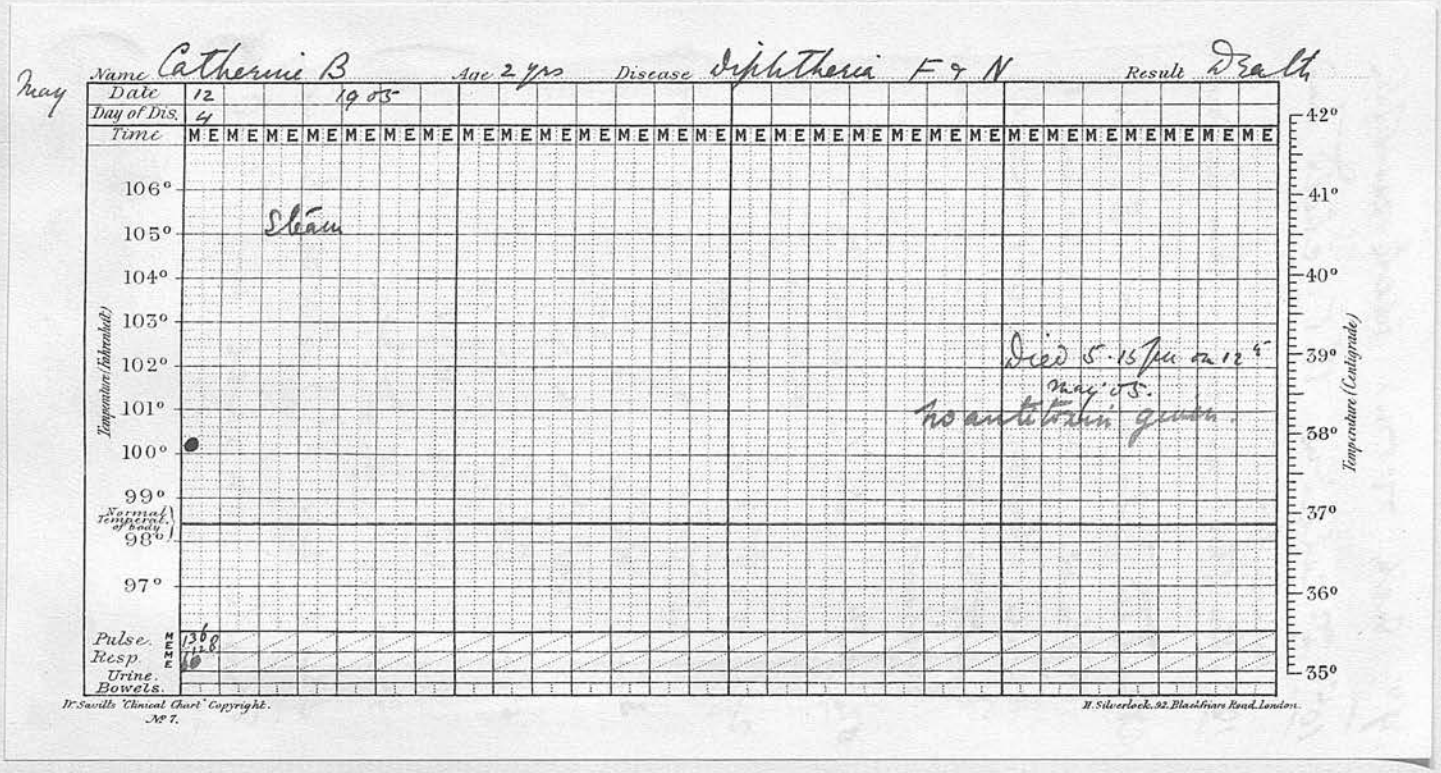
H. Silverlock. 92, Blackfriars Road, London.

Some palatal paralysis. Oct 3rd nasal fed, owing to difficulty in swallowing. Oct 5th right otorrhoea. Oct 7th palatal paralysis improving. Oct 10th left internal strabismus. Oct 12th slight cough after swallowing each mouthful, suggestive of paresis of pharyngeal constrictors. Oct 15th otorrhoea ceased. Lies listless. Oct 20th Strabismus more evident. Knee jerks absent. Each side of spinal column painted several times with Liq. Iodi. Nov 2nd no sign of any paralysis. Discharged on Nov 4th. A very anxious case. His brother died of cardiac failure on Sept 13th.

Case 9. Admitted on Sept 8th from Sick Childrens hospital. Has recently had pneumonia and on Sept 7th was operated on for left pneumococcal empyema. Looked ill and poisoned. Membrane covered uvula and spread to posterior pharyngeal wall. 5500 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


Name Catherine B
Age 2 yrs
Disease Diphtheria F & N
Result Death
Date 12
1905
Day of Dis. 4
Time M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E
106°
105°
104°
103°
102°
101°
100°
99°
Normal Temperat. of body
98°
97°
Temperature (Fahrenheit)
Steam
Died 5.15 pm on 12th May '05.
No antitoxin given.
Pulse. M 130 E 128
Resp. M E 46
Urine.
Bowels.
42°
41°
40°
39°
38°
37°
36°
35°
Temperature (Centigrade)
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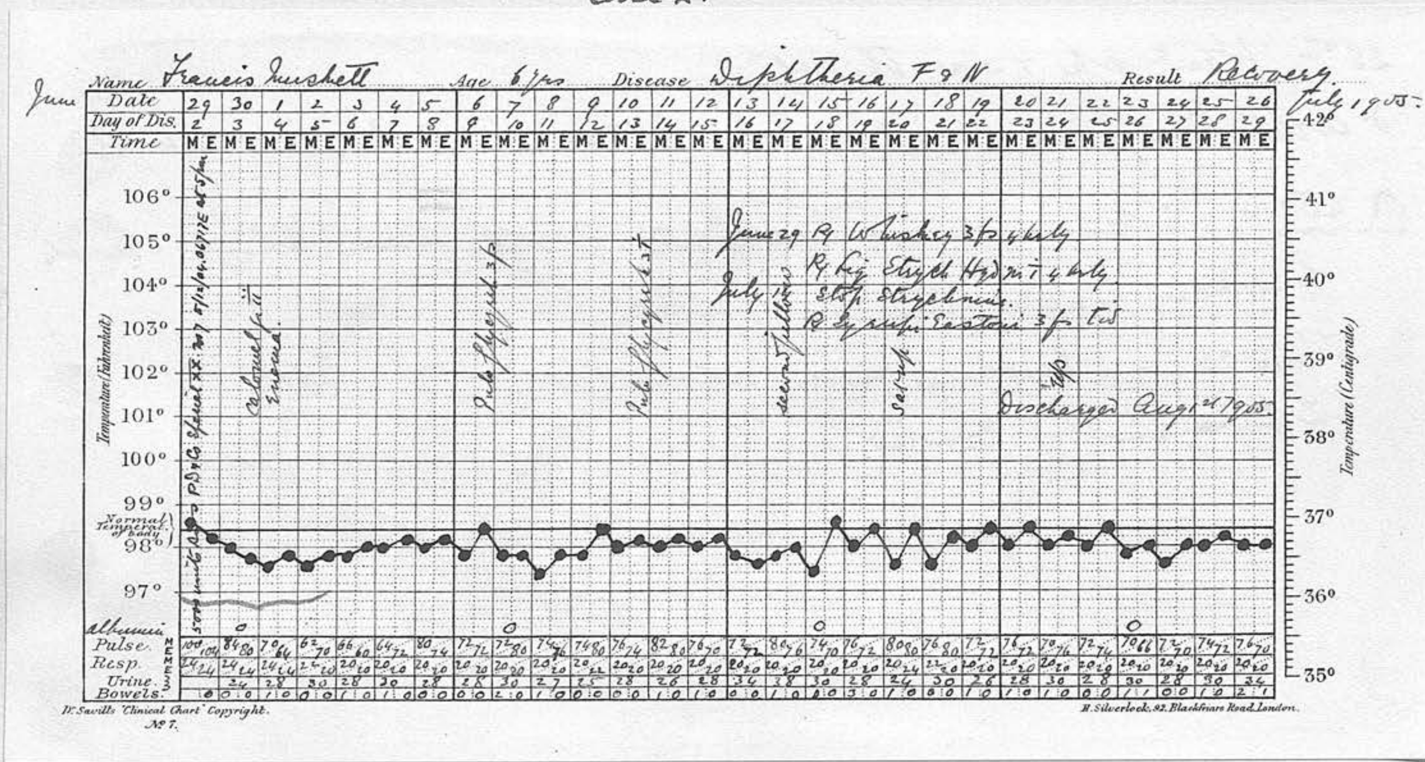
B. The following cases include those of faucial and nasal diphtheria combined.

In each patient the bacillus of diphtheria was found present both in the fauces and in the nose.

Case 1. 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 discharge. Mouth very dirty, whole naso pharynx blocked with membrane. She was put under steam and a hypodermic of strychnine given. No improvement. at 2 pm adrenalin chloride mx 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.


Name Francis Muskett
Age 6 yrs
Disease Diphtheria F & N
Result Recovery
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Pulse.
Resp.
Urine.
Bowels.
Discharged Aug 1st 1905.
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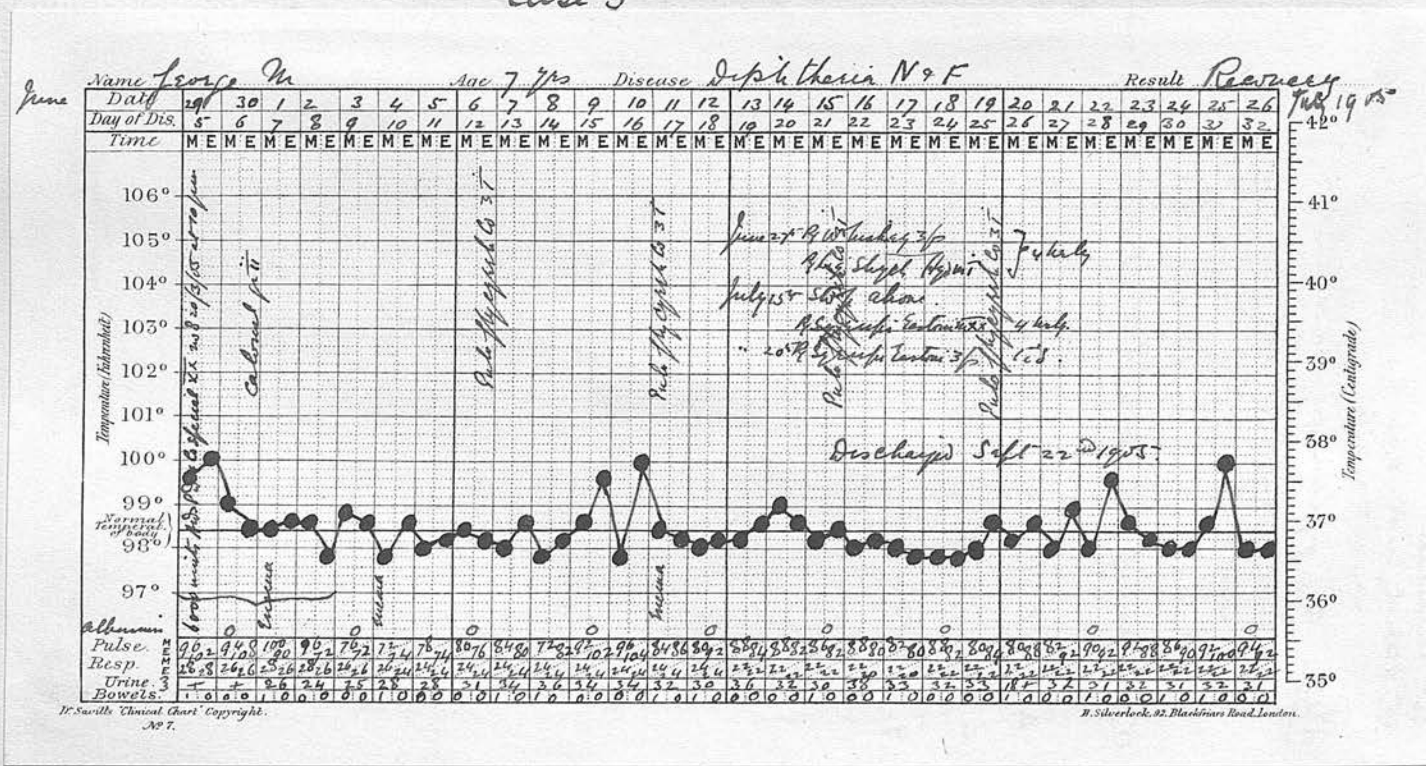
Case 3


Name George M
Age 7 yrs
Disease Diphtheria N & F
Result Recovery
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Pulse.
Resp.
Urine.
Bowels.
Discharged Sept 22nd 1905.
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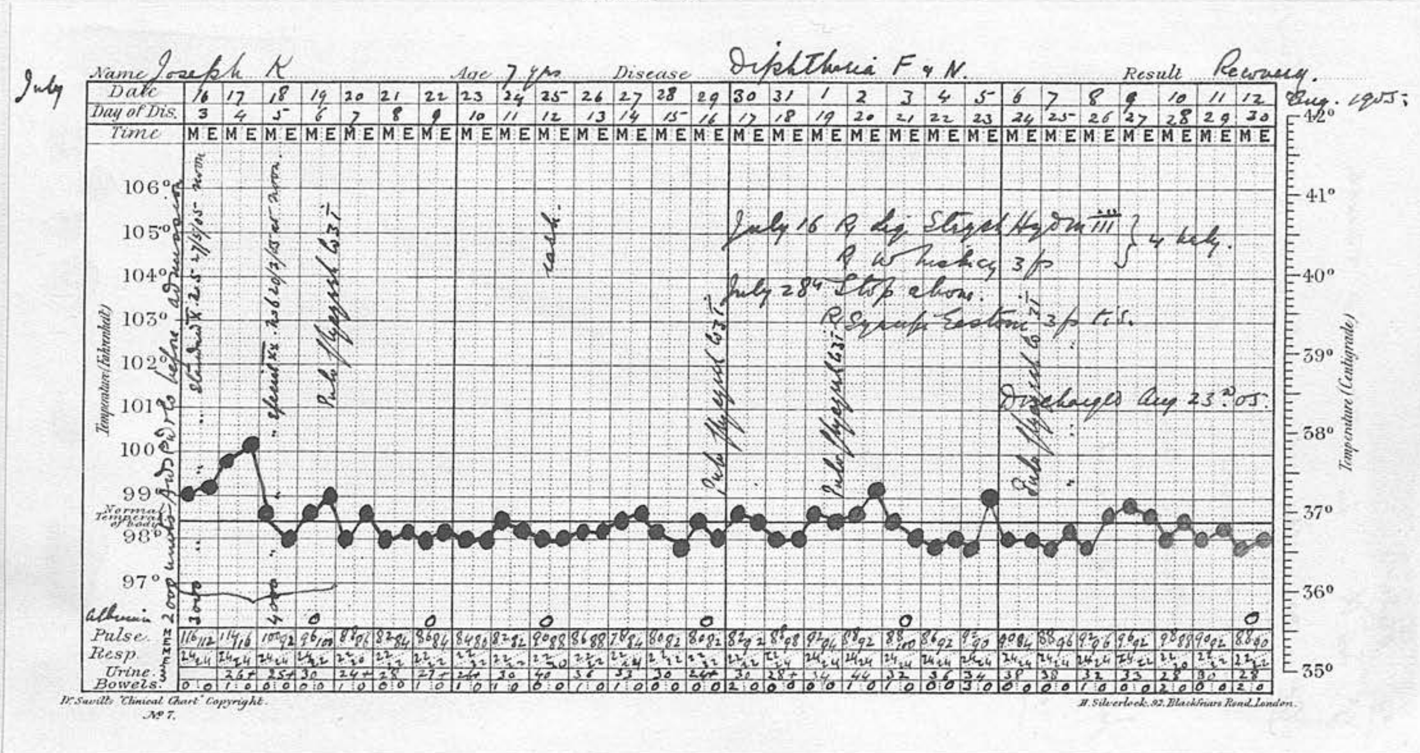
Case 2. June 28 complained of headache and sore throat. Doctor called in who suspected diphtheria and took a swab. June 29th admitted with thin sanious discharge proceeding from each nostril, with general faucial congestion and with membrane covering each tonsil. 5000 units rapidly cleared up the local conditions and he made an excellent recovery.

Case 3. June 23rd rhinorrhoea noticed. 25th headache, sore throat and vomiting. Admitted on 29th generally depressed, with thin bilateral nasal discharge, with congestion of fauces and with membrane covering each tonsil. 6000 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 otorrhoea present. He left cured and free of diphtheria bacilli on Sept 22nd.

Case 4.


Name Joseph K
Age 7 yrs
Disease Diphtheria F & N.
Result Recovery.
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Normal Temperature of body
Temperature (Centigrade)
Albumin
Pulse.
Resp.
Urine.
Bowels.
July 16 R Liq Strych Hyd m iii } 4 hrly.
R Whiskey 3 p
July 28th Stop above.
R Syrup Easton 3 p t.i.s.
Discharged Aug 23rd 05.
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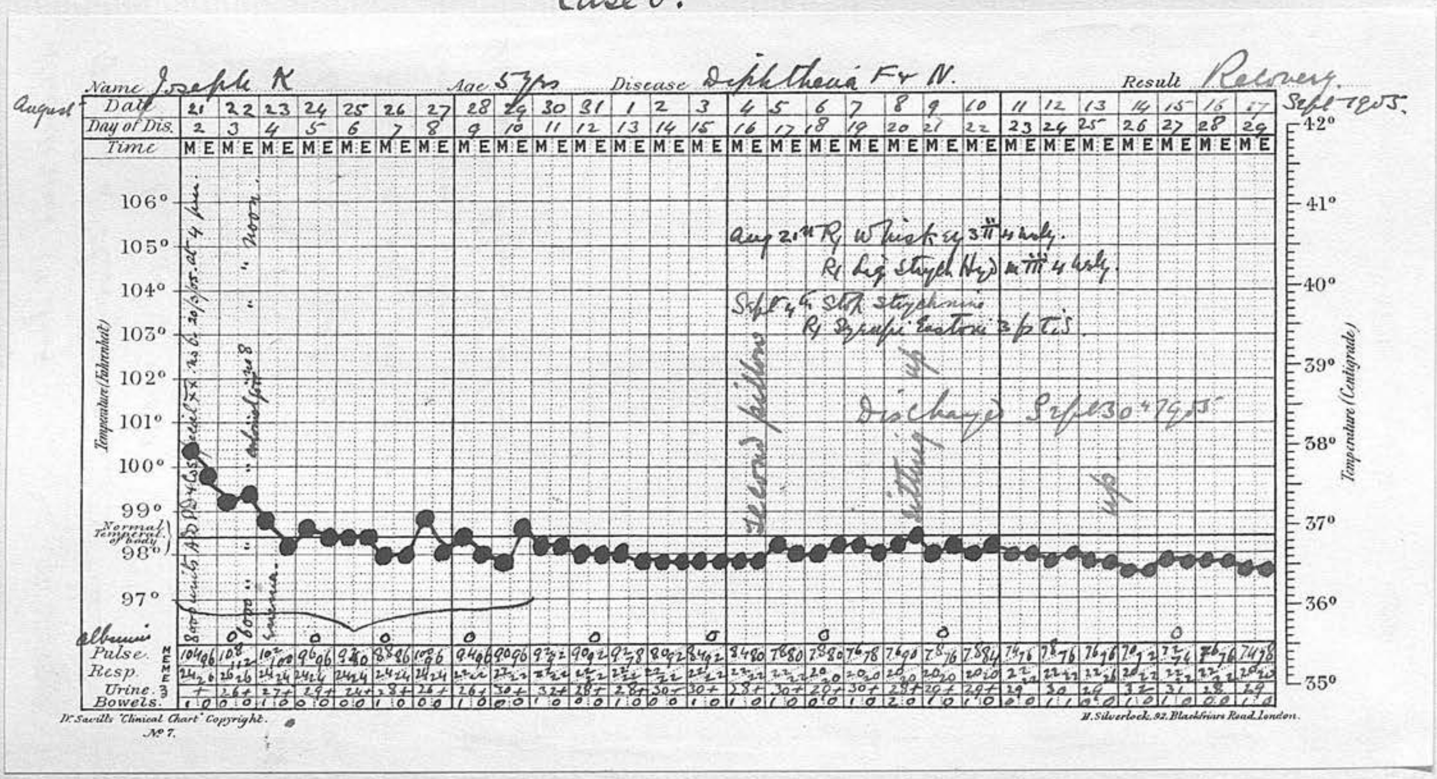
Case 5.


Name Joseph K
Age 5 yrs
Disease Diphtheria F & N.
Result Recovery.
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Normal Temperature of body
Temperature (Centigrade)
Albumin
Pulse.
Resp.
Urine.
Bowels.
Aug 21st R Whiskey 3ii 4 hrly.
R Liq Strych Hyd m iii 4 hrly.
Sept 4th Stop strychnine
R Syrupi Eastoni 3 p t.i.s
Discharged Sept 30th 1905.
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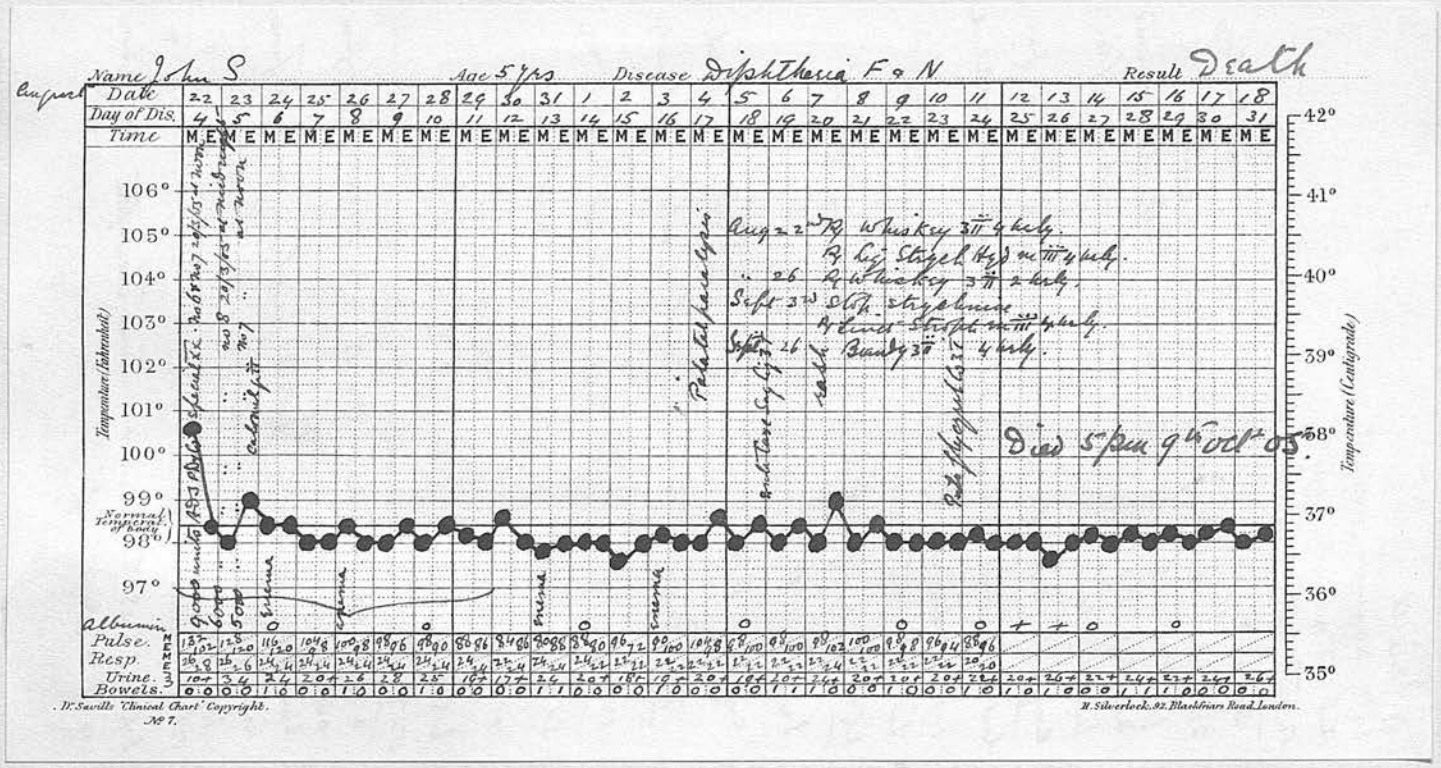
Case 4. July 13th headache. 14th sore throat. Admitted on 16th sharply ill, bilateral nasal discharge, membrane on each tonsil. 2000 units of antitoxin had been given before admission. 3000 units given on admission. On 18th July membrane still stationary - 4000 units injected with good result. On 25th 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. Saneous discharge from left, purulent from right, nostril. Membrane covered each tonsil. Tongue raw and dry. 14 000 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


Name John S.
Age 5 yrs.
Disease Diphtheria F. & N.
Result Death
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
Albumin
Pulse.
Resp.
Urine.
Bowels.
Died 5 pm 9th Oct 05.
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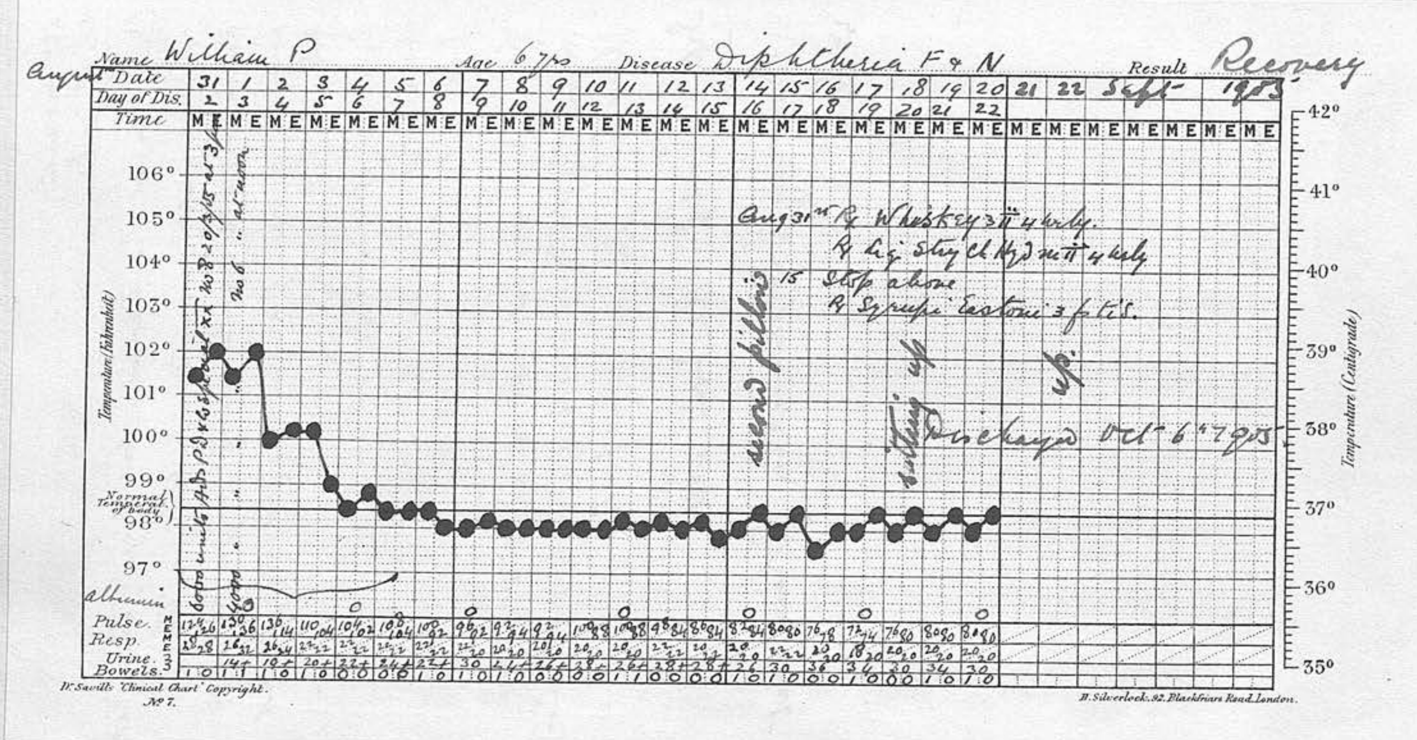
Case 6. Aug 19th sore throat. Aug 20th nausea and vomiting. Aug 22nd admitted very ill. Face pale and earthy looking. Marked diphtheritic smell present. Lips and tongue dry and raw. Sanious nasal discharge. Neck swollen. Membrane visible on edge of soft palate, also upon uvula and tonsils. 20,000 units of antitoxin was given in 24 hours. Aug 24th Nostrils oozing with blood the last 36 hours, now plugged with wool soaked in adrenalin chloride (1 in 1000). Taking fluids well. Pulse keeps good but he looks poisoned. Aug 25th Pulse weaker, nostrils still oozing blood. Aug 29th bleeding all ceased. Pulse very weak. Sept 2nd very pale. vomited once. Sept 5th Palatal paralysis has appeared. Sept 7th morbilliform antitoxin rash. Sept 12th Has been very somnolent for 10 days - sleeping most of 24 hours. very dull pale and feeble. no appetite. albumin appeared in urine. Sept 14th albumin away. Sept 20th very slow progress. Pulse still feeble. Oct 7th in much the same feeble condition. Oct 8th albumin profuse in urine, no blood.

Case 7


Name William P
Age 6 yrs
Disease Diphtheria F & N
Result Recovery
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
albumen
Pulse.
Resp.
Urine.
Bowels.
Discharged Oct 6th 1905
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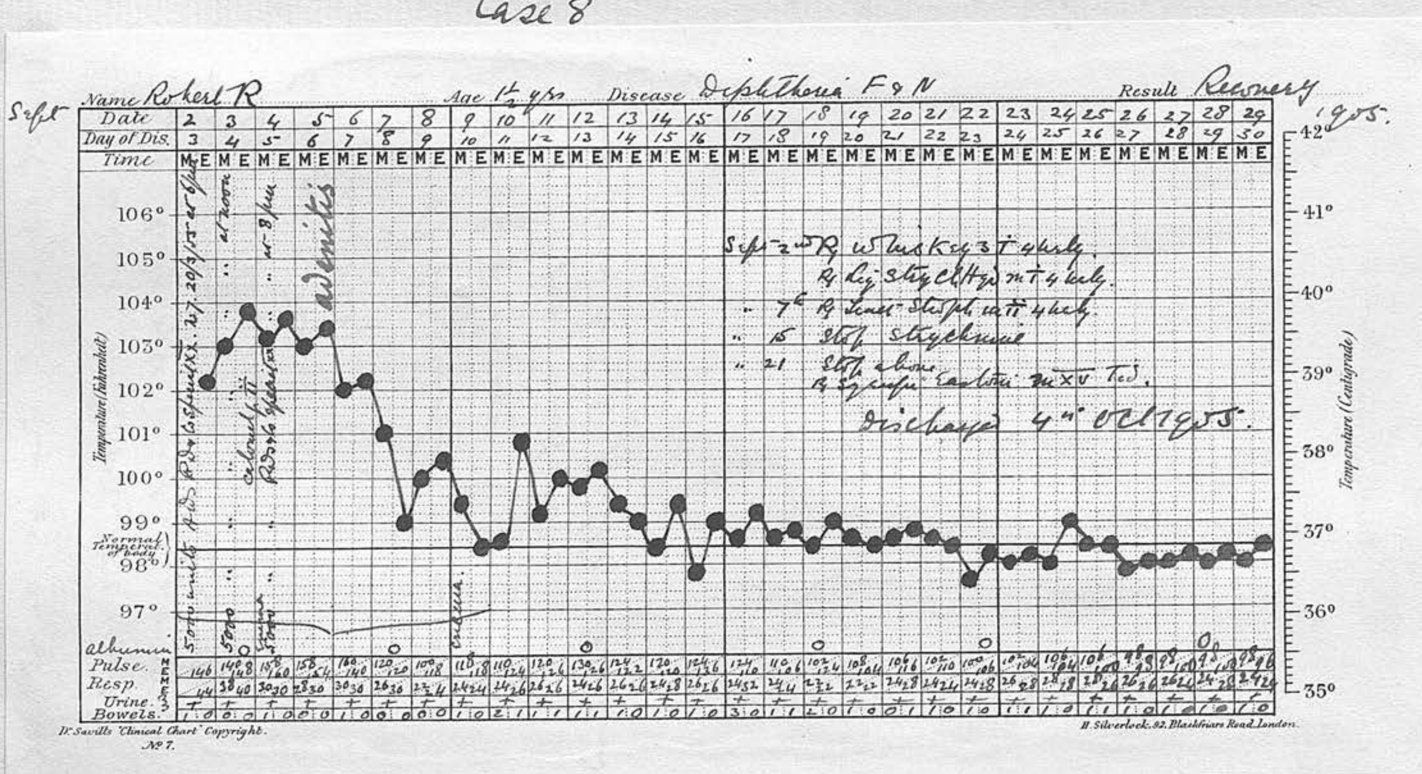
Case 8


Name Robert R
Age 1½ yrs
Disease Diphtheria F & N
Result Recovery
1905
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
albumen
Pulse.
Resp.
Urine.
Bowels.
Discharged 4th Oct 1905.
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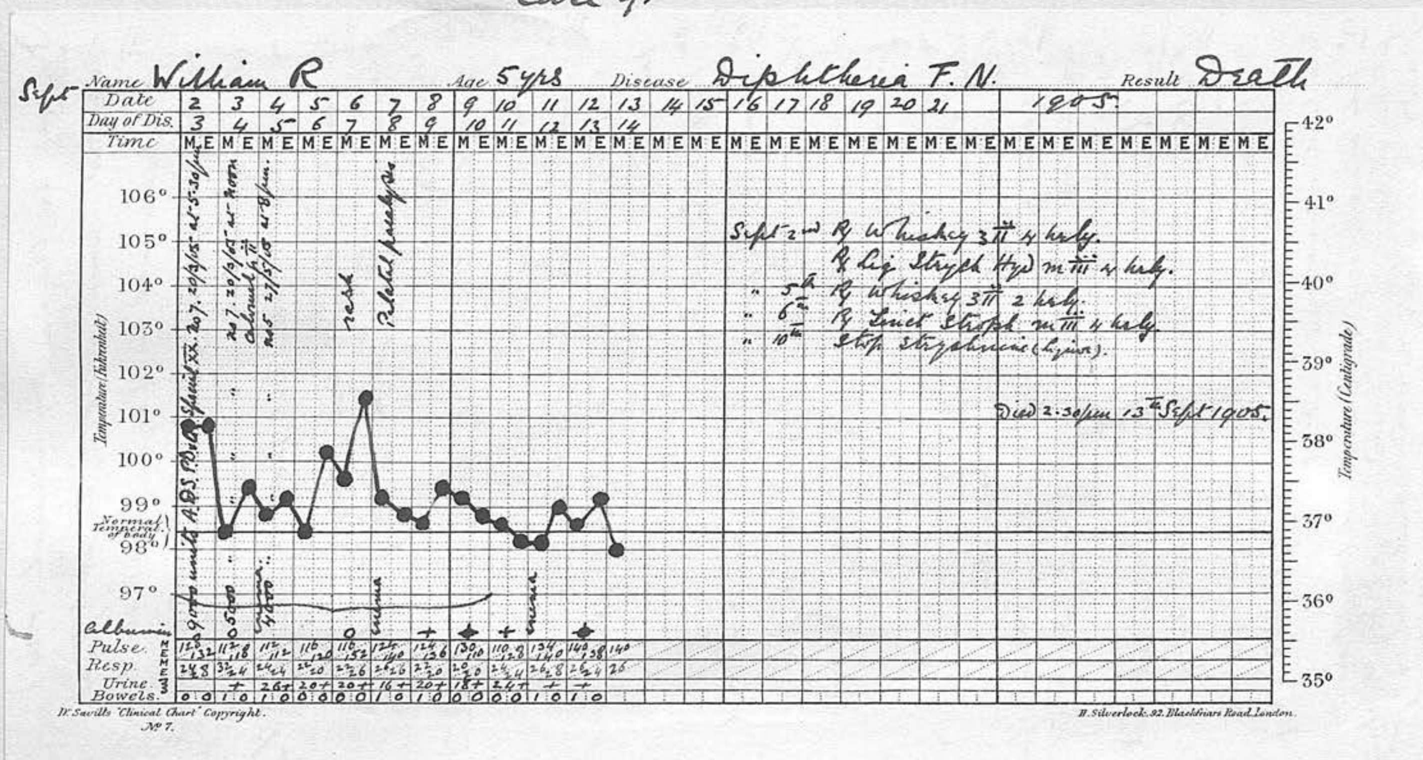
Palatal paralysis still present. Left internal strabismus appeared to day. 3.30 pm some twitching of mouth. Could not swallow. Profuse salivation. 8 pm - fauces congested. Pulse 108. Oct 9th gradually sank and died apparently of heart failure. Complexion fair.

Case 7. Aug 28th out of sorts. Aug 31st sore throat - admitted sharply ill, right eye shews spasmodic squint, gland at angle of jaw enlarged. Tongue dry and furred. Fauces congested and dirty. Thin membrane on each tonsil. Purulent nasal discharge. 10,000 units of antitoxin relieved the local conditions. He did well and recovered rapidly.

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.


Name William R
Age 5 yrs
Disease Diphtheria F. N.
Result Death
Date
Day of Dis.
Time
1905
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of Body
Pulse
Resp.
Urine
Bowels
Sept 2nd R Whiskey ʒii 4 hrly.
R Liq. Stryph Hyd m iii 4 hrly.
" 5th R Whiskey ʒii 2 hrly.
" 6th R Liq. Stryph m iii 4 hrly.
" 10th Stop Strychnine
Died 2.30 pm 13th Sept 1905.
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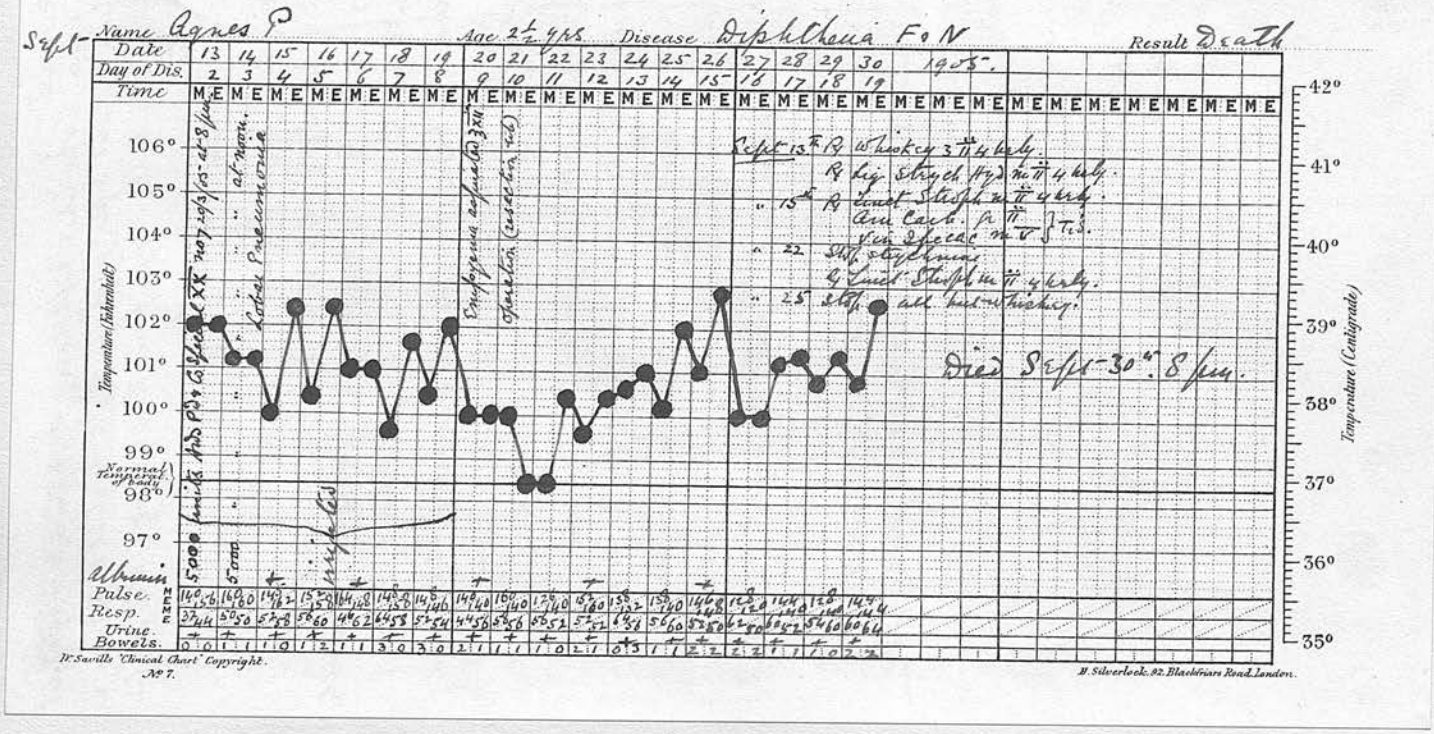
Case 9. The brother of case 8, see severe faucial series. Took ill on Aug 31st. Sore throat Sept 1st Admitted Sept 2nd severe case, pale face. Evil smell from mouth. Glands in neck enlarged. Copious purulent nasal discharge. Pulse feeble. Fauces contained much muco pus. Membrane on each tonsil. Some 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 9000 had to be given to cause disappearance of membrane. Sept 6th Scarlatiniform antitoxin rash appeared near injection point. Sept 6th Palatal paralysis. Paler. Pulse quicker. More listless. Sept 8th Weaker. Sept 10th vomited 10.15 pm. Pulse much worse. Hands cold. Restless. 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 11th 12.15 am adrenalin Chloride m x hypod. Pulse improved again in a few

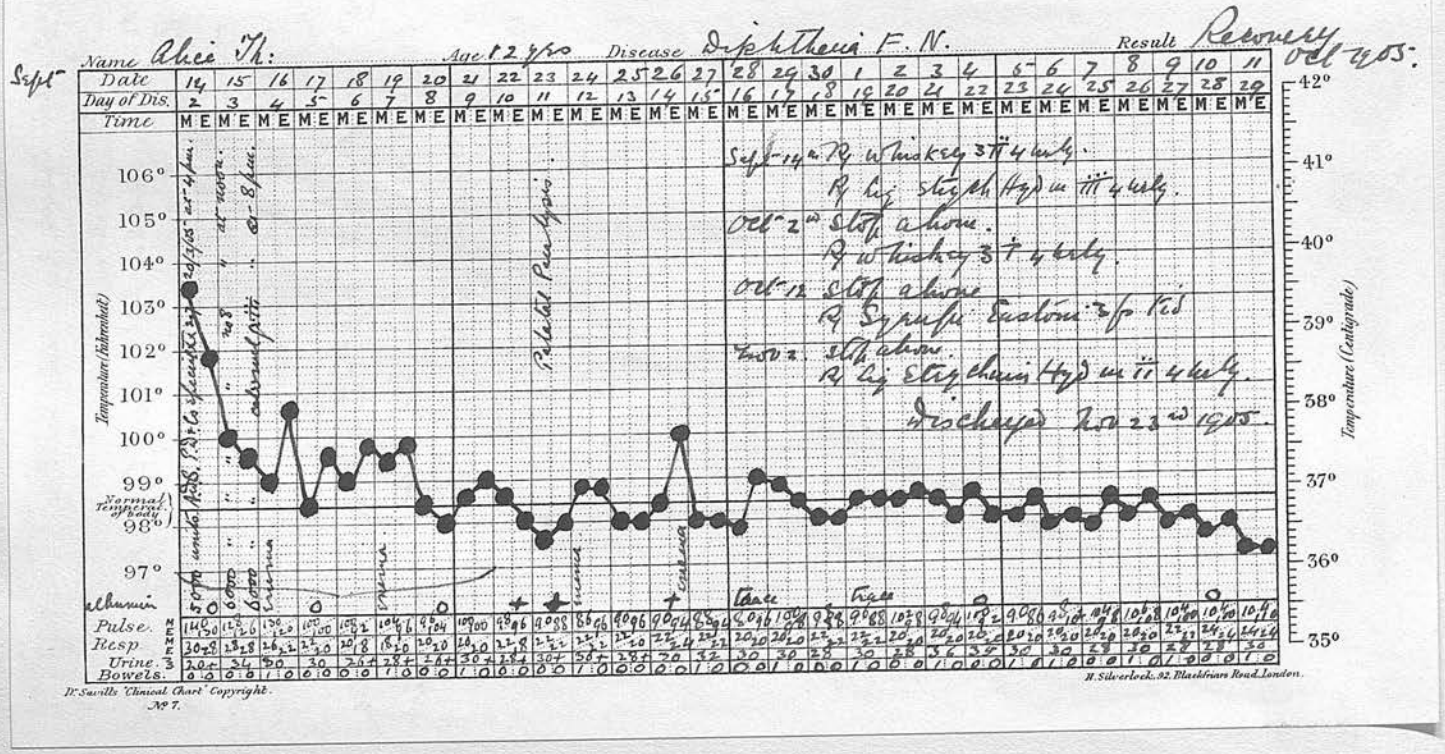
seconds, but not quite so noticeably as after previous dose. Three hourly injections of Adren. Chloride m v and Strychnin: Hyd: gr $\frac{1}{60}$ vel Strophanthin gr $\frac{1}{100}$ ordered.
11 am. No more vomiting. Pulse still very feeble. Has slept a little. 12th Sept had a restless night. Rectal feeding. Fair 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. Mustard leaf and hot precordial fomentations. All useless. Died 2.30 pm. Complexion dark.

Case 10. Admitted Sept 13th Pale and ill. Smells like a diphtheria. Right tonsil discharging and bleeding a little. Back of uvula and soft palate covered with membrane. Sept 14th Pale and poisoned. 10,000 units of antitoxin has

Case 10



Case 11



been given. Local conditions improved. Right base of lung involved with lobar pneumonia. 15th Bad night. Cold at times. Given whiskey frequently. Brighter this morning. 16th Better night. Herpes on lips. Troubled with diarrhoea. 19th not so well. 20th Troublesome short cough. Right base duller, suggested fluid. Right pleura explored and aspirated ℥ x ii of pus, pneumococcal, removed. Breathing relieved. 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. Medium complexion neither dark nor fair.

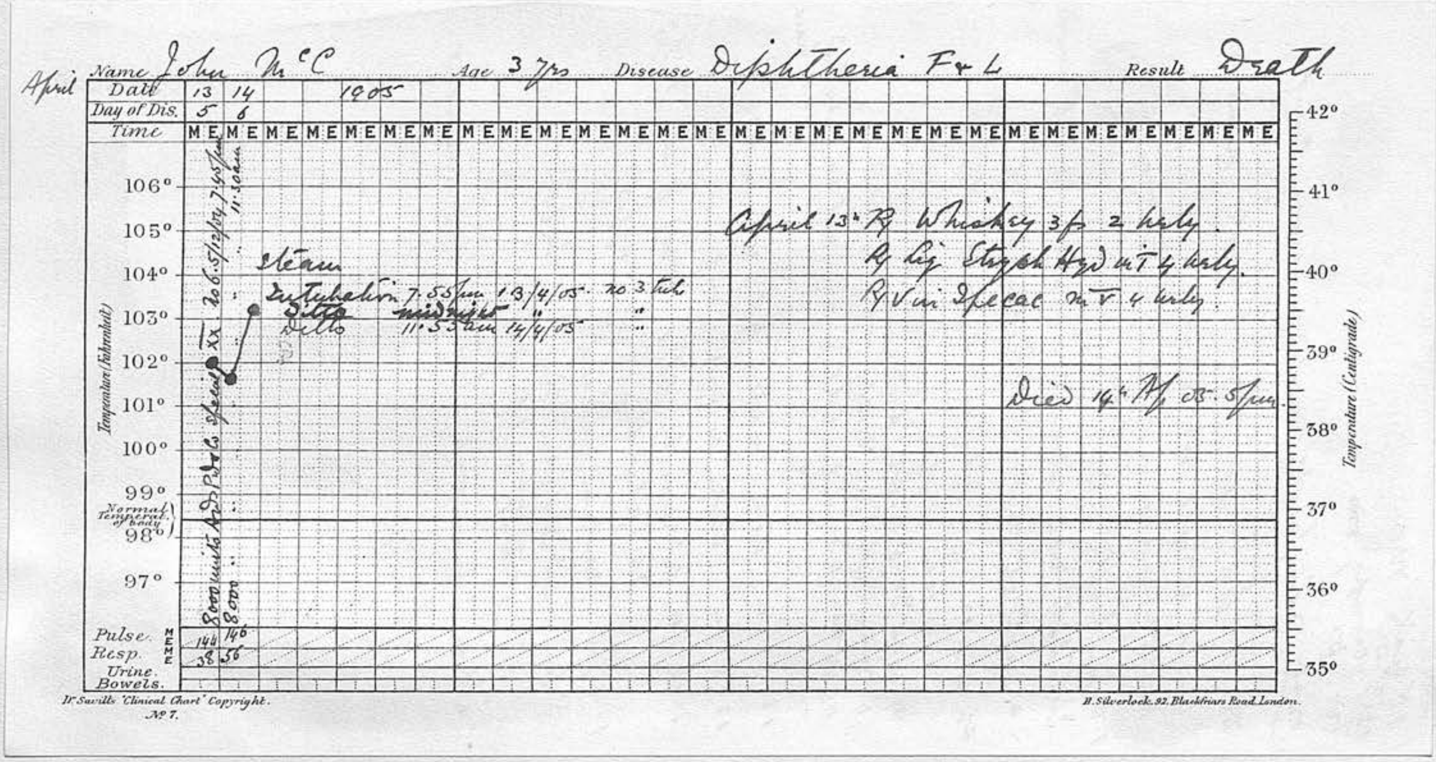
Case II. Sept 13th Shivering, headache, pain in back and sore throat. Admitted on 14th Pyrexia, diphtheritic smell, Uvula much swollen and congested. Tonsils enlarged and covered with thin membrane, extending to soft palate. Nasal discharge. A severe case. 15th membrane spread with great rapidity, invaded hard palate. 17,000 V

units of antitoxin checked spread. Sept 22 albumin copious in urine. Sept 23rd 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.

C. 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 epigastrium and intercostal spaces. Croupy cough. General faucial congestion. Membrane covered each tonsil and right side of uvula. Ill kempt and nourished. Put under steam 8000 units of antitoxin

Case 1.


April
Name John McC
Age 3 yrs
Disease Diphtheria F & L
Result Death
Date 13 14 1905
Day of Dis. 5 6
Time M E M E M E
106° 105° 104° 103° 102° 101° 100° 99° 98° 97°
Normal Temperat. of body
Temperature (Fahrenheit)
42° 41° 40° 39° 38° 37° 36° 35°
Temperature (Centigrade)
Steam
Intubation 7.55 pm 13/4/05
Ditto midnight
Ditto 11.55 am 14/4/05
April 13th Rx Whiskey 3 p 2 hrly.
Died 14th Ap/05. 5 pm
Pulse. 144 146
Resp. 38 56
Urine.
Bowels.
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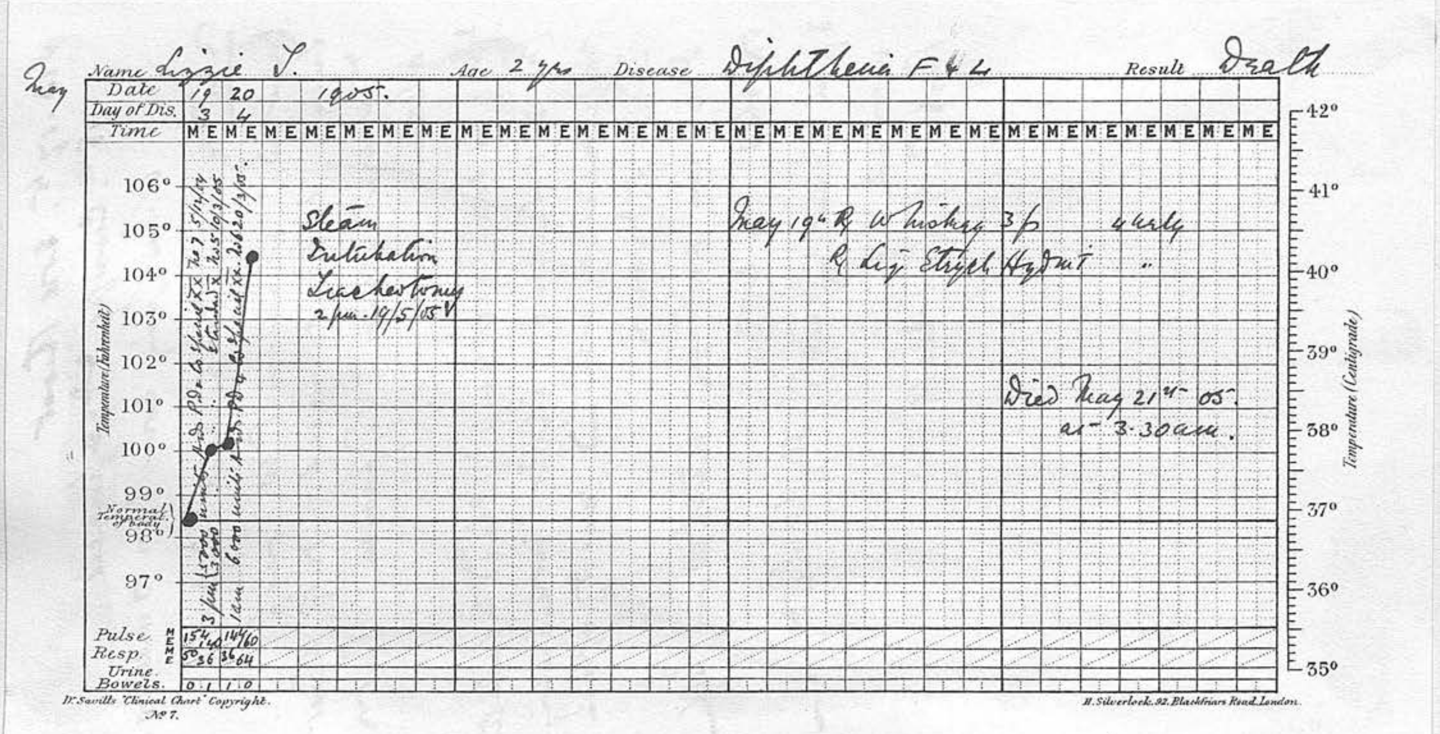
given intravenously. 7.55 pm breathing worse. Intubated with no 3 vulcanite tube. As the child immediately shewed signs of suffocation, the tube was pulled out, whereupon a complete cast of the trachea in membrane was coughed up. At mid-night breathing again very bad, no 3 metal intubation tube then inserted. Breathing improved a little. Ap 14th 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 gr 1/150 hypod; also adrenalin chlorid (1.1000) m VIII hypod. Temporary and very slight improvement produced. 11.55 am no 3 metal intubation tube again inserted. 12.50 pm. Tube coughed out having given little relief. Several further doses of adrenalin chloride were given, saline enemata, strophanthin and atropine 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.


May
Name Lizzie S.
Age 2 yrs
Disease Diphtheria F & L
Result Death
Date 19 20 1905.
Day of Dis. 3 4
Time M E M E M E
106° 105° 104° 103° 102° 101° 100° 99° Normal Temperat. of body 98° 97°
Temperature (Fahrenheit)
42° 41° 40° 39° 38° 37° 36° 35°
Temperature (Centigrade)
Steam
Intubation
Tracheotomy
2 pm. 19/5/05
May 19th R Whisky 3 j 4 hrly
R Liq Strych Hydrat "
Died May 21st 05.
at 3.30 am.
Pulse 154 140 144 160
Resp. 50 36 36 64
Urine.
Bowels. 0 1 1 0
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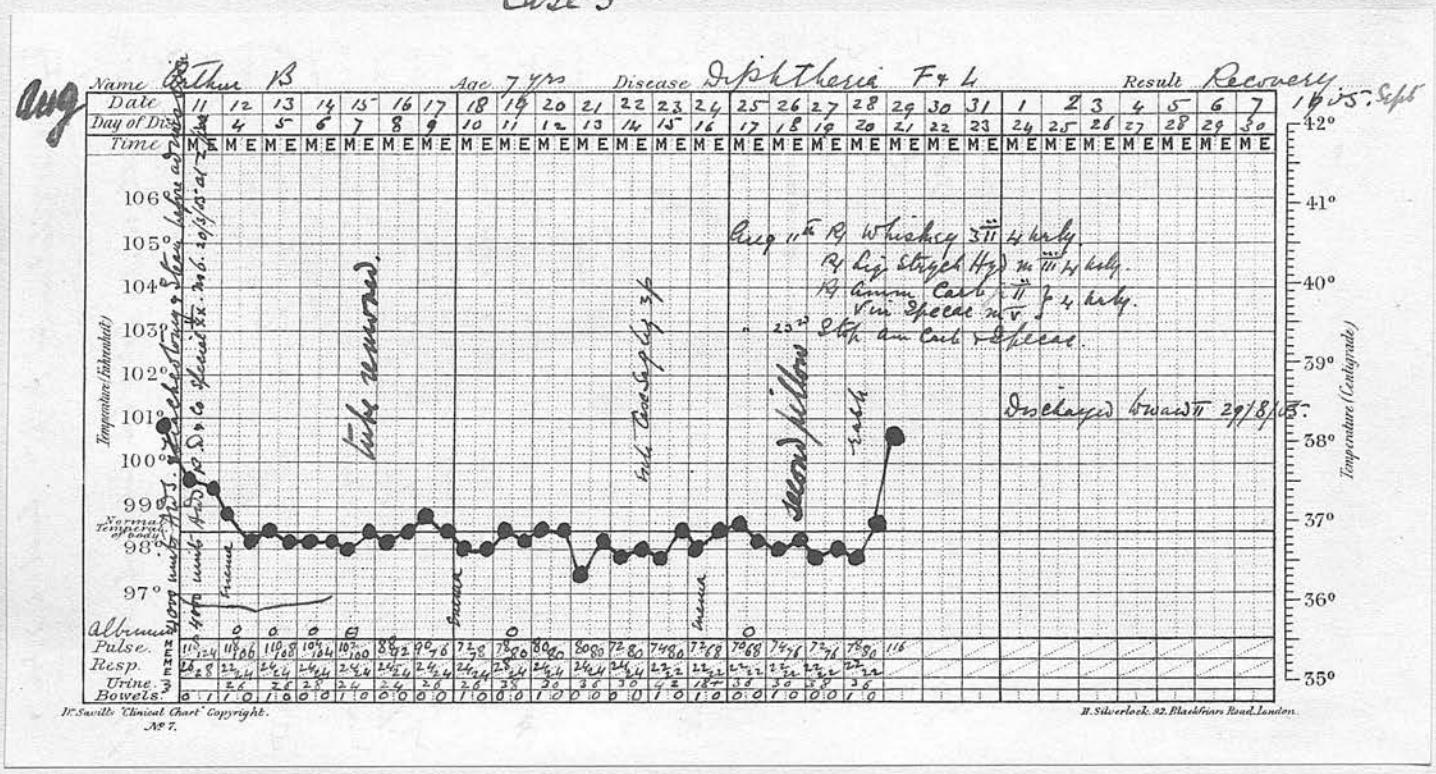
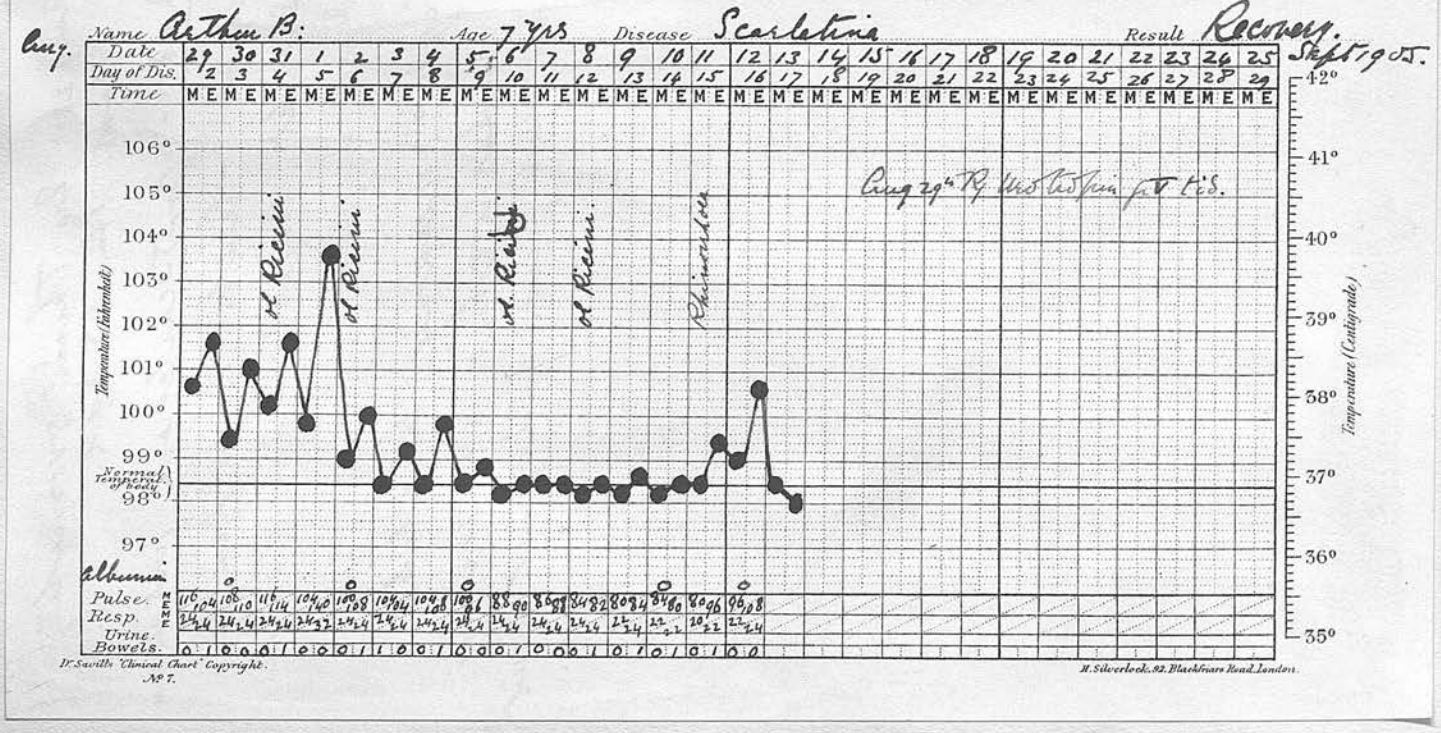
have been given a chance instead of repeatedly trying intubation, which obviously did not relieve the breathing. The fauces were continuously being blocked with muco pus.

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 dyspnoea with indrawing of epigastrium and intercostal spaces. Spasms of whooping cough present. Tonsils covered with membrane. Fauces full of muco pus. Put under steam. In half an hour as no improvement, child was intubated with no 2 vulcanite. There was slight momentary improvement, then urgent dyspnoea. Tube pulled out. Dyspnoea 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. Respirations 90 just before death.

Case 3



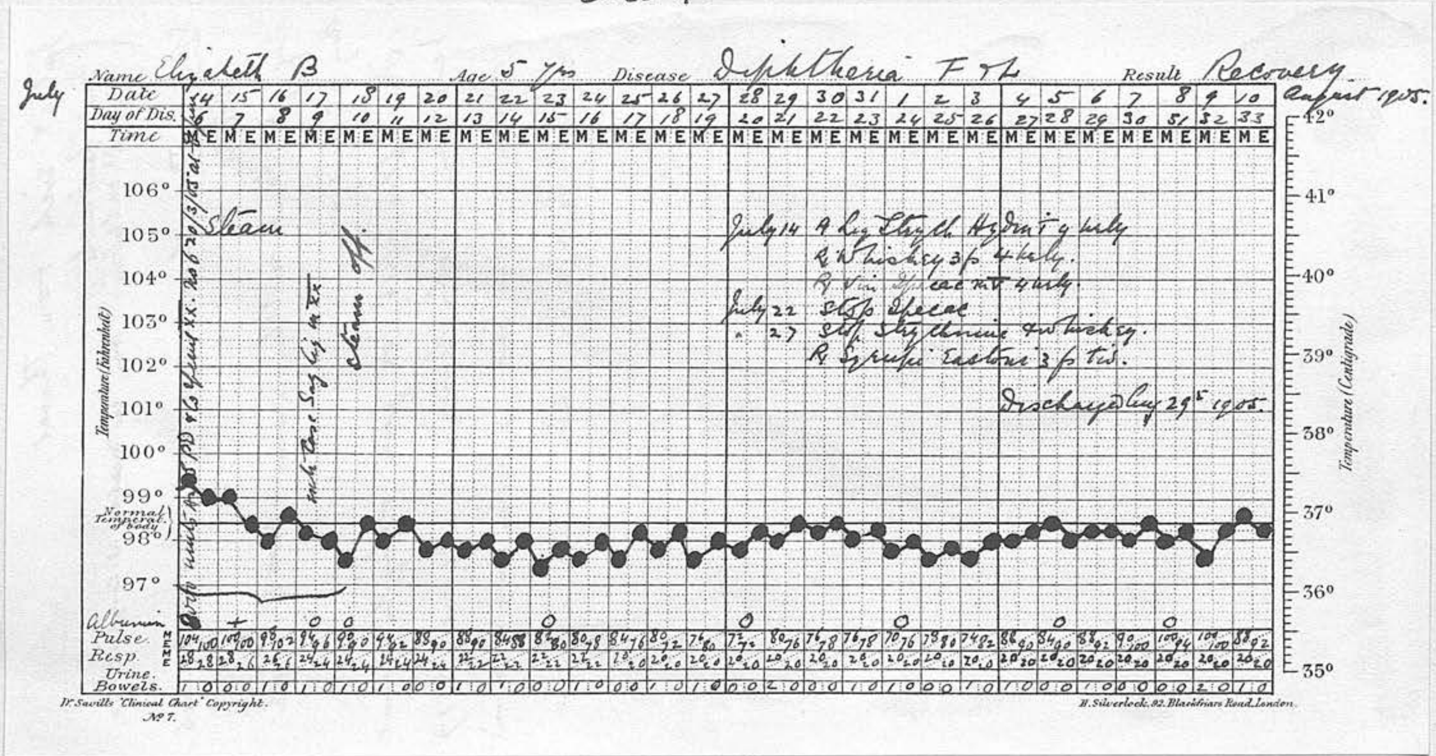
Case 3 (continued)



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 4.



Name Elizabeth B
Age 5 yrs
Disease Diphtheria F & L
Result Recovery
July
August 1905.
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
Steam
Steam off.
July 14 R Liq Strych Hydr 4 hrly
R Whiskey 3ʒ 4 hrly.
R Vin Ipecac 4 hrly
July 22 Stop Ipecac
27 Stop Strychnine & whiskey.
R Syrupi Eastoni 3ʒ t.i.d.
Discharged Aug 29th 1905.
Albumin
Pulse.
Resp.
Urine.
Bowels.
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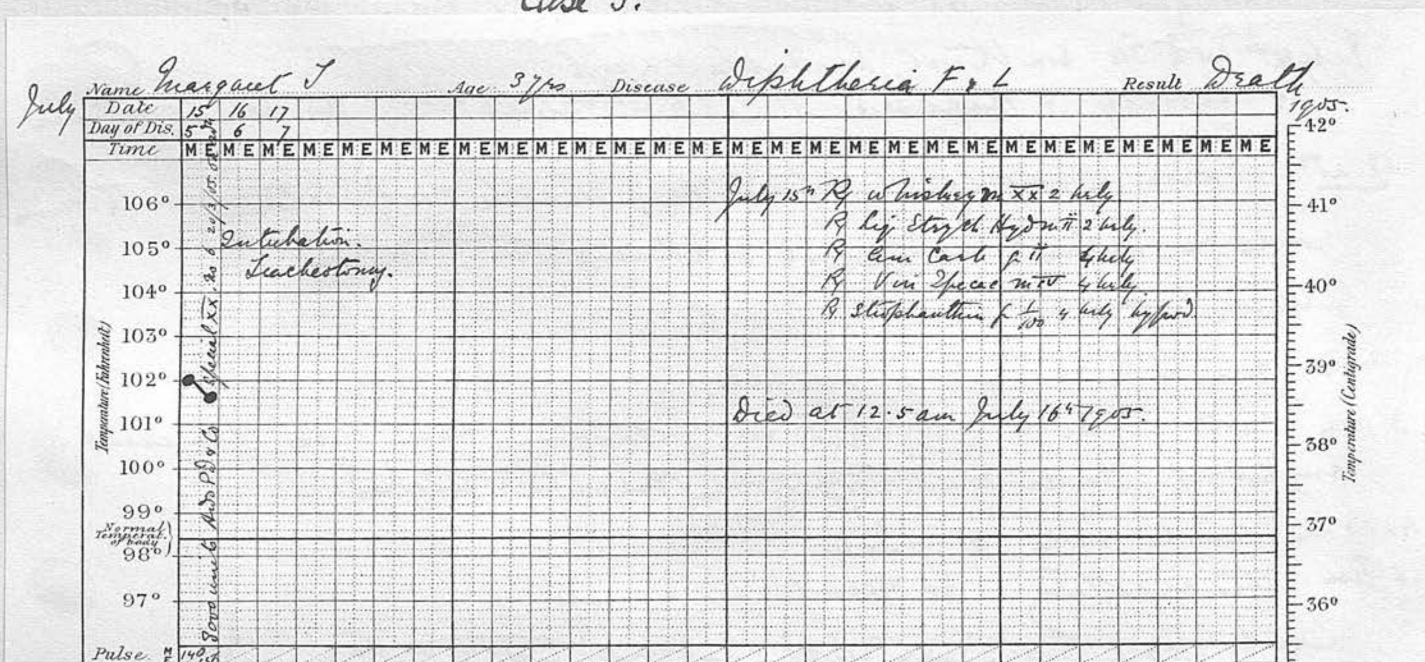
Case 5.



Name Margaret T
Age 3 yrs
Disease Diphtheria F & L
Result Death
July
1905.
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
Intubation.
Tracheotomy.
July 15th R Whiskey m xx 2 hrly
R Liq Strych Hydr 2 hrly
R Am Carb 4 hrly
R Vin Ipecac 4 hrly
R Strophanthin 1/100 4 hrly hypod.
Died at 12·5 am July 16th 1905.
Pulse.
Resp.
Urine.
Bowels.
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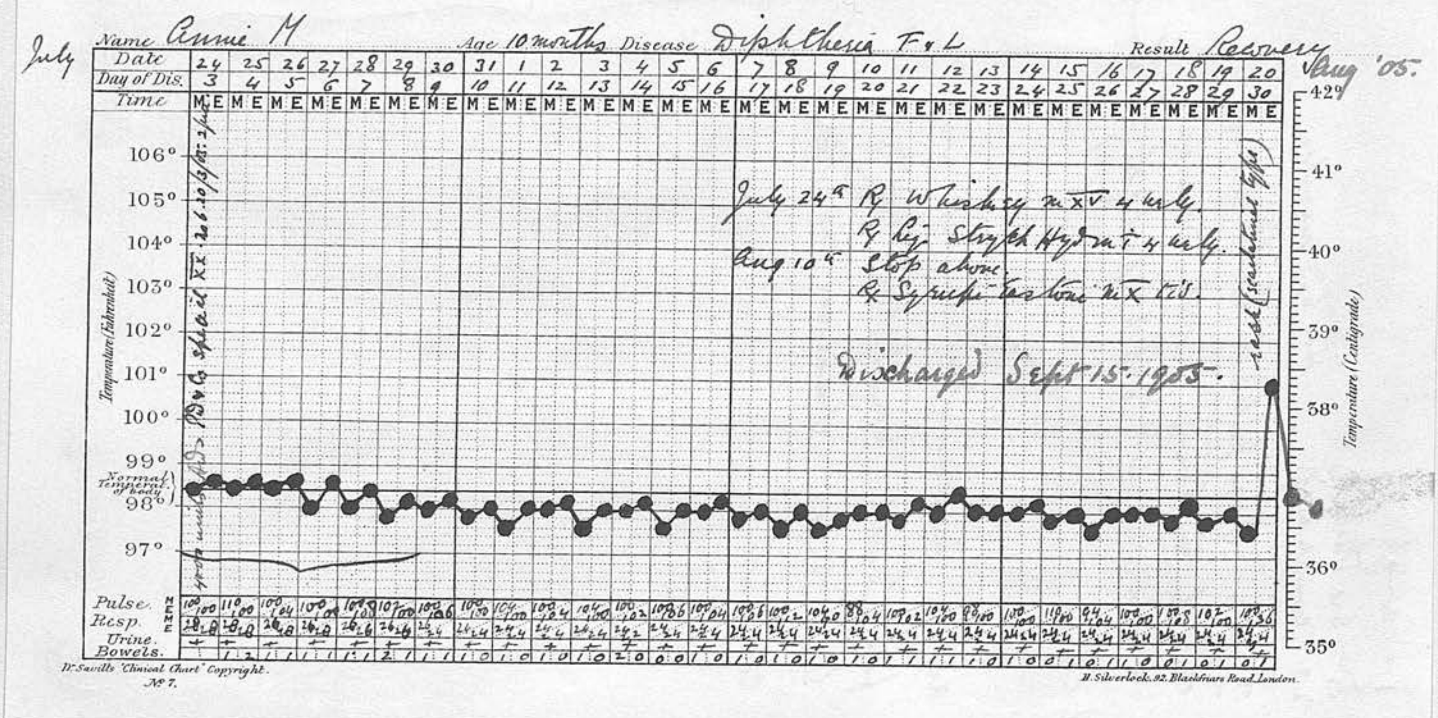
Case 4. July 9th sore throat. July 10th head-ache. July 14th doctor called in. admitted same day. Croupy cough. membrane on each tonsil and on uvula. Apparently a mild case. given 8000 units of antitoxin and put under steam. She made a good recovery.

Case 5. (Dr Thompson's case). July 10th ill, sore throat headache and cough. July 14th croupy and dyspnoeic. Doctor called in. July 15th admitted dyspnoea very marked. Croupy cough. Membrane on each tonsil. Intubation performed at once, no 3 vulcanite tube inserted. Gave relief. Put under steam and given 8000 units of antitoxin. 3 pm child suffocating. Tube pulled out. Large piece of membrane coughed up. Tube reintroduced. 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 16th Child died of exhaustion. An interesting question regarding this case might be, was it one diagnosed after 6 pm on 14th

Case 6.



Name Annie M
Age 10 months
Disease Diphtheria F & L
Result Recovery
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
July 24th R Whiskey m xv 4 hrly
Aug 10th Stop above
Discharged Sept 15. 1905.
Pulse.
Resp.
Urine.
Bowels.
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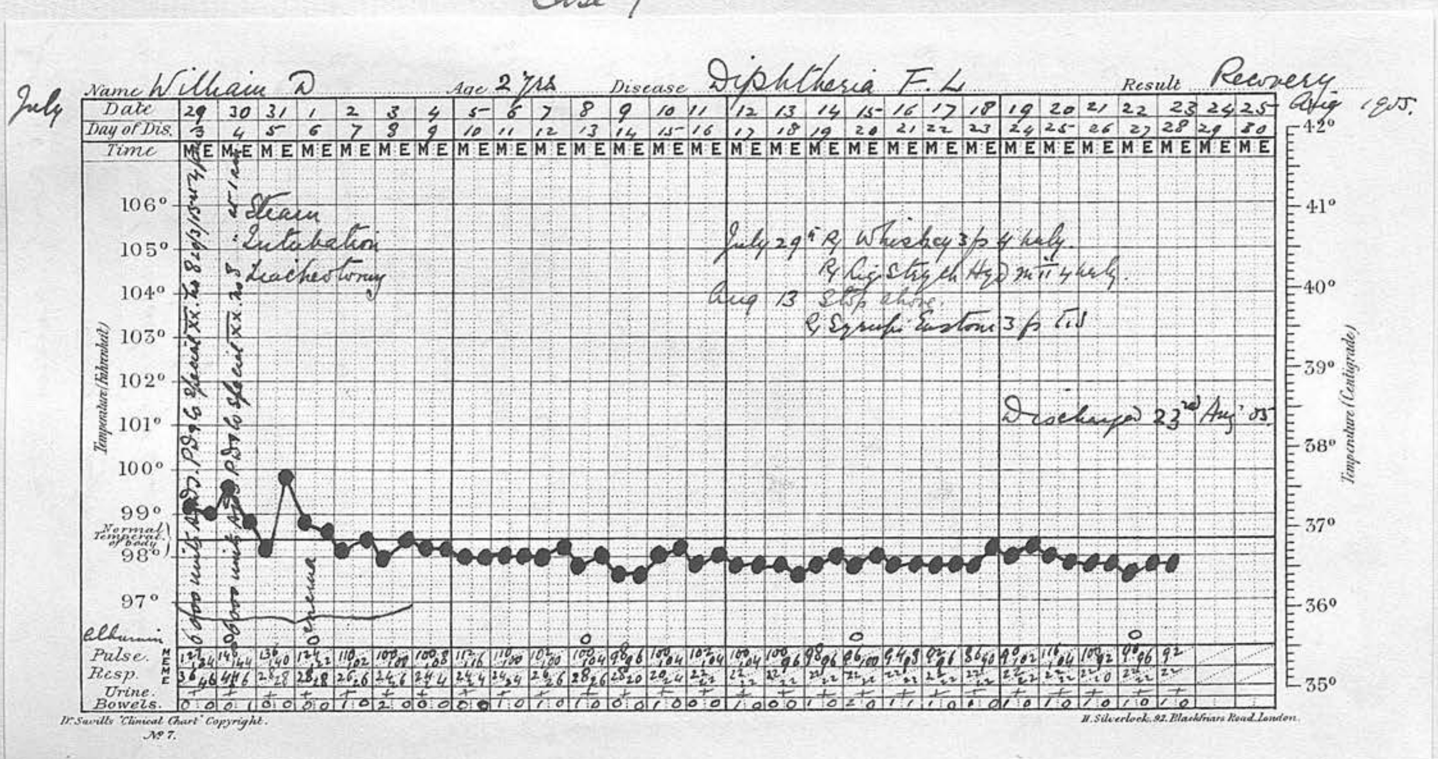
Case 7



Name William D
Age 2 yrs
Disease Diphtheria F. L
Result Recovery
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Steam
Intubation
Tracheotomy
July 29th R Whiskey 3 ss 4 hrly
Aug 13 Stop above
Discharged 23rd Aug. 05.
Albumin
Pulse.
Resp.
Urine.
Bowels.
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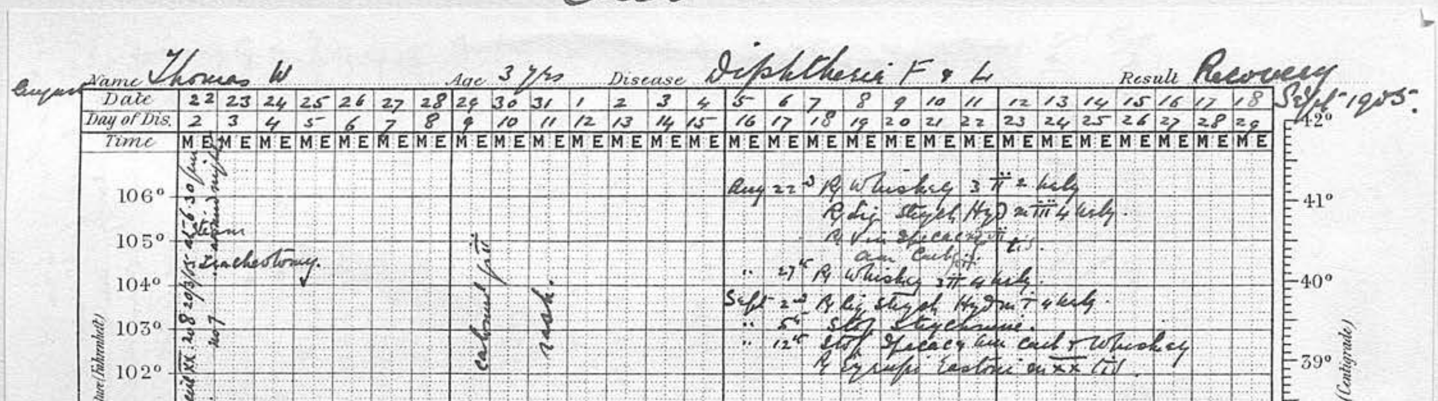
July and therefore too late for admission to the City Hospital on that day?

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 antitoxin rash of scarlatinal 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 dyspnoea. very slight indrawing. Membrane on left tonsil and on pharyngeal wall. Put under steam. Given 6000 units antitoxin. 8 pm marked indrawing. Crowing inspiration. 8.30 pm slight improvement. Midnight worse, intubated without improvement. July 30th 12.30 am. 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
Sept 1905
Aug 22nd R Whiskey 3 ii 2 hrly
Tracheotomy
Discharged Oct 7th 1905
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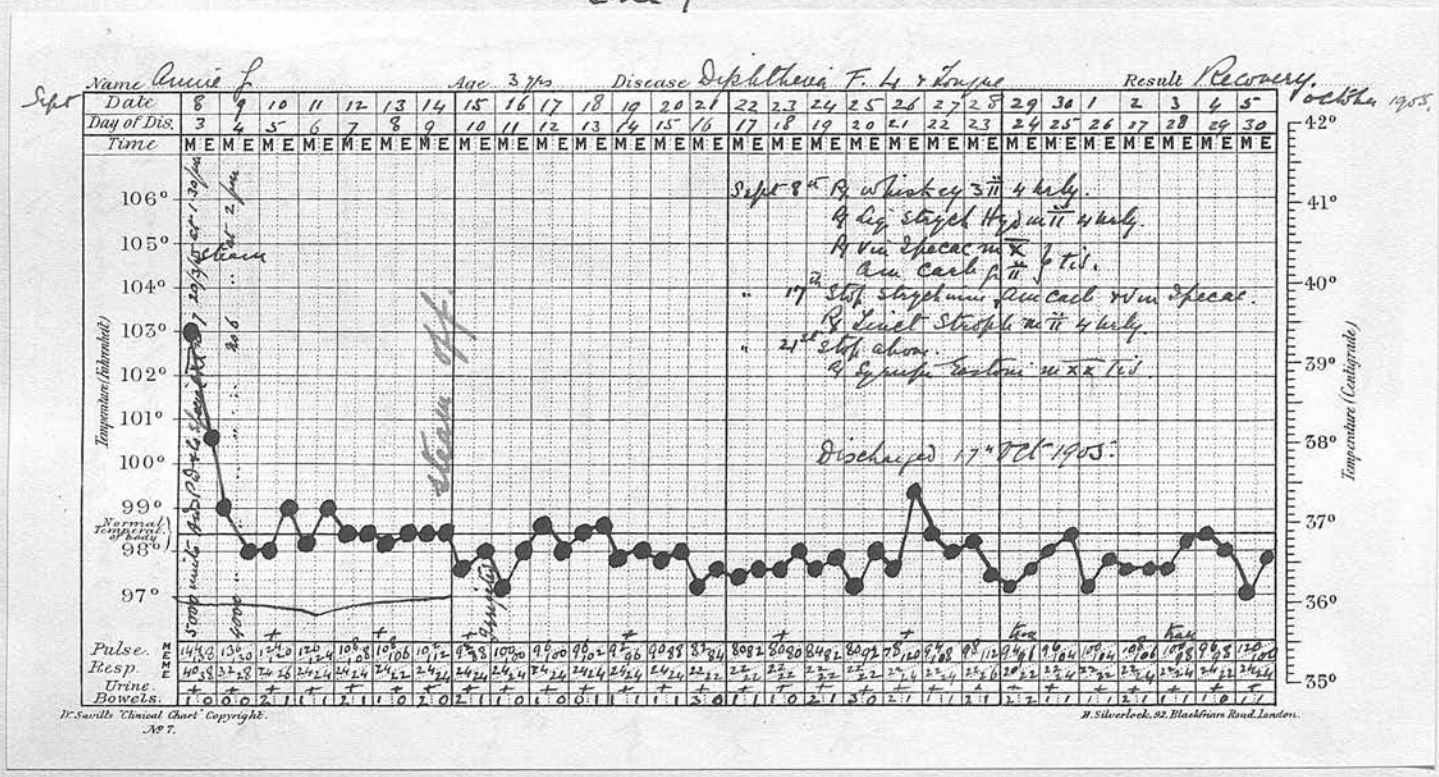
mxxx per rectum and Ammon: Bromid gr v by mouth. It rested well after these. During the day much slimy mucus was expelled through tube. Aug 1st tube removed successfully during sleep. Did well and made an excellent recovery. 12,000 units of antitoxin in all was used.

Case 8. Aug 21st croupy. Aug 22nd admitted poisoned looking and collapsed. Cyanosed. Marked indrawing of epigastrium and intercostal spaces. Respiration rapid. Croupy. Fauces full of muco pus. Membrane on tonsils. Pulse weak. Put under steam and given 6000 units of antitoxin. Worse at 7.30 pm. a low tracheotomy was then performed under chloroform. On opening trachea a large amount of evil smelling muco pus was expelled. Some membrane shewing from above was pulled down and removed. The inside of the trachea could be seen lined with fast, grey membrane. Given strychnine gr $\frac{1}{60}$ hypod and hot precordial fomentations after operation. Aug 23rd 8 pm not so well pulse weaker, cyanosed. A large amount

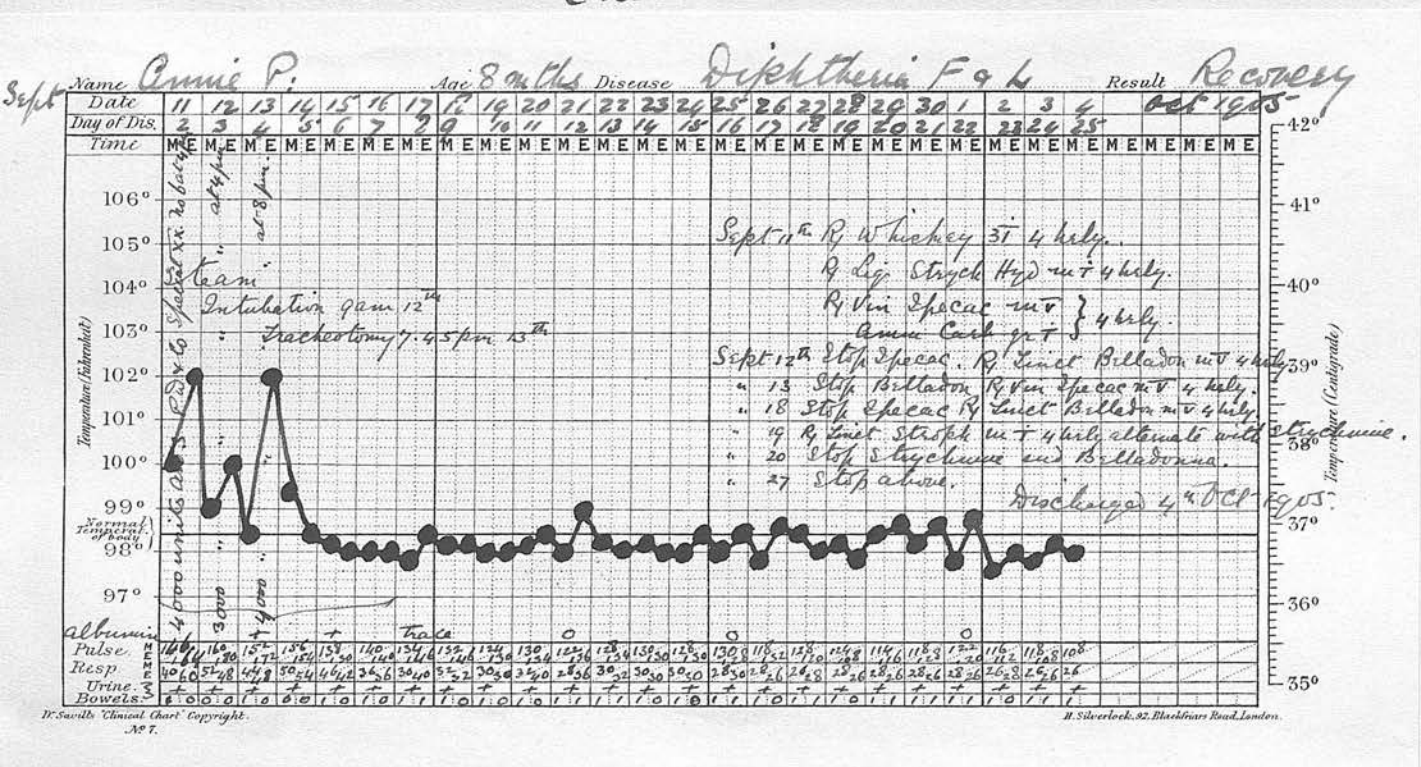
Case 9.



of muco pus discharged through tube. 24th Better today. Much troubled with the large amount of discharge. 11,000 units of antitoxin has been given in all. Aug 26th doing well. Sputum still profuse. Aug 27th tube removed during sleep with success. Aug 28th slight jaundice. Aug 30th steam off. Aug 31st scarlatiniform antitoxin rash on abdomen. Sept 4th still croupy. Sept 11th croupiness away. Sept 21st some nasal and bronchial catarrh has delayed convalescence. Good recovery.

Case 9. Poor house case. Admitted Sept 8th a pale, weak, rickety and ill nourished child. Left otorrhoea. Sores over various parts of body. Enlarged glands in neck. Croupy, some indrawing of epigastrium. Tonsils much enlarged and covered with diphtheritic membrane. Put under steam. Given 5000 units of antitoxin. Sept 9th Breathing good. Less croupy. Tonsils less enlarged. Membrane has appeared under tongue. Given 4000 units antitoxin. Sept 14th tendency to cardiac failure. at 8.30 am was cold and almost pulseless. Freely

Case 10.



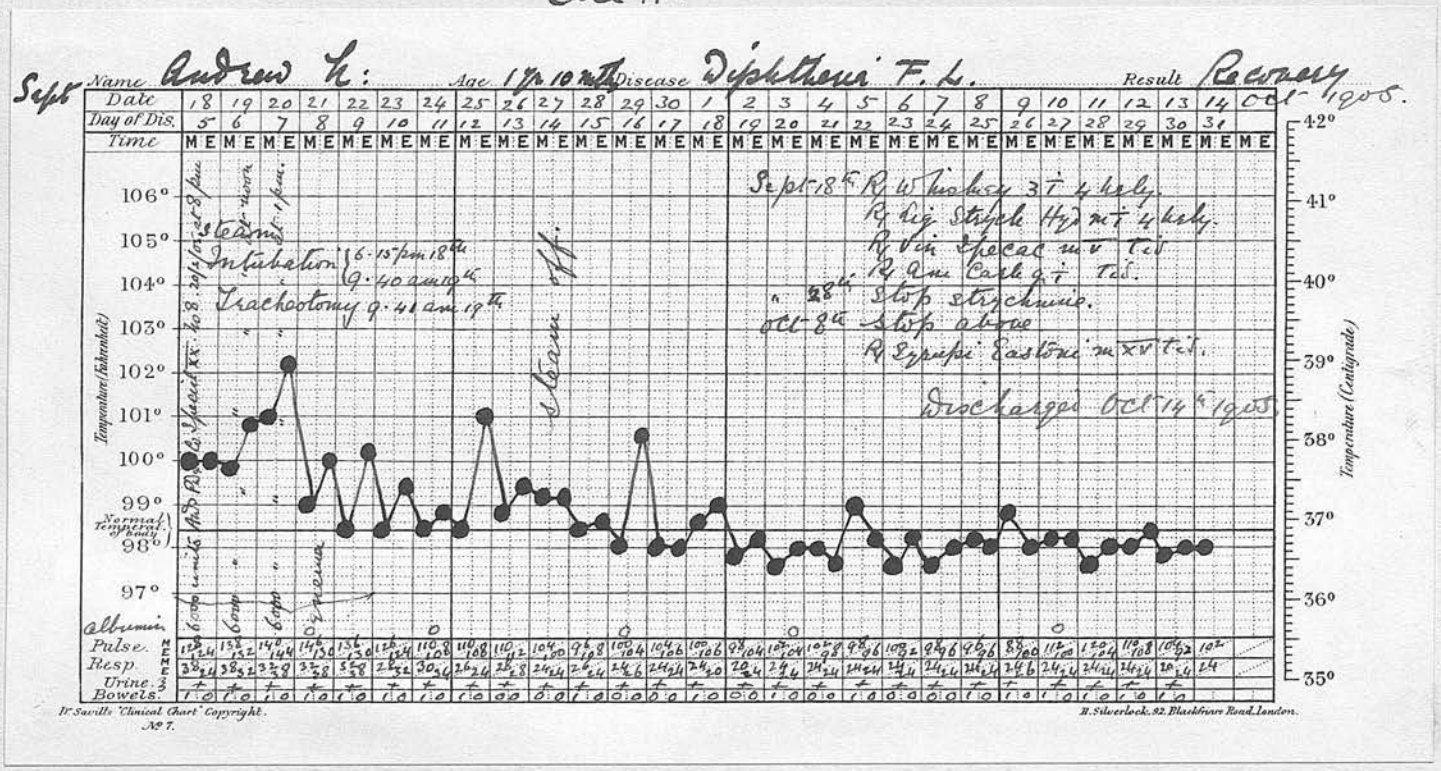
stimulated. At 11 am revived somewhat. Sept 15th vomited. Sept 25th child very dull mentally. Progressing slowly. Sept 27th left-sided adenitis (-neck), improved after fomenting. Albumin remained in urine for some weeks. She was also troubled with occasional diarrhoea. Left cured of diphtheria, but still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

Case 10. Sept 10th feverish and croupy. Sept 11th admitted very ill. Dyspnoea. Inspiratory indrawing of intercostal spaces. Some membrane on left tonsil. Put under steam and given 4000 units of antitoxin. Sept 12th Laryngeal spasm present. Intubated with partial relief. Sept 13th 1.30 am coughed up tube. Reintubated. 4 am again coughed up tube. Breathing quietly when asleep, laryngeal spasm with dyspnoea when awake. Belladonna pushed. 7.30 pm breathing very badly. Marked indrawing. Eyes turned up. Looks pale. Pulse running. Low tracheotomy performed under chloroform. Trachea just admitted the smallest tube. Trachea lined with membrane. Thick muco pus coughed up. Much relieved. Given nutrient enemata. Slept quietly. Sept 14th taking

milk well by mouth from spoon. Large amount of muco pus being discharged. Sept 18th Has done well. Tube removed during sleep at 9.30 pm. Cried loudly at 11 pm. Sept 20th slight twitching of fingers. Strychnine 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 14th ailing. Sept 16th sore throat. Sept 17th croup. Sept 18th admitted very ill. Cyanosed. Indrawing of epigastrium and intercostal spaces. Croupy. Membrane on each tonsil. Put under steam without benefit. Given 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 muco pus. 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 mid line

Case 11.



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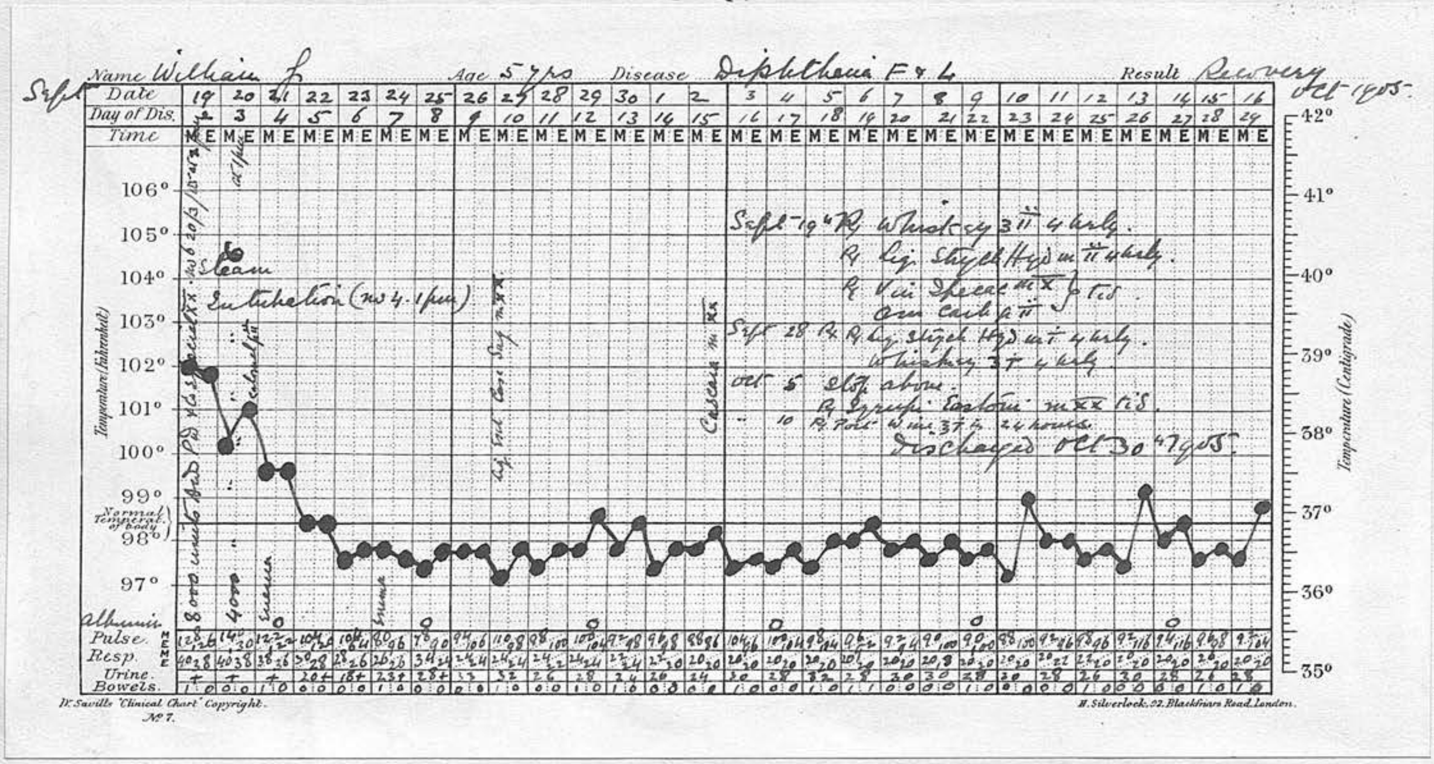
A low tracheotomy was then rapidly performed, the trachea being opened in a few seconds. A tracheal dilator was inserted and artificial respiration started, whereupon natural breathing soon recommenced. Stimulants Strych Hyd $\frac{1}{60}$, Ether mxx were given hypodermically and hot precordial fomentations applied. Aug 20th swallowing well. Has slept well. Very 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 patients 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. Marked epigastric indrawing. Fauces full

Case 12.


Name William L
Age 5 yrs
Disease Diphtheria F & L
Result Recovery
Sept
Oct 1905
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
Steam
Intubation
Discharged Oct 30th 1905
Albumin
Pulse
Resp.
Urine
Bowels
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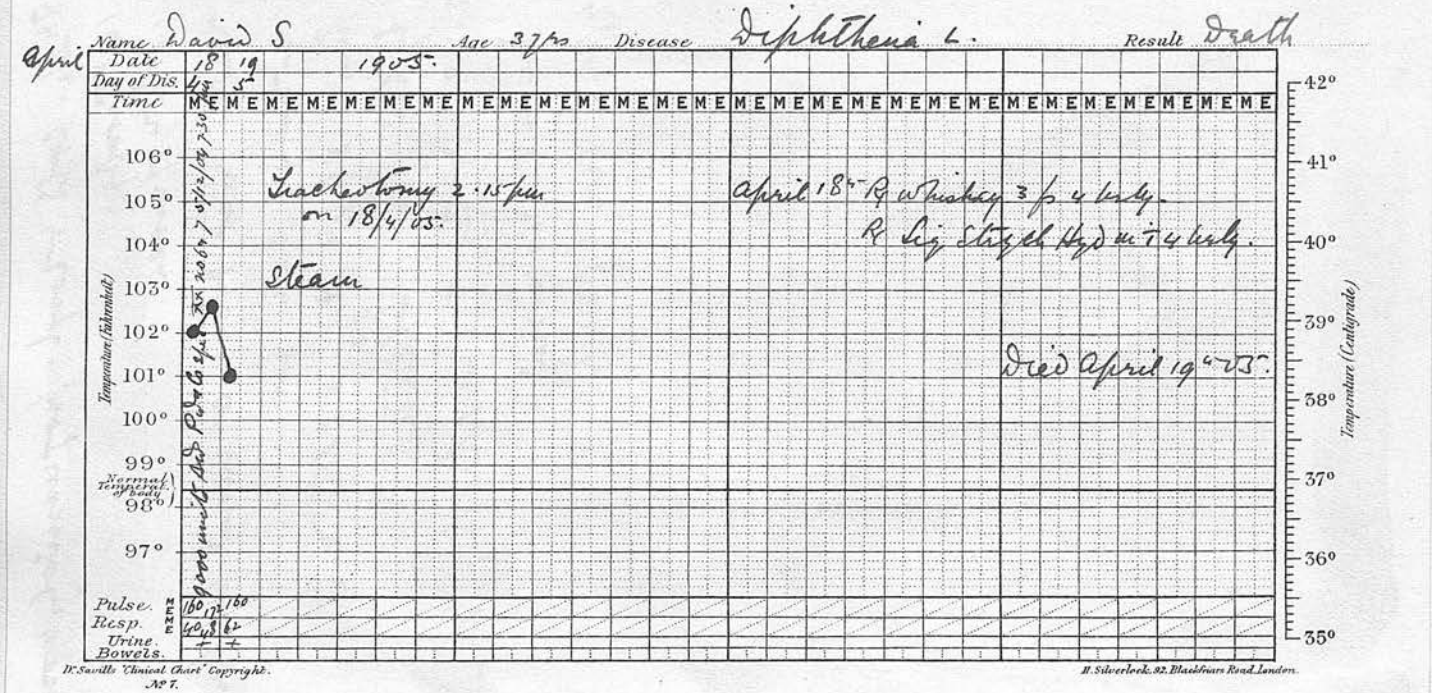
of muco pus. Extensive membranous deposit on each tonsil. Tonsils are bleeding slightly. Put under steam and five minutes later intubated with no 4 metal tube. Some membrane and a large amount of muco pus expectorated and breathing relieved. Slept quietly after. 8000 units antitoxin given. Aug 20th Fluids taken well by mouth. Food colon. Given 4000 units antitoxin. Aug 21st tube removed at 3 pm. At 11 pm breathing a little stridulous. Aug 24th steam off. Made a good recovery. In this case the patient was strong enough to expel, and the tube large enough (no 4) to allow the passage of, the thick muco pus. This might explain the reason why this intubation case was successful, whereas the preceding ones had been unsuccessful.

2. <u>The following cases illustrate pure laryngeal diphtheria</u>. In no instance was there any membranous implication of the fauces, although in each patient the Klebs Loeffler bacillus was found

Case 1.


April
Name David S
Age 3 7/12
Disease Diphtheria L.
Result Death
Date 18 19
Day of Dis. 4 5
1905.
Time M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E
Temperature (Fahrenheit)
106° 105° 104° 103° 102° 101° 100° 99° 98° 97°
Normal Temperature of Body
Temperature (Centigrade)
42° 41° 40° 39° 38° 37° 36° 35°
Pulse. 160 172 160
Resp. 40 48 62
Urine. + +
Bowels.
Tracheotomy 2.15 pm on 18/4/05.
Steam
April 18th R Whiskey 3 p c hrly.
R Liq Strych Hyd m 4 hrly.
Died April 19th 05.
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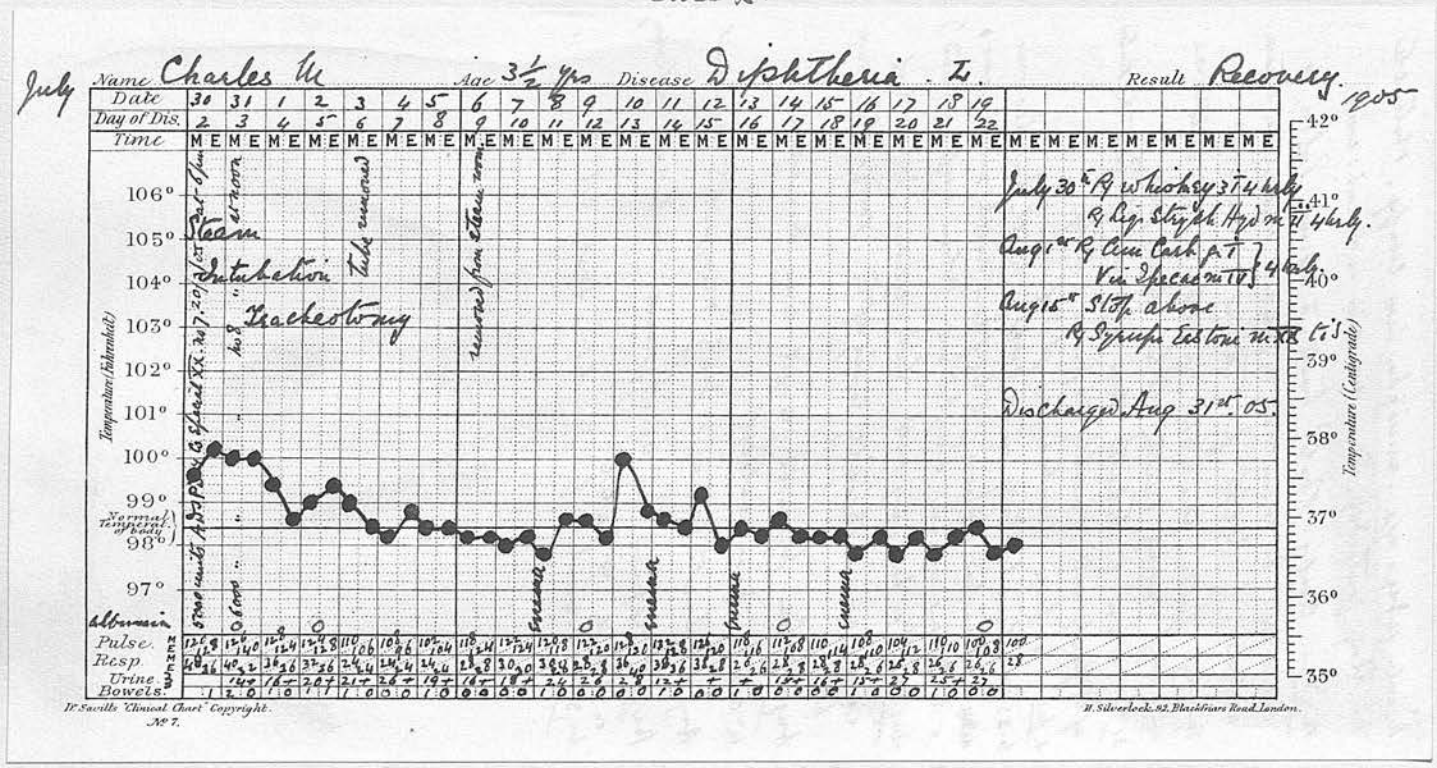
present in that region.

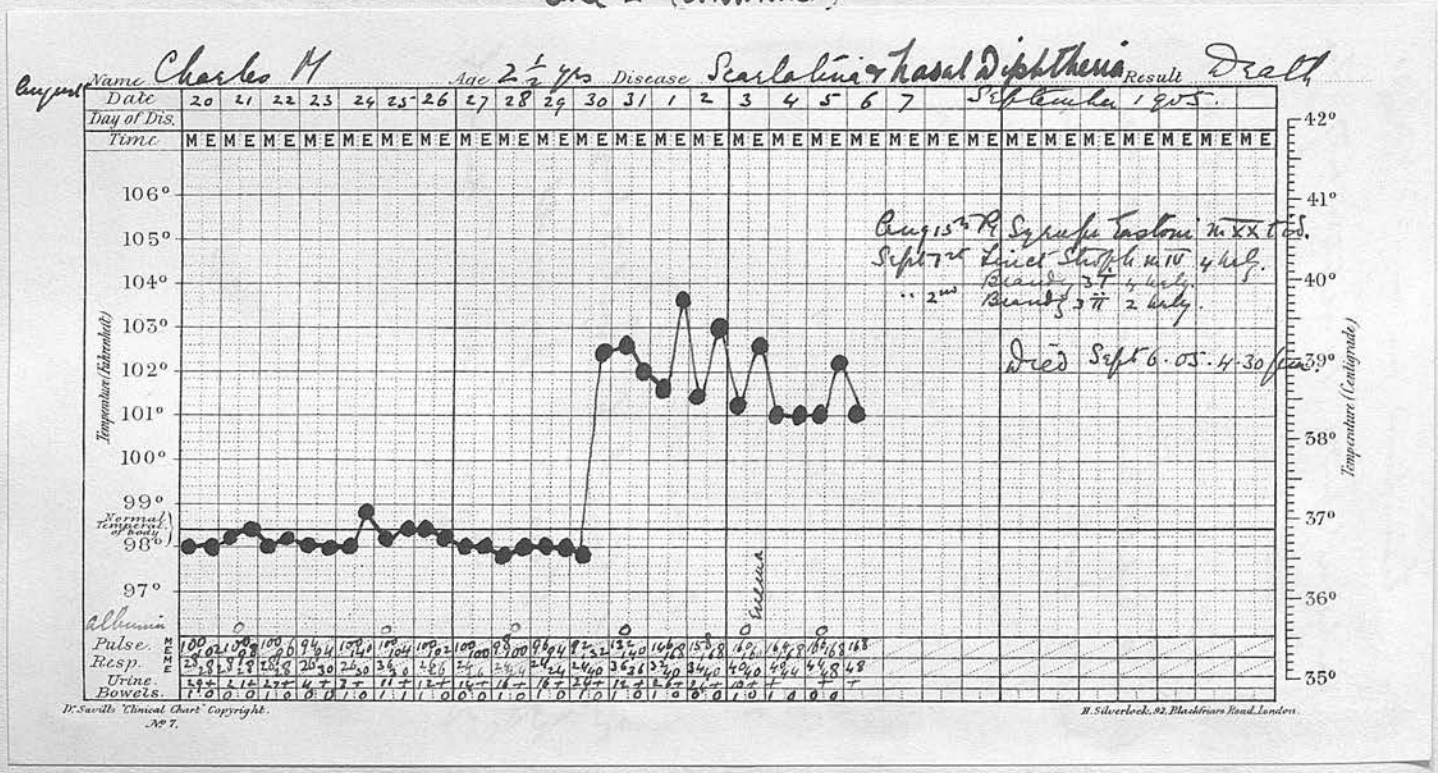
Case 1. (Dr Davidson's case) on 8th April caught cold. Progressively worse ever since. ap 18th admitted very ill, has been croupy for four days. Marked dyspnoea and cyanosis. Indrawing of epigastrium and intercostal spaces very pronounced. Put under steam. Given Strychnine gr 1/60 and ether m x hypodermically. Given 9000 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 expelled practically no sputum.

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 5000 units of antitoxin. Improved slowly, so that by evening the colour had improved and the indrawing was

Case 2.

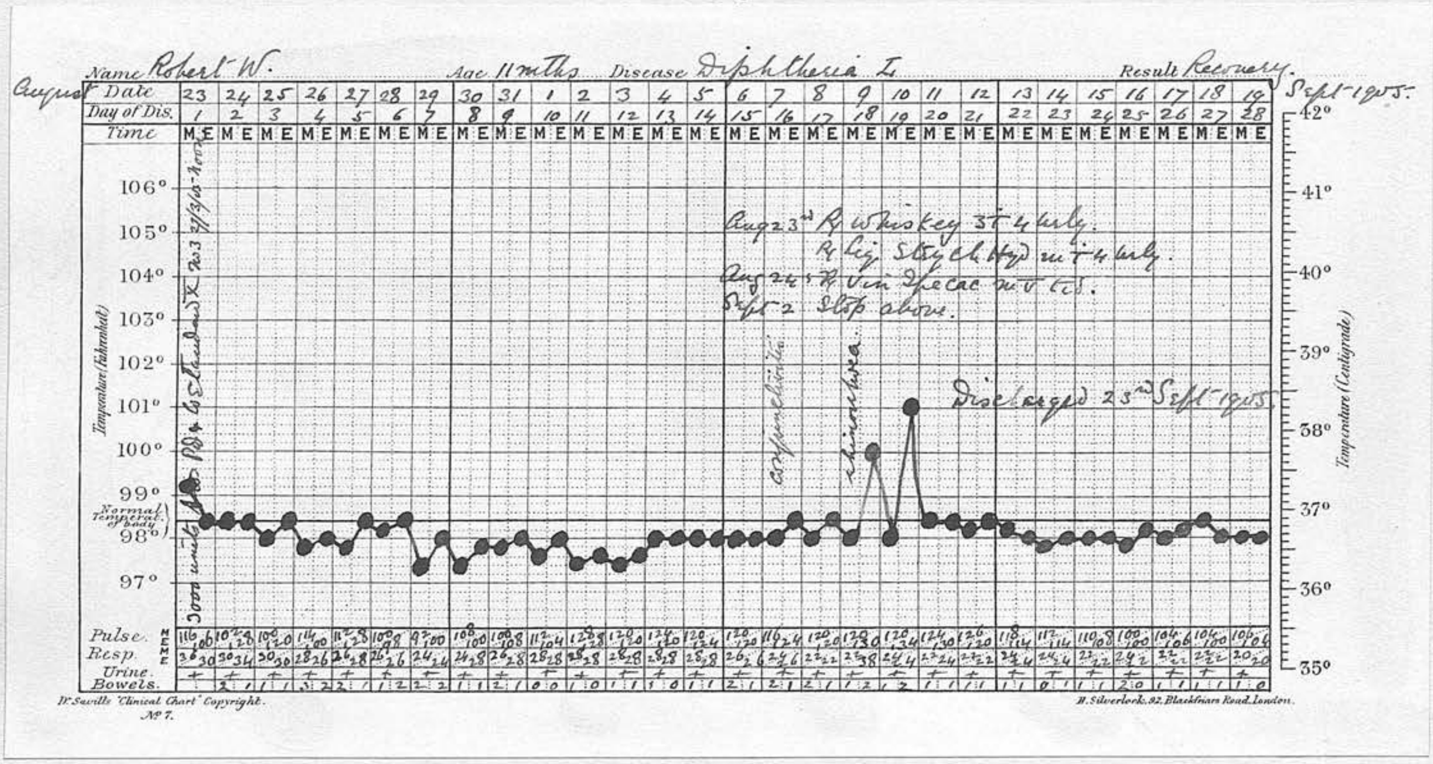


Case 2 (continued)



less marked. July 31st 1.15 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 foul smelling pus and a little membrane was coughed out. Great relief followed. A further 6000 units of antitoxin had been given at noon. Aug 3rd very good progress. Tube removed during sleep successfully. Aug 10th some bronchial and nasal catarrh. Aug 20th tonsils enlarged and congested. Aug 30th Scarlatinal rash. Aug 31st Vomited. Sept 2nd a septic scarlatina. Some nasal discharge. Sept 3rd 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

Case 3.


Name Robert W.
Age 11 mths
Disease Diphtheria L.
Result Recovery.
August
Sept 1905.
Date
Day of Dis.
Time
Aug 23rd R Whiskey 3i 4 hrly.
R Liq Strych Hyd m i 4 hrly.
Aug 24th R Vin Ipecac m v t.i.d.
Sept 2 Stop above.
Discharged 25th Sept 1905.
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
Pulse.
Resp.
Urine.
Bowels.
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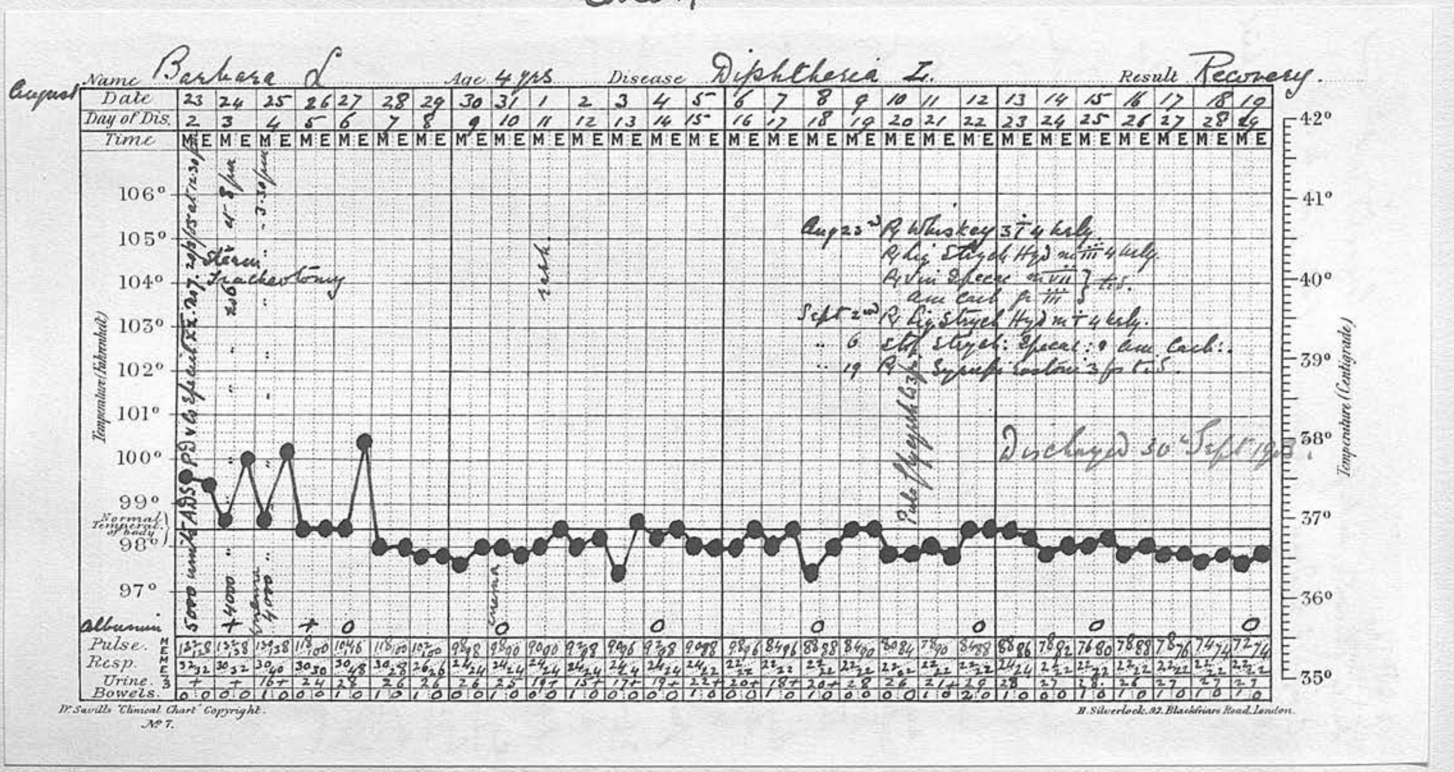
Case 4.


Name Barbara L
Age 4 yrs
Disease Diphtheria L.
Result Recovery.
August
Date
Day of Dis.
Time
Aug 23rd R Whiskey 3i 4 hrly.
R Liq Strych Hyd m iii 4 hrly.
Sept 2nd R Liq Strych Hyd m i 4 hrly.
Discharged 30th Sept 1905.
Tracheotomy
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
Albumin
Pulse.
Resp.
Urine.
Bowels.
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on Sept 2nd.

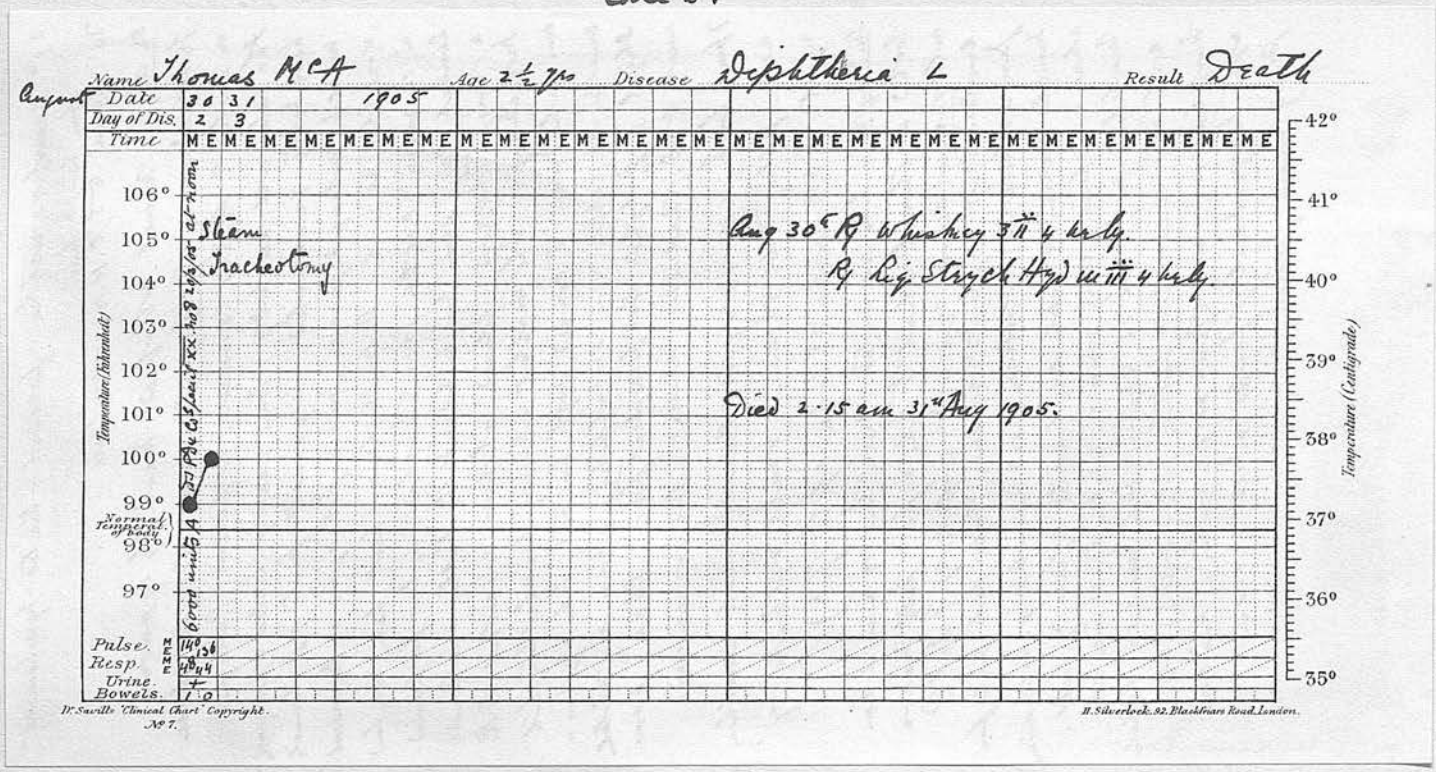
Case 3. Poor house case, first days illness. Croupy. Breathing well. Put in general ward. 3000 units antitoxin given on admission on Aug 23rd. Aug 24th cough looser, expelled a little membrane. glands in neck enlarged. This patient did well, being taken early.

Case 4. Poor house case admitted Aug 23rd, 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 muco pus and no membrane was expelled. Given strychnine gr $\frac{1}{60}$ and hot precordial fomentations. Aug 24th rested well and breathing good. Inclined to vomit through night. Given saline and nutrients per rectum. 4000 units given. Aug 25th Little discharge expelled

therefore 4000 units of antitoxin again given. In evening looked better, sputum 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 1st morbilliform anti-toxin rash. Made an excellent recovery.

Case 5. Aug 29th croupy, restless, feverish, treated by a chemist. Aug 30th taken to Sick Childrens 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 kempt. 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.


Name Thomas McA
Age 2½ yrs
Disease Diphtheria L
Result Death
August
Date 30 31 1905
Day of Dis. 2 3
Time M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E
Temperature (Fahrenheit)
106° 105° 104° 103° 102° 101° 100° 99° 98° 97°
Temperature (Centigrade)
42° 41° 40° 39° 38° 37° 36° 35°
Normal temperature of body
Steam
Tracheotomy
Aug 30th R Whiskey 3ii 4 hrly.
℞ Liq. Strych Hyd m iii 4 hrly.
Died 2·15 am 31st Aug 1905.
Pulse. M E M E 140 136
Resp. 48 44
Urine.
Bowels. + 0
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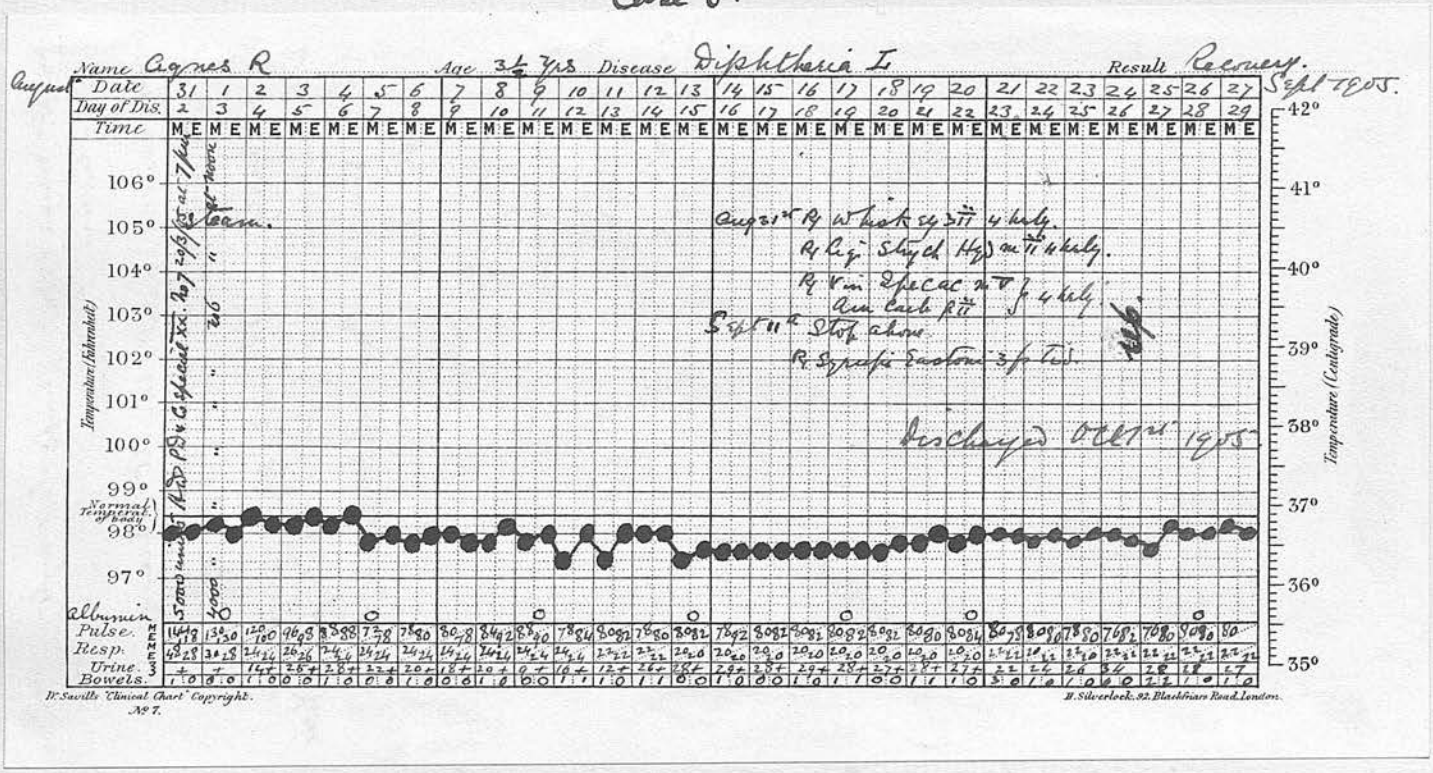
owing to the diminutive size of the trachea. Given strychnine gr $\frac{1}{60}$ hypod and hot precordial fomentations. At 7 pm looked well. Pulse good. Breathing easily. Swallowed milk, whiskey and bovinine well. Passed urine freely. Put on Liq Strychnin Hyd m $\overline{\text{iiii}}$ 4 hourly through 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 widly and equally dilated and insensible to light, jaws clenched, head aimlessly oscillated, muscles of arms and neck contracted, teeth ground together. Between fits the pupils contracted, consciousness did not return. Given morphine gr $\frac{1}{10}$. Freely stimulated with brandy enemata and hypodermics. Fits gradually ceased as life ebbed away. Died 2.15 am 31st Inst. Liq Strych Hyd m $\overline{\text{vi}}$ and Strychnin Hyd gr $\frac{1}{60}$ had been given in the 12 hours since admission. Chloroform would probably have done better than the morphine used. Fair complexion.

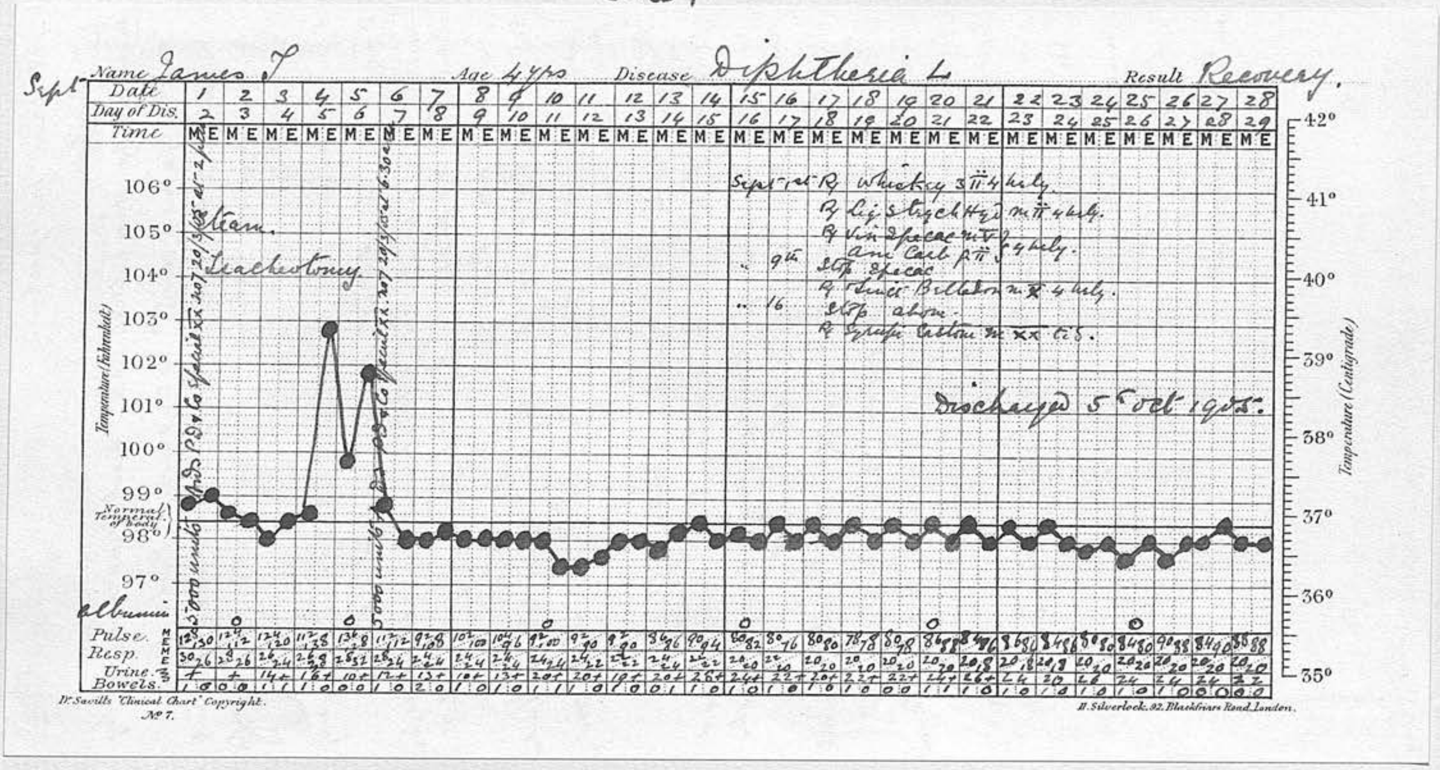
Case 6.



Case 6. Aug 30th croupy. admitted Aug 31st slightly croupy. a little obstruction to breathing. very slight epigastric indrawing. Colour and Pulse good. Put under steam. Given an emetic of Vmin Ipecac with benefit. Given 5000 units of antitoxin. Sept 1st given 4000 units. Sept 6th steam off. Has done well. Made a good recovery.

Case 7. Aug 31st croupy. Sept 1st admitted Face pale, not cyanosed. Marked in-drawing of epigastrium and intercostal spaces on inspiration. Pulse fair. Croupy cough. Given an emetic of Vii Ipecac without benefit. Put under steam and given 5000 units of antitoxin at 2 pm, on admission. 6 pm indrawing more marked. Child worse. Pulse failing. A low tracheotomy was therefore performed under chloroform. No membrane expelled and little muco pus. Much relieved. Given Strychnin Hyd gr $\frac{1}{60}$ hypod and hot precordial fomentations. Sept 2nd slept well. Breathing, pulse and colour good. very little discharge from tube. Sept 4th at

Case 7.


Sept
Name James T
Age 4 yrs
Disease Diphtheria L
Result Recovery.
Date
Day of Dis.
Time
Steam.
Tracheotomy
Discharged 5th Oct 1905.
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
Pulse.
Resp.
Urine.
Bowels.
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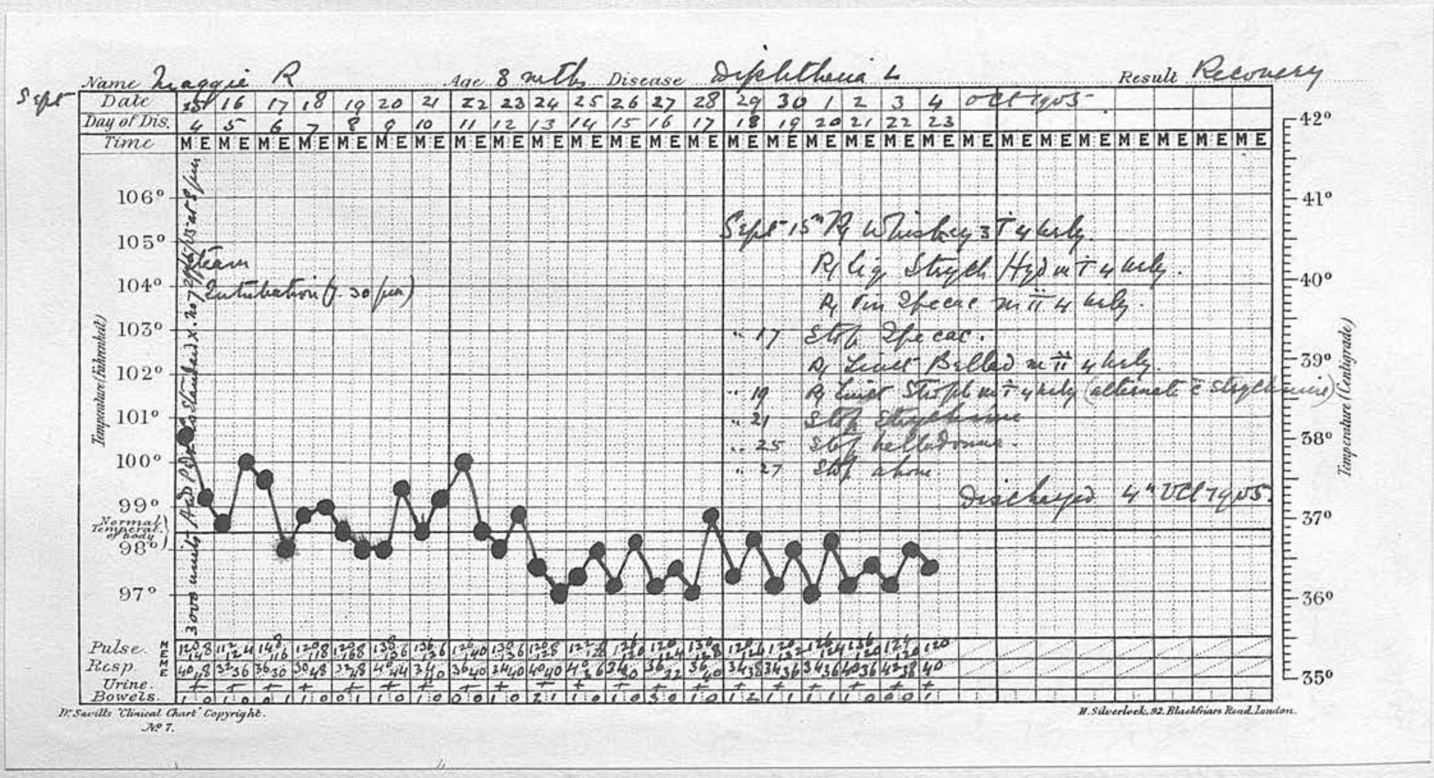
Case 8


Sept
Name Maggie R
Age 8 mths
Disease Diphtheria L
Result Recovery
Date
Day of Dis.
Time
Steam
Intubation (7.30 pm)
Discharged 4th Oct 1905.
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
Pulse.
Resp.
Urine.
Bowels.
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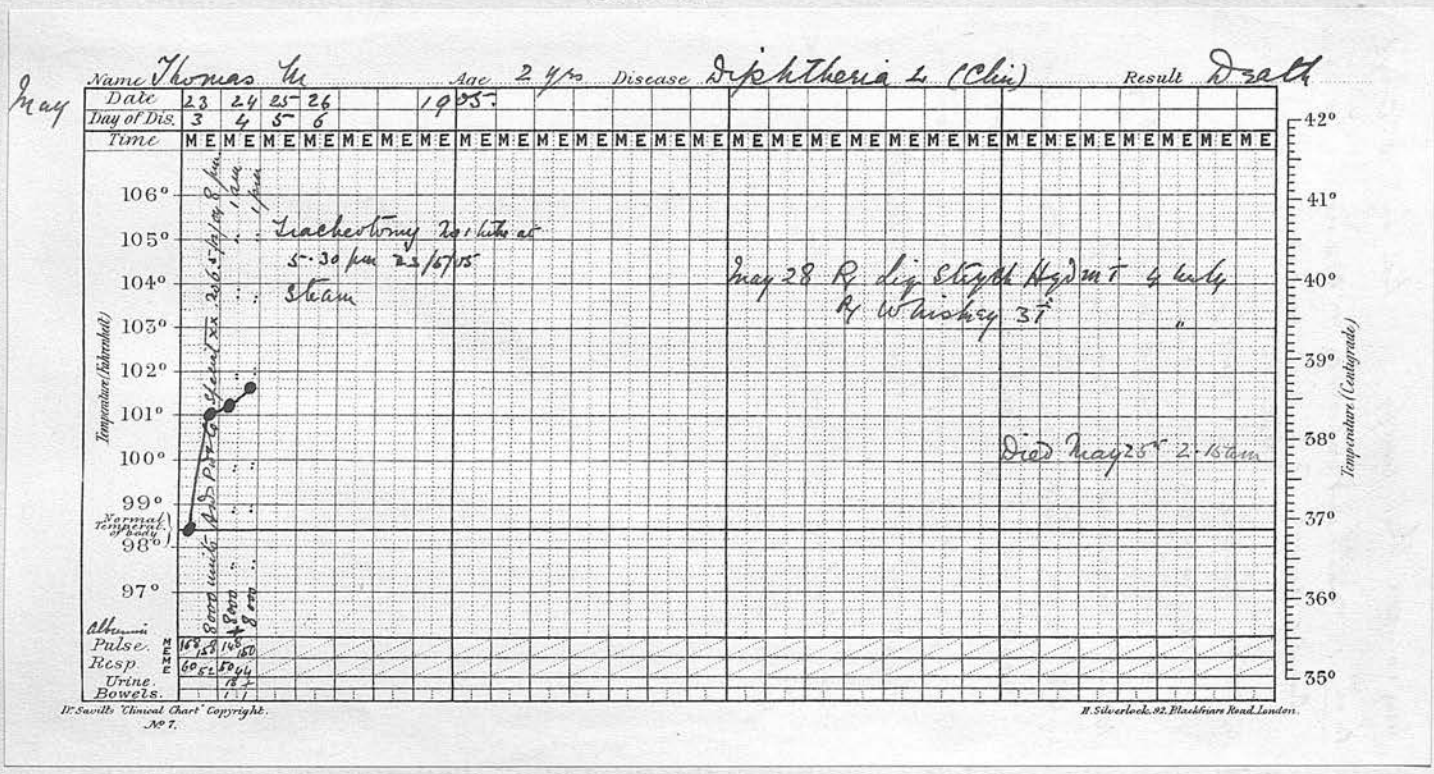
11 am tube removed when child awake. It became nervous, took spasm of the larynx and the tube had to be reinserted. Temperature rose. Looked pale. Sept 5th much the same. Sept 6th 6 am obstructed breathing. Tube removed. Membrane visible in trachea. A larger tube was inserted and 5000 units of antitoxin 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 good. Nasal fed. Aug 19th spoon fed. Made a good recovery. Intubation was here most successful.

Case 1.


Name Thomas Mc
Age 2 yrs
Disease Diphtheria & (Clin)
Result Death
May
Date 23 24 25 26
Day of Dis. 3 4 5 6
1905.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperature of body
Albumen
Pulse
Resp
Urine
Bowels
Tracheotomy 20 c.c. at 5.30 pm 23/5/05
Steam
May 28 R Liq Steph Hydrat 4 hrly
R Whiskey 3i
Died May 25th 2.15 am
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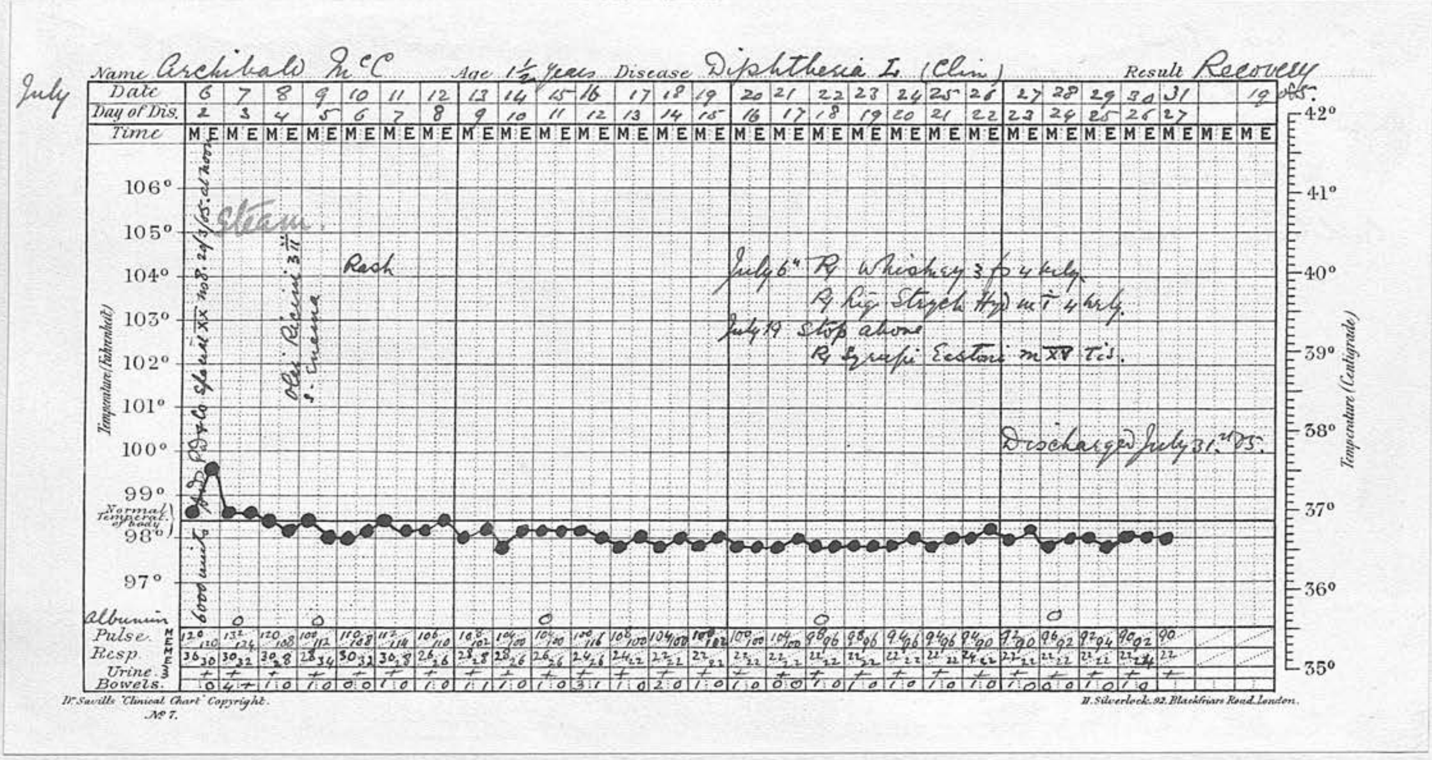
3. The next series contains those cases clinically of a diphtheritic nature. In none was the Klebs-Loeffler bacillus found in the fauces or in the membrane expectorated.

Case 1. May 20th sore throat, croup. May 23rd admitted (Dr Davidson's case). Dyspnoea and cyanosis marked at 5.20 pm. Marked indrawing of epigastrium and intercostal spaces. No faucial membrane visible. Put under steam. At 5.30 pm a low tracheotomy was performed under chloroform. Dyspnoea relieved. Pulse fair. Some membrane was expelled. Given 8000 units of antitoxin intravenously. 10 pm. More membrane expelled. At 10 am 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 pm lungs involved marked dyspnoea and cyanosis. 10 pm colour temporarily improved. Nasal fed. May 25th 2.15 am died of suffocation and exhaustion.

Case 2.


Name Archibald McC
Age 1½ years
Disease Diphtheria L. (Clin)
Result Recovery
July
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Steam.
Rash
July 6th Rx Whiskey ʒ i 4 hrly.
Rx Liq. Strych. Hyd. m i 4 hrly.
July 19 Stop above
Rx Syrupi Eastoni m XV t.i.d.
Discharged July 31st 05.
Normal Temperat. of body
Albumin
Pulse.
Resp.
Urine.
Bowels.
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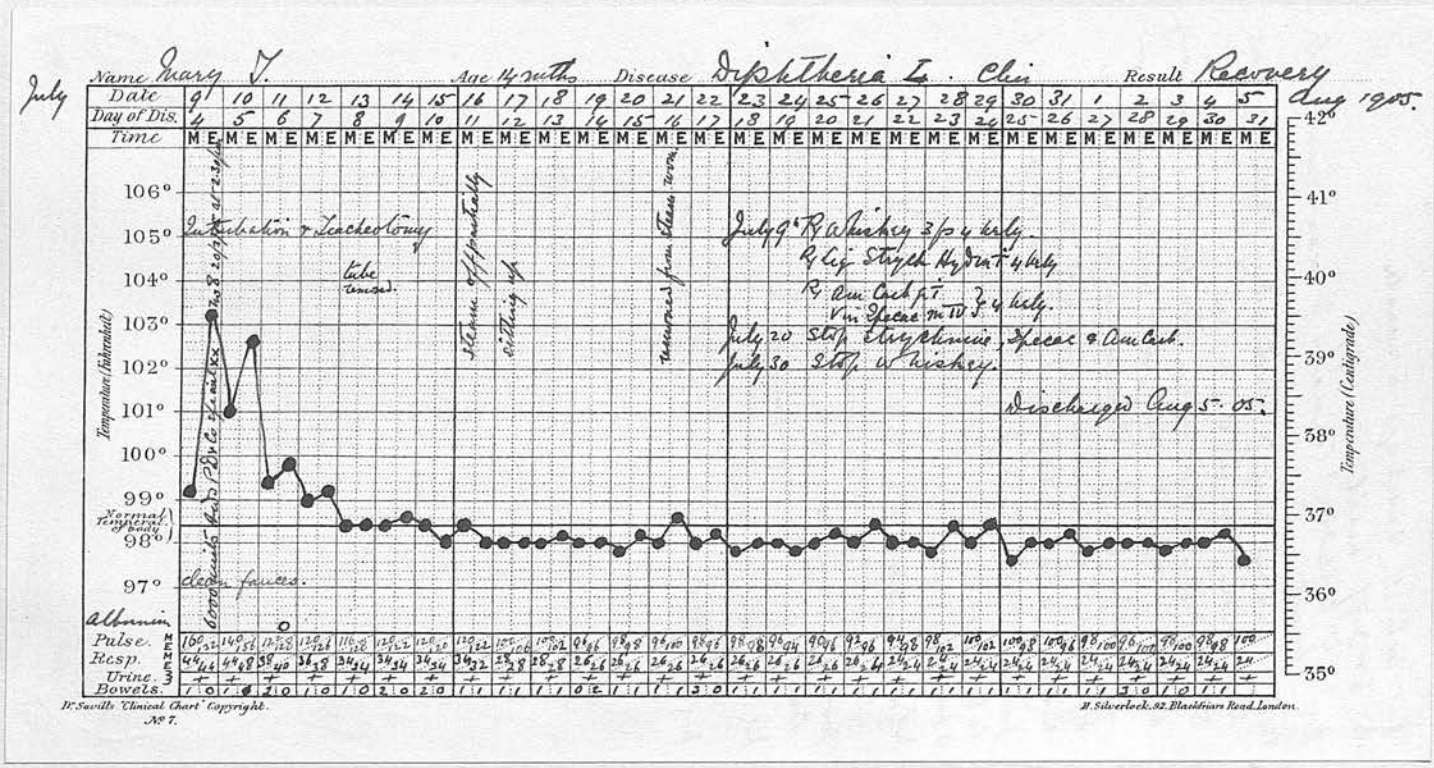
Case 2. July 4th sore throat. July 5th croup. Doctor called in. July 6th admitted face pale, slightly cyanosed. Croupy. Breathing obstructed somewhat. Slight inspiratory indrawing. No membrane visible on fauces. 6000 units of antitoxin given. Put under steam. July 7th improved. Expelled a little membrane. July 10th erythematous antitoxin rash. July 11th steam off. Made a good recovery.

Case 3. July 2nd measles. July 6th croupy with obstructed breathing. July 9th 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 muco pus was expelled and a little membrane. Colour slowly improved. Breathing not very good.

Case 3.



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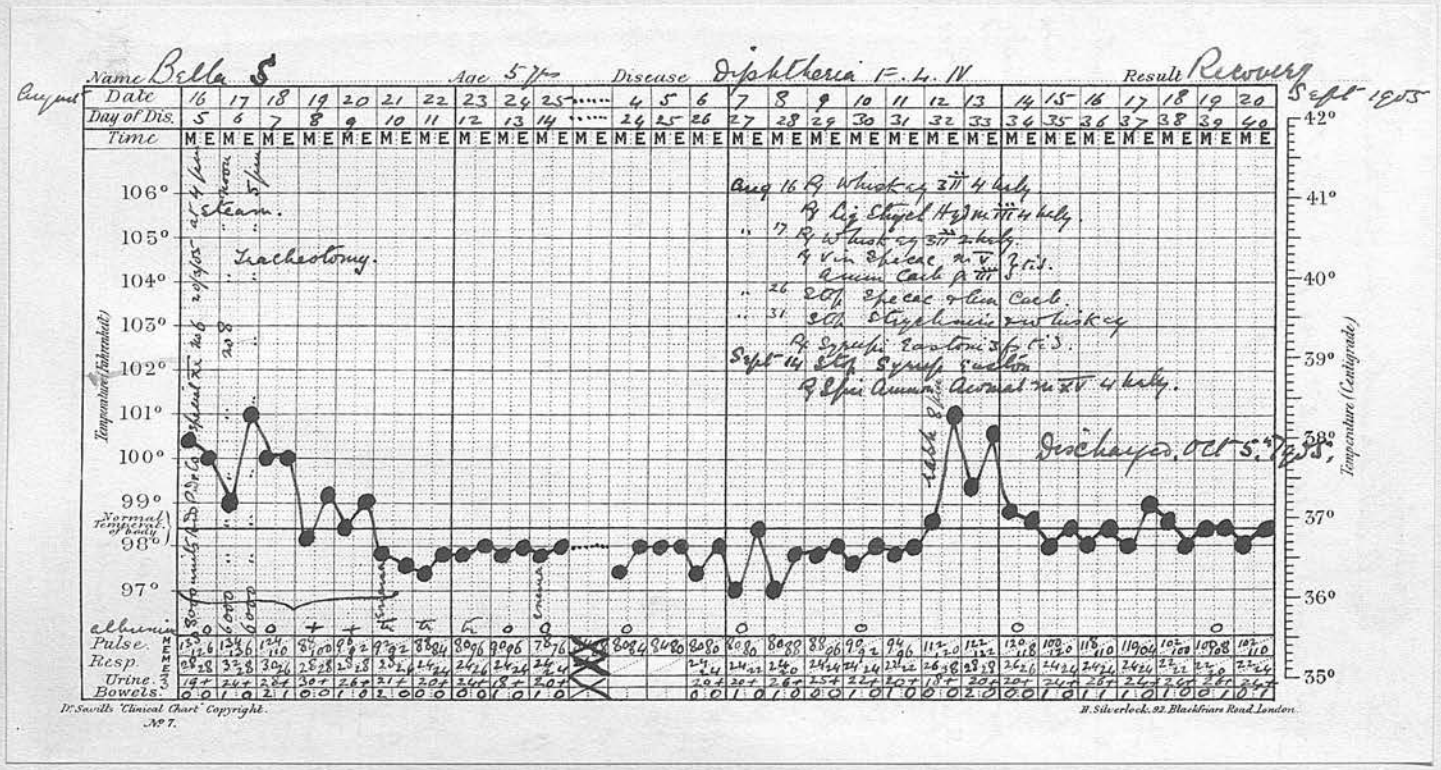
There was much coughing after the operation. Hot precordial fomentations were applied and Strychnii Hyd gr 1/100 given hypodermically. Put under steam. Breathing slowly improved. 6000 units of antitoxin given. July 10th Paraldehyde m xxx per rectum given at 12.30 am. Slept two hours after the dose. Breathing rapid. Pulse running. Colour good. A large quantity of muco pus expelled. Bronchitic sounds over front of chest. July 11th doing well. July 13th tube removed during sleep. July 21st steam off, croupiness absent. Made a good recovery.

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

Case Aug 12th sore throat. Aug 16th croup. Admitted on 16th Aug very ill, slight obstruction to respiration, slight epigastric indrawing. Croupy cough. Pulse fair. Each tonsil and uvula covered with membrane. Nostrils discharging


Name Bella S
Age 5 yrs
Disease Diphtheria F. L. IV
Result Recovery
5 Sept 1905
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperature of body
Tracheotomy.
Discharged. Oct 5. 1905.
Albumin
Pulse.
Resp.
Urine.
Bowels.
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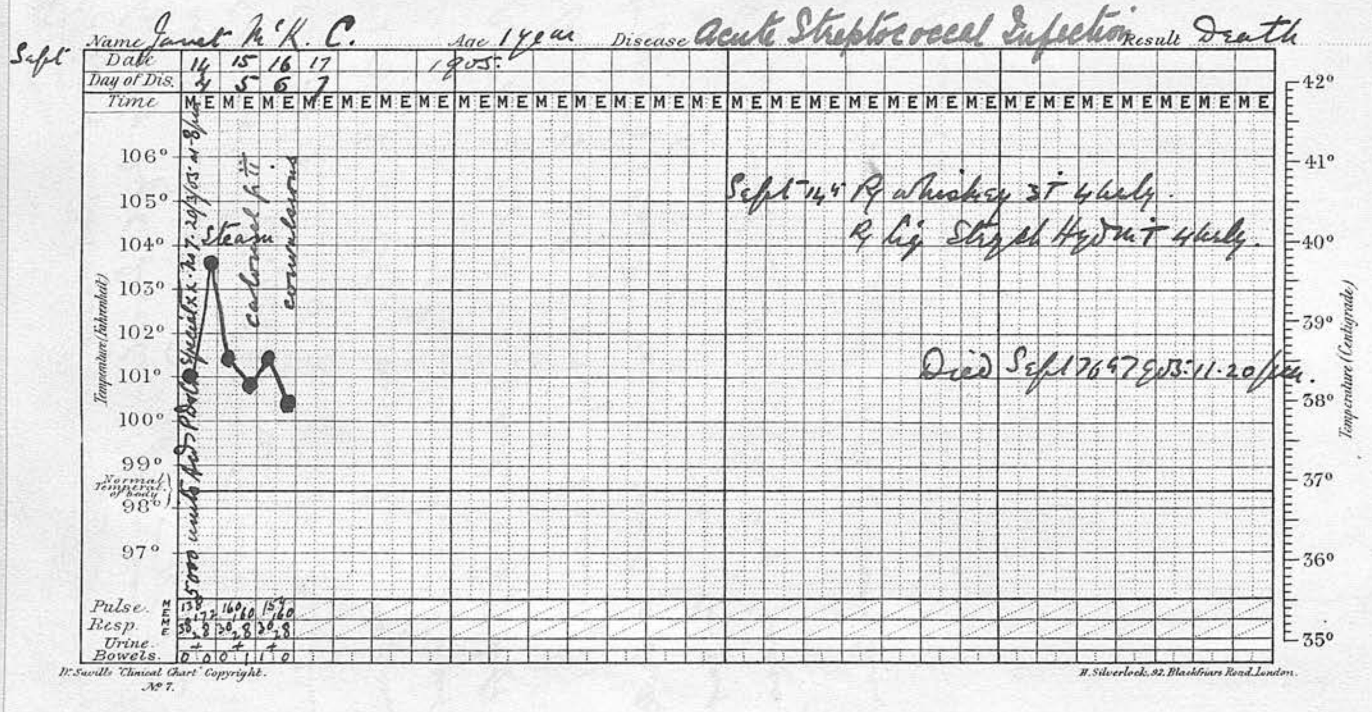
freely. Membrane visible in each nasal cavity. The membrane loose and on a bleeding surface. Given 8000 units of antitoxin and put under steam. Aug 17th Pulse weaker. Inspiration still somewhat obstructed. Looked more poisoned. Some bleeding from nose. Given 6000 units of antitoxin. At 5 pm pulse failing, breathing and indrawing progressively worse – a low tracheotomy was therefore performed under chloroform. Much relieved. Given strychnin Hyd gr 1/60 hypod and hot precordial fomentations. Put on rectal feeding. 6000 units of antitoxin given during operation. Aug 18th slept well without hypnotics. Getting nutrients and some fluid by mouth in addition. Pulse weak. No signs of pneumonia.
Aug 19th Slept well. Nutrient enemata stopped. Much improved. Aug 20th Tube removed during sleep. Aug 23rd steam off. Aug 31st Erythematous antitoxin rash. On Sept 12th a scarlatiniform rash appeared fauces congested – uncertain whether a very mild scarlatina or whether an antitoxin


Sept
Name Janet McK. C.
Age 17 years
Disease Acute Streptococcal Infection
Result Death
Date 14 15 16 17
1905.
Day of Dis. 4 5 6 7
Time M E
106° 105° 104° 103° 102° 101° 100° 99° 98° 97°
Normal Temperat. of body
Temperature (Fahrenheit)
Steam
calomel fr ii
convulsions
Sept 14th Rx whiskey 3i 4 hrly.
Rx Liq Strych Hydr m i 4 hrly.
Died Sept 17th 9.15 11.20 pm.
Pulse. 138 172 160 160 157 160
Resp. 30 28 30 28 30 28
Urine. + + +
Bowels. 0 0 0 1 1 0
42° 41° 40° 39° 38° 37° 36° 35°
Temperature (Centigrade)
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disturbance. Was isolated. Made a good recovery.

D. The last case is interesting from the point of view of diagnosis. The fauces shewed a large amount of apparently typical diphtheritic membrane, the nostrils were oozing with sanious discharge. There was a profuse muco purulent discharge from the fauces. The tongue was atypical. There was no sign of a rash. Repeated examinations failed to shew in the fauces or nose the presence of any organisms except streptococci. Antitoxin had no curative effect on the condition. One brother and one sister were at this time isolated on the scarlatinal side of the hospital with apparently typical scarlatina 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. Complexion fair.

The following table illustrates some of the results of treatment in the series of cases described. Consecutive cases alone are considered and in estimating the average duration in residence fatal cases are not considered.

	Total Cases	Recoveries	Average in hospital in days	average antitoxin in units
Mild faucials	10	10	19·5	5·25
Average faucials	38	38	31·4	3,250
Clinical faucials	8	8	30·5	2,687
Severe faucials	9	6	46·6	10,555
Nasal + faucial	10	7	48·4	12,200
Laryngeal + faucial	9	9	38·3	5,888
Laryngeal	7	6*	31·8	7,142
Clinical laryngeal	2	2	27	6000
Faucial, nasal + laryngeal	1	1	44	20,000
Total cases	94	87	35·2	7360

* 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 occured in children of fair complexion. With one exception the worst cases of cardiac failure occured 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 bill, no 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 Parke Davis and Company. This is prepared by immunizing a horse, previously tested for glanders and tubercle and dosed with antitetanic

serum, with very virulent toxin. Increasing doses are injected, about every three days, until in six months or thereabouts, 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 Bosanquet, 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 processes of intoxication; firstly the poisons circulate free in the blood, the body cells being unattacked, this being a most favourable time to give antitoxin; secondly the poisons have combined loosely with the cells

and antitoxin can still withdraw the toxin, 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 specially 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, 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 cc of antitoxic serum is concentrated, until it contains from 300 to 500 units of antitoxin. According to Bosanquet, 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 their sera. After this interval the reduction of potency usually proceeds at the comparatively insignificant rate of 6% 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 L. Sims Woodhead, whose certificate is attached to each bulb. 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 undoubted 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 Loeffler bacillus. Recently three children, brothers and sister, 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 scarlatinal rashes and typical diphtheritic throats. In each case the uvula was patched, in each case, with no effect upon the

state of the fauces, antitoxin was given, and in each case repeated examinations failed to reveal the presence of diphtheria bacilli. It is thus seen, that in cases of doubtful diagnosis, the administration of suitable doses of antitoxin may serve as an aid to diagnosis, the fauces that clear being probably diphtheritic, those unaffected by the material being probably not of a diphtheritic nature.

No rules can be laid down as to what is a suitable dose of antitoxin. The dose depends chiefly upon the day of the disease, the severity of the disease, the extent and site of the membrane. Very early a smaller dose will suffice than later; severe types, a large extent of membrane, especially if spreading, nasal and laryngeal varieties require large doses. As a rough guide it may be said, give 2000 units for each part affected, irrespective of the age of the patient. Thus if each tonsil and the uvula is coated with membrane give 6000 units. 8000 units is about the largest single dose given at the present

time 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 thereabouts. 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 collodion dressing. Throughout the operation the child, if young, must be forcibly held still, in order to obviate the danger of breaking a needle. Dr

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 or stationary membrane and a want of improvement in the general condition. Probably the best indicator 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 shew 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 paralyses. The increase in these paralyses 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 occuring in about 25% of cases, joint pains, slight albuminuria, slight pyrexia in about 19% of cases, rarely dyspnoea and precordial pain. Warming of the serum prior to injection has

probably no effect upon these sequelæ.

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 natural 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.

Soiled 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 night dress is advisable until convalescence is established.

The utmost quiet should prevail in the sick room. For quiet stoking of the fire, coal may be conveniently kept in paper bags. Noisy poking 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 fauces or nose. On this subject numerous experiments are being made at the City Hospital. These seem to shew that the bacilli of diphtheria, uninfluenced by the antiseptics, take their own time in disappearing.

(c.) Dietetic treatment:-

Until the fauces or the affected part is clear of membrane, a fluid diet, light and stimulating, such as milk, beef tea and egg flips is advisable. After this Benger'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 curtailed for albuminuria alone. A little later chicken and rabbit

can be allowed. Each case must be dieted on its own merits, consequently none 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, varied as much as possible. At night four hourly feeding is advisable, but the patient should not be roused from natural sleep for this purpose. When convalescent meal hours such as the following are suitable, milk and bread and butter at 6 a.m., porridge and milk at 9 a.m., dinner at 12.30 p.m., tea at 3.30 p.m., supper at 7 p.m. and beef tea at 11 p.m.

(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 reconsider the conditions under which drugs are applied. Putting aside the

physical obstruction to respiration due to laryngeal spasm, induced by fear, or by the presence of laryngeal irritation, or to the actual presence of membrane or of the products of germinal growth and treated by antispasmodics, as belladonna, by emetics, as Vinum Ipecacuanha, by stimulating expectorants, as ammonium 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 the central cells of the vagi and a fatty degeneration of the heart muscle. These 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. Later 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 toxine, 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 vaso motor 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 Lauder Brunton can be believed, it would appear to be a powerful cardiac stimulant. It is best given in the form of Liquor Strychninae Hydrochlor: 5 m 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 Easton's 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, adrenalin 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 minim doses four 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 combined with a vasodilator. 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 formate 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 ipecacuanha is frequently given for its emetic action in croup and also for its expectorant action in those cases when 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 phosphate or as the tinctura of Ferric Chloride, is often prescribed during convalescence for its haematinic and tonic actions.

In the early stages of the disease, if much acute tonsillitis is present, small repeated doses of aconite are often of

use and very comforting to the patient.

Tincture belladonnae is much used in those cases of laryngeal dyspnoea in which spasm of the larynx is supposed to be the chief factor. For this class of case it should be given in large doses. When so given an improvement in the pulse is often noticeable. According to Dr Bolton (Lancet Feb 3 1906) it should be given a fair trial in diphtheritic cardiac failure. By its paralysing 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. Viewing these actions, it would therefore seem to be a suitable 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 swabbing the fauces, must be stopped. Using good whiskey or brandy, give frequent small doses of alcohol. Give strychnine 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 strychnine 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 anterior nares with cotton wool soaked in this solution, though it is better to avoid this manoeuvre, 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.

(b) Alimentary System.

(1). Vomiting:- Food and drugs by the mouth should be stopped. Strychnine by the mouth is sometimes liable 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 gripe and nauseate.

③ Dysphagia and sore throat :- These if very severe may be treated by nasal feeding; otherwise hot fomentations to the neck may give relief. If much tonsillitis is present, with pyrexia and a rapid pulse, tincture aconiti in minim doses every half hour, till five 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

by intervals of quiet breathing during sleep and repose. The patient should be kept very quiet, under steam, and given tinctura belladonnae in large doses. Operative measures may be required.

(3) Laryngeal dyspnoea due to mechanical obstruction requires the most skilled 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 antitoxin 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 fatness 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 forcibly 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, of depth, of liability to haemorrhage 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 croup, on the second day of the disease. There is some indrawing of the epigastrium and intercostal spaces; the pulse is fair; the colour shews 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 dyspnoea 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 thin 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 firm 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 episternal notch. Inserting his forefinger 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 he exposes 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 touch, which can only be acquired by practice. Having done this and put in a superficial stitch or two, fix the tube with tapes tied round the neck,

and dress with a thin strip of iodoform 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 keeps to the middle line and does not make the lower part of the incision too deep. After a hypodermic injection 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 awakes shewing signs 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 number 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 gauze, 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 final withdrawal 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 learn directions that in the event of dyspnoea, the tracheal dilator must be inserted and

himself sent for.

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 diaper, 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 inner 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 irritates 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 inner 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) Haemopoietic 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 iodide of iron or with tincture ferric chloride. Easton's syrup is an excellent tonic. Parrish'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 on 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 aconite. During convalescence bromid or bromide of ammonia 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 aconite may again be beneficial.

3. Post diphtheritic paralyses are said to be produced, by the variety of toxine 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 septic pneumonia, 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. Faradization of the phrenics has been tried without success. The paralyses of the various voluntary muscles need not be specially mentioned. They can be treated with massage and electricity. Each patient suffering from post-diphtheritic paralysis requires rest, careful watching and nursing and a course of tonic treatment.

(h.) 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.

(i) General

(1.) Lassitude 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) Scarlatina 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 scarlatina, perhaps through the medium of pyrexia, seems to act as a stimulant to the exhausted diphtheria 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 faucial diphtheria, with merely the organisms and no membrane present, feel as 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 pts
Spt. vini Rect.	60 pts
Tinct Ferri Perchlor	4 pts

bed is not necessary. A small dose of antitoxin will often hasten the extermination of obstinate organisms. Four hourly listerine gargles or boroglyceride 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 obstinate cases. Mild faucial cases with membrane may be treated as above, but in addition a weakened Loeffler'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 topical solution, as soon as the membrane has disappeared. Finally the boroglyceride swabbings are gradually stopped, but it is usual to continue gargling, at least three times a day, until the

℞ Acidi Borac Pulv ʒi
Ol Menth Pip mv
Vaselini ʒi
M

patient is discharged. As far as clinical experience goes, carbolic acid and glycerine seems to be the most useful application for exterminating the bacilli.

In severe dirty faucial cases, with marked mixed infection, the fauces should if possible be sprayed every two hours with corrosive sublimate (1 in 4000) 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 boroglyceride. To hasten the loosening of the membrane, spray or swab with a saturated sodium bicarbonate solution. Frequent listerine gargles are beneficial. The mouth must be kept clean by swabbing with listerine and by applying the Olei Menth: Pip: ointment to the tongue. Cracked lips are best treated with vaseline ointment, applied two or three

R Hazeline (B.W +lo) 1pt
adeps Lanae Hyp 9pts.

times a day.

Haemorrhagic cases should be sprayed with hazeline, hemesine or adrenalin chloride. It is best to avoid the application of tincture ferric chloride, gargles and swabbing.

Mild nasal cases should be syringed two or three times daily with boracic lotion or listerine or salt solution, using a Higginson or bulb syringe for the purpose. If the patient is in a fit state, syringe in the sitting posture, when he can expectorate 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 Zinc ointment. If crached hazeline ointment may be applied with benefit. For nasal bleeding

spray with hazeline, Senesine or adrenalin 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 antitoxin, the steam assisting the patient over the troublesome period, before the antitoxin begins to shew its action. It is useful also, after these operations, in aiding the expulsion of muco pus and membrane and perhaps in lessening the danger of pneumonia. Medicated 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 faucial disease the measures applicable to each should be adopted unless there is dyspnoea present, when all faucial applications must be neglected.

All these methods of treatment are mere accessories and adjuvants to the main and important rest and antitoxin treatment. Every hours delay in giving antitoxic serum increases the patients 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 conveys 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 such 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 croup. Cases of this sort, met with after 6 pm, are practically untreated, because no dispensary doctor or poor practitioner can be expected to pay 10/- or £1 for antitoxin, necessary for practical treatment. Neither can he apply steam, intubate or perform tracheotomy in many of the hovels, in which he will find the disease. Such cases are notified and moved some seventeen hours later, often arriving moribund at the City Hospital. There 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 it 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 save its officials night work, or does not recognize the importance of immediate treatment in such urgent cases as diphtheritic croup. The following case, happily with a favourable termination, illustrates this question. On 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 pm, 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 Dr Dunbar, whilst the instruments for tracheotomy were collected. Tracheotomy was then performed. The case, being one of diphtheritic croup, was isolated in the only place available- a scullery. The Public Health Department was then communicated 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.