THESIS.

THE PANDEMIC OF INFLUENZA 1918 - 1919

AS IT AFFECTED AN INDUSTRIAL AREA, WITH SPECIAL REFERENCE TO THE CONTROL OF THE VIRULENCE OF INFECTION.

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Because of certain shortcomings which are revealed in this thesis it may not be altogether out of place to give an explanation of the genesis of the investigations recorded in it.

For the past few years it has been an endeavour of mine to devise some scheme of note taking easy of reference to individual patients and which would become a help rather than a hindrance in the average routine of general practice. As the result of the keeping of those records I thought that some light might be thrown on the relationship of what are generally regarded as minor maladies, and which embrace a very large percentage of the complaints of all insurance practices, to the major illnesses.

During the time ~~of~~ the Influenzal epidemic described in this thesis occurred, the keeping of those records was persisted in, more as a matter of routine rather than from any expectation that they could be of any assistance to me in my investigations. However, as the epidemic progressed, and as opportunities arose for analysing those records, it appeared to me that certain facts revealed themselves which, so far as I could judge from the reports of other investigators, had generally been overlooked.

It may be that the opportunities for making these observations have arisen from certain exceptional circumstances. Amongst other reasons this was partly due to the temporary shortage of medical men

owing to the War, which left me practically the sole medical practitioner for a considerable industrial area. For this reason it may be urged that time was denied me to make the minute inquiry into specific cases which obtained to practitioners with smaller practices, but as a recompense perhaps the opportunity enabled me to record certain facts which would not readily come to the notice of those, in a certain sense, with more limited opportunities, for if the work of the area had been carried out by two or three more practitioners certain aspects of the epidemic might easily have been overlooked.

I am aware that those observations add very little to our limited knowledge of influenza epidemics; but they appear to indicate that much investigation has yet to be made into many common everyday ideas of the subject.

In presenting a thesis, it is the sustom I believe to specify the particular subject of research, to record the steps of proceedure and to state the conclusions arrived at from the investigations. Based on that standard the work recorded in this paper may be regarded as aimless. The records were kept with no specific object in view so far as the epidemic was concerned: it was only towards the latter end of the epidemic that it occurred to me that those records might deserve a detached analysis, and however far one might disagree with

the views expressed here, one could not in any fairness suggest that the records were prepared to prove any preconceived notions. In place therefore, of stating the subject of research, I may here be allowed to give a brief summary of the deductions drawn from the investigations.

1. That in an epidemic of influenza all sources of infection are not of equal virulence; that there is a comparatively attenuated form of infection which is chiefly spread by persons more or less able to pursue the ordinary routine of life, and a virulent form of infection which appears to spread from house to house and that it is this latter form of spread which causes greatest anxiety to practising physicians and is the main cause of death from the infection. That,if such be the case, so long as effective measures cannot be taken to prevent the spread of the epidemic it would appear that any steps taken by the community to prevent the spread of the attenuated form of infection may react detrimentally to the community by leaving a greater number of susceptible persons open to attack from the more virulent form of infection.

2. That it might be preferable in dealing with cases of influenza to adopt the use of the terms "Primary Stage" and "Secondary Stage" rather than use the expressions "Uncomplicated attack of Influenza" and "Complications of Influenza"

so that the relationship apparently existing between the two conditions might be placed on a more satisfactory basis. Thus, the primary stage may be mainly a stage of abnormal body reaction in which the main symptoms manifesting themselves are indications of a healthy body reacting to prevent the invasion by micro-organisms or their toxins rather than the indications of the actual magnitude of the body invasion. That the secondary stage is the stage of pathological changes due to the presence of micro-organisms or their toxins in the tissues and circulating fluids of the body, and that cure in this stage is effected by a process of immunisation due to the presence of those micro-organisms or their toxins.

3. That the sequelae of influenza appears to be of minor importance.

4. That the main objects therefore, in dealing with an epidemic of Influenza should be -

(a) to prevent the spread of infection through the home.

(b) to prevent the onset of the secondary stage.

DEFINITION OF THE TERM "INFLUENZA".

While it will be found that the description in this thesis of the influenzal attack agrees in the main with the accepted description, yet, as the specific micro-organism present in the epidemic has not been definitely established, and because the symptoms which the micro-organisms produced appeared to vary in different individuals, it is

obviously necessary to define the use of the term if a proper value is to be placed on the statistics given in this paper.

As a very high degree of infectivity appeared to be associated with the micro-organism all doubtful cases were considered in relationship to this infectivity both in regard to the relationship of the case to persons who shewed the ordinary symptoms of influenza and the relationship to persons who might subsequently develop the ordinary symptoms. For example, three cases may be cited which shewed similar symptoms occurring under different conditions.

1. Godfrey Martin, 10, Belgrave Street, aet 44, seen November 2nd, 1918. Influenza was present in the neighbourhood and his two children who slept in the same bedroom had been suffering from ordinary symptoms of the attack.

2. Florence Howard, 20, Parker Street, aet 1 yr. 3 mnths, seen October 29th, 1918. Influenza present in the neighbourhood; father and mother both suffering from the influenzal condition during illness of child.

3. Arthur Holmes, 4, Back West View, Boothtown, aet 7 years, seen October 4th, 1918. Practically no influenza present in the neighbourhood; his mother and sister who were nursing him both developed synchronous attacks of influenza three days later and no further spread in the neighbourhood.

Similar illness therefore, occurring under those three different conditions appeared to establish a relationship between that illness and the epidemic and claimed consideration along with the other phenomena of the epidemic.


HALIFAX
OVENDEN CROSS
PULE HILL
Shibden Dale
Pepper Hill
High Roya
Dirk Carr
High Sunderland
Lower High Sunderland
Spa House Farm
Longfield Farm
Black Boy
Hollins Greave Lane
Public Library & Museum
Woodlands
SHROGGS PARK
LEE MOUNT
LEE BRIDGE
DEAN CLOUGH
Old Lane Dye Wks.
Crown Works
Ladyship Mills
Park Lodge
Central Iron Works
Moor Fall
Fire Clay & Sanitary Tube Works
Stump Cross Brewery
Stump House
Eastfield Mills
Park Farm
Air Shaft
Undercliffe House
St. Joseph's R.C. School
Beacon Hill
THEATRE
SCALE 6 INS = 1 MILE

DESCRIPTION OF THE AREA IN WHICH THE OBSERVATIONS WERE MADE.

The area in which these observations were made contains a population of about 11,000, and while being a portion of Halifax, it is separated from the town proper by a deep ravine in which runs a railway and small river: a bridge forms the only main connection with the town.

On reference to the accompanying map it will be seen that by reason of open spaces and workshops, seven separate divisions of this area can be recognised. These lie on a slope rising eastwards and northwards from the main connection to the town.

Eastward there are Range Bank and Claremount districts, the latter being divided into Claremount proper and Horley Green, and northward from the bridge there are Haley Hill, Hoodside, Akroydon and Boothtown districts. There are three undemoninational schools in the area, but there is only one Roman Catholic School and one Roman Catholic Church, the Roman Catholic School being situated in Horley Green and the Church in Haley Hill. There is a considerable and well scattered Catholic population.

Like most of the towns in the West Riding of Yorkshire the majority of the patients belong to a fairly good type of artisan

class. There are no real slums in the sense in which they are found in the larger towns, but back to back houses are common in all areas with the exception of Akroydon, which, built by the late Colonel Akroyd, is, I believe, the earliest attempt at town planning in England.

The adult population in those districts intermingle freely in the factories and in places of entertainment. There are no houses of entertainment in any of the districts, the favourite place of amusement common to all districts, with the exception of Akroydon, being a Music Hall at the farther end of the Bridge, and although the hours were curtailed in all places of entertainment in Halifax during the period of the epidemic, none of them were shut.
While there are considerable shopping facilities in all districts, there is the usual weekend shopping in the town proper.
It will thus be seen that peculiar opportunities were afforded for analysing the supposed factors in producing the spread through the various districts.

During the epidemic five classes of patient came under observation, viz.,

1. Insurance patients; mainly industrial workers.
2. Private patients; mainly dependents of Insurance patients. ‡‡

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‡‡ Outside of the National Insurance Act there is no contract practice in this neighbourhood.

3. Insurance patients of Service Doctors.

4. Private patients of Service Doctors.

5. Poor Law patients.

Because the investigations meant following the subsequent history of patients affected, I abstained from including the patients of Service Doctors as I did not know how soon I would be able to relinquish their care. Similarly of the Poor Law patients, a considerable number were patients of colleagues who had suggested their removal to the Poor Law Hospital and they were only seen formally by me to certify their fitness for removal.

The statistics therefore, are confined to my own practice. It has been noted that five colleagues, whose practices extend into this neighbourhood, had been called up for military service, and with an individual Panel of well over 2,000, increased by about 40%, it may be taken that a fairly intimate knowledge of the epidemic in this neighbourhood was gained.

HEALTH OF THE AREA IMMEDIATELY PRECEEDING THE EPIDEMIC.

Much has been written about the relationship of the general health of the community to the epdemic. There may have been some relationship but so far as the suggestion that War conditions led to an impairment of health of the community I am without any evidence.

By July, 1918, I had been in practice in this area for four years and I am in possession of the visiting lists of my predecessor for the past twenty years, and comparing the visiting lists of the various years I have found nothing that will bear out this suggestion. In fact, during the intermediate months between the summer and winter epidemics of 1918, the visiting lists were much below normal. The fact that people were urged through the Press not to make undue calls on their medical attendants may in part account for this, but on the other hand, increased notification of Tuberculosis during the War as an indication of impairment of health should be accepted with reservation. Many practitioners have not taken kindly to the compulsory notification of Tuberculosis, and it is reasonable to suggest that this increase of notification was in part due to this antipathy. In pre-war days, if the Practitioner wished to give his patient the benefit of the doubt then, owing to the social stigma attached to the complaint, the case was not notified, but during the War, with the special rations granted to patients notified as suffering from Tuberculosis, it was obvious, to give the patient the benefit of the doubt was to notify the case. It is difficult therefore, to make any definite statement in regard to this, but this much can be said definitely, that there was no increase of those cases of serious illness which at all times require attention

and that among the consulting insurance patients, which shewed no abatement during the whole of the War period, there was nothing to indicate any unusual impairment of health.

GENERAL DESCRIPTION OF THE EPIDEMIC. ‡‡

There have been three exacerbations of the epidemic. The first occurred in July, 1918; the second reached its maximum about November 1918, and the third its maximum about March, 1919. The statistics given in this paper refer to the two latter, for unfortunately, being an early victim of the July epidemic, note taking was interrupted and at that time assistance being unattainable, work was cut down to a minimum. However, it was noted:-

1. Individuals affected were chiefly of the Insurance class, and enquiry seemed to indicate that infection was associated with the workshops.
2. The majority were able to attend at the Surgery.
3. The wives and children were not affected to any extent, or if so, then it was so slight that they did not consider it worth while to call in a medical man.
4. Illness led to very short incapacity.
5. There were no deaths.

During the second and third exacerbations 768 patients were seen: of these 555 were private and 213 were insurance patients. Of the private patients 504 were visited in their homes and 51 attended at the Surgery.

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‡‡ Most of this portion of the thesis appeared in the British Medical Journal of October 25th, 1919.

Of the insurance patients 115 were visited and 98 seen at the Surgery.

The total number of deaths which could in any way be attributed to Influenza, was 19; of these 9 were amongst the private patients and 10 amongst the insurance.

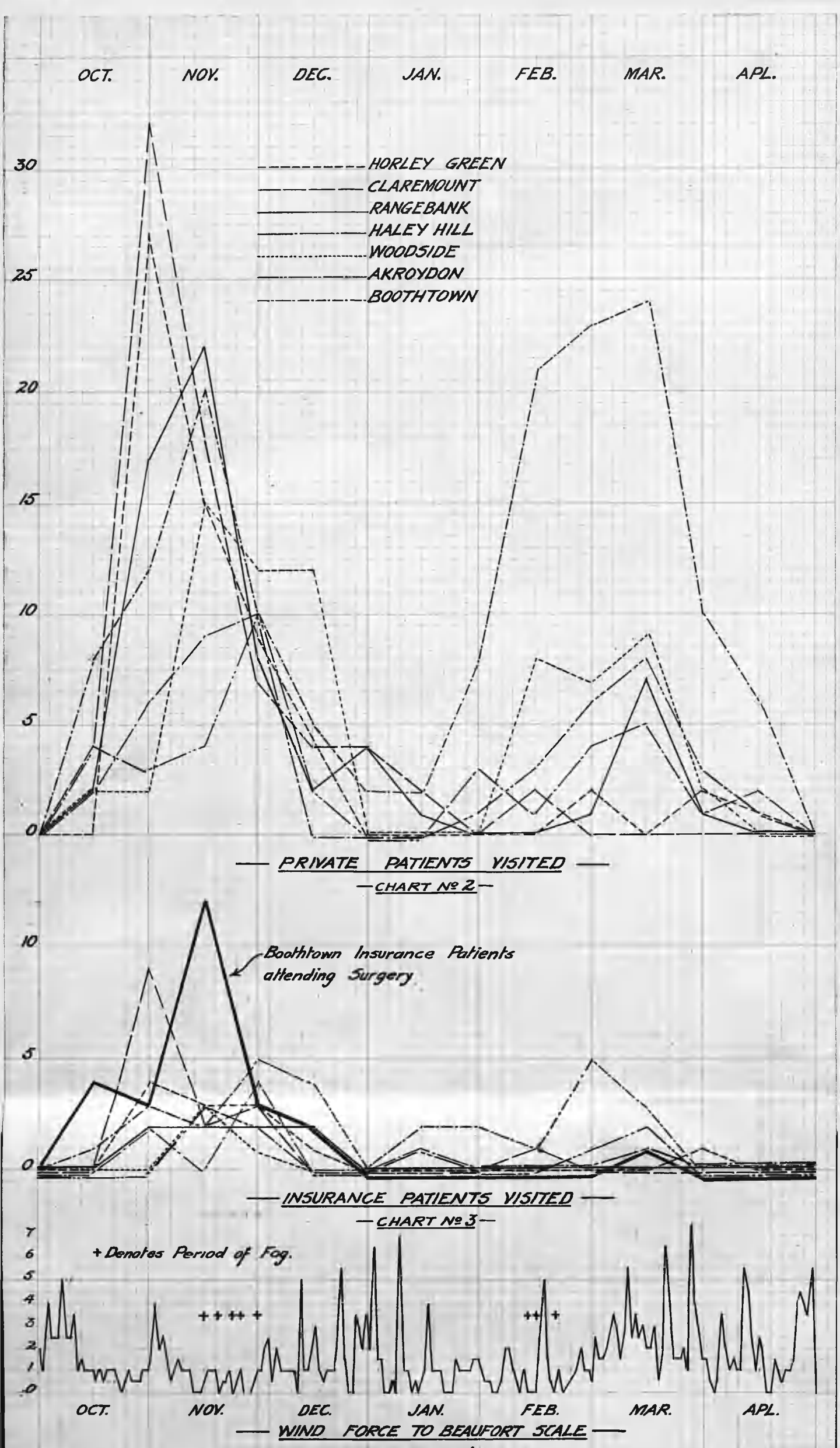
Of 223 housewives visited, two died. There were no deaths amongst either private or insurance patients who were first seen by me in the consulting room. There was therefore, a death rate of approximately $1\frac{3}{4}$ per cent amongst the private patients visited and approximately $8\frac{1}{2}$ per cent amongst the insurance patients visited. It will be noticed that the death rate amongst housewives was less than 1 per cent.

Amongst the insurance patients three were removed to the Poor Law Hospital and amongst the private patients nine were removed, but I am without any exact data with regard to the ultimate course of these cases.

While possessing figures of the total number of cases diagnosed as suffering from Lobar and Lobular Pneumonia, they are not given in this paper. There was great difficulty in diagnosing with absolute certainty the presence or absence of pneumonic consolidation in many of these influenza cases; and while the actual death rate can be taken as a criterion of the gravity of the epidemic, I do not see there is anything to be gained by

supplying figures which might be regarded as very debatable. As the total number of cases seen was less than one in ten of the population, it is not suggested that one can form from these figures any idea of the total number of people affected in the area. I was made aware of a large number of cases by people informing me that influenza was present in the house and if any of the occupants became worse they would call me in, and to those some general advice was usually given. On the other hand, it may be taken that those figures do bear a definite relationship to those cases in the epidemic which led to any anxiety.

In noting the high death rate amongst the insurance patients visited as compared with private patients visited, it might be urged that this was probably due to insurance patients failing to seek the services of a physician unless seriously ill. This suggestion would be scouted by any physician who has had experience in industrial areas, but apart from that, the relationship of women and children able to visit my surgery to those visited in their homes, was 51 to 504, but amongst the insurance patients it was 98 to 115, shewing that amongst insurance patients I saw a mugh higher proportion of the milder cases, and therefore, it is not likely that the insurance patients shewed any hesitation in calling for attendance. The probable significance of this high death rate will be discussed later.



— PRIVATE PATIENTS VISITED —

— CHART Nº 2 —

— INSURANCE PATIENTS VISITED —

— CHART Nº 3 —

— WIND FORCE TO BEAUFORT SCALE —

— CHART Nº 1 —

When the epidemic first broke out in October, infection appeared to be present in all districts, but the two exacerbations here described presented a curious phenomenon and for purpose of description is called the "household wave". This was a slow advancing wave of infection which commenced in October in the Claremount district, slightly later passing through Range Bank, then Haley Hill and Woodside districts, almost disappearing about the New Year, and again appearing in Woodside and in the Boothtown districts in the early months of the year. (See Charts 2. and 3.) ✳

It was in association with this "household wave" that the more serious cases occurred, both amongst the private and insurance patients, and it was during its presence that nearly all the deaths occurred. It would appear that the phenomena underlying this household infection deserve greatest consideration.

As Boothtown was the last district to be visited by the "household wave", there was sufficient time for observations to be

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✳ (The diagram accompanying this thesis and illustrating this wave was prepared by James Garvie, B.Sc., A.M.I.C.E., and at his suggestion, and was graphed from a diagrammatic map which I had prepared of the neighbourhood, on which was noted every household affected, with the date of infection and with separate notes for the total number in each household affected, but it failed to demonstrate the spread of the infection in so interesting a manner as that revealed by the diagram.)

made before the onset of the wave, and it is worth noting what occurred in this district.

Actually, the first cases with symptoms of the epidemic occurred here in early October, mainly among school children. On reference to the diagram of insurance patients it will be noticed that there was a considerable number of insurance patients affected who were able to visit at the surgery and a smaller proportion had to be visited. It will be further noticed that when the "household wave" visited Boothtown, insurance patients affected, with one exception, were so ill as to call for visitation.

For purposes of analysis I have divided all patients affected into two classes, so far as any one neighbourhood is concerned:-

A. Sporadic cases.

B. Cases associated with the "household wave".

Each had its characteristics.

1. Sporadic cases occurred mainly among the wage-earning members of the household.

2. A sporadic case had little tendency to affect other members of the household, whereas in the presence of the "household wave" usually the whole house was more or less affected with the illness.

3. Sporadic cases were seldom seriously ill: one death occurred in Boothtown, Oct./Dec. and one in Claremount Jan./Apl.

4. During the passing of the "household wave", "clumping" of the houses affected was a marked feature. In illustration of this I will give two cases. The areas are shewn in the map marked A. and B. and any one house in the list is within a stone throw of any other house in the list.-

(1) which occurred during the October/December period.

Schoolboy	2,	Alexander Street.	October 30th.
Office boy.	69,	Horley Green Road.	,, 30th.
Schoolboy	11,	Primrose Street.	,, 28th.
Worker	5,	Salubrity Street.	,, 28th.
Housewife	67,	Horley Green Road.	,, 28th.
Baby	13,	Primrose Street.	,, 29th.

(2) which occurred during the January/April period.

Housewife	159,	Claremount Road.	February 17th.
Housewife	143,	Claremount Road.	,, 18th.
Housewife	137,	Claremount Road.	,, 18th.
Housewife	15,	Iona Street.	,, 20th.
Housewife	124,	Claremount Road.	,, 21st.
Schoolgirl	8,	Royd Place.	,, 22nd.
Housewife	28,	Malton Street.	,, 23rd.
Clerkess	18,	Malton Street.	,, 24th.
Mechanic	26,	Malton Street.	,, 24th.
Rly.Porter	1,	Malton Street.	,, 25th.
Mechanic	1,	Robert Street North.	,, 26th.
Housewife	24,	Malton Street.	,, 26th.
Weaver	4,	Hardy Street.	,, 27th.

It will be noticed that all ages and types of patient are included in these groups.✳

✳ The various members of the household were divided into four classes, namely;- workers, housewives, children of school age and children under school age. An attempt was made to find in each household the individual member who had introduced the infection. In a large number of cases it was found to be impossible to arrive at a definite conclusion, but the above may be taken as illustrating the conception arrived at; that no particular class appeared to be primarily responsible for the spread.

5. Among sporadic cases there appeared to be no tendency to affect houses in the vicinity.
This is well illustrated in the diagram by the number of insurance patients affected in Boothtown during the October to December period. Those failed to produce any crisis in the neighbourhood.

6. So called "complications" of the influenzal attack were much more common amongst those affected in the "household wave" than amongst the sporadic cases.

In any one home affected in the "household wave" the first member of the family affected appeared to escape with the mildest attack and serious illnesses usually developed among the other members of the family. I made observations of this in a large number of cases: the assertion is obviously rather difficult of proof but to find probable confirmation of it I have analysed the cases where death occurred,

No.of case.	Relationship to infection in house.	Remarks.
1.	1st.	Lived alone
2.	4th	Six in one bedroom.
3.	2nd	
4.	3rd.	Brothers: six inmates residing in one-roomed cottage.
5.	3rd.	
6.	2nd	
7.	3rd.	
8.	2nd.	

No. of case.	Relationship to infection in house.	Remarks.
9.	2nd	
10.	1st.	Sporadic.
11.	2nd.	
12.	1st.	Sporadic.
13.	1st	
14.	2nd.	
15.	2nd.	
16.	2nd	
17.	1st.	Nursed sister who was said to have been seriously ill with influenza & pneumonia
18.	2nd.	
19.	1st.	

CONSIDERATION OF THE HOUSEHOLD WAVE.

After I had prepared those diagrams it occurred to me that it might be of some use to obtain the records of wind force to see if they bore any relationship to the exacerbations of the epidemic or to the temporary arrest of the infection in the Woodside district at the end of the year, and I am indebted to Mr. Green, Librariaan, for supplying me with the wind velocities * and from these the following extracts have been made:-

* See append. page 12.

During the period November 11th to December 2nd, there were 21 periods of calm (two periods of observation each day and Sundays not observed), the wind never exceeded light air and there were five days on which fog occurred. This period will be noticed to coincide with the crest of the November epidemic.

During the whole of December there were only seven periods of calm, no fog, and winds varying from light breeze to strong occurred during twenty-two periods.

From January 5th to 17th there were eight periods of calm and nine periods of light air (0 and 1 on Beaufort scale) and on the 9th there was a moderate gale. (7 on Beaufort scale).

During February, when it will be again noticed the epidemic was moving up towards its maximum, there were thirteen periods of light air and twenty-three periods of calm, with three days of fog. On the 17th there was a fresh breeze.

From March 10th until the end of the month only four periods of ~~full~~ calm were recorded and six periods of gale occurred.

The full details supplied are included in the appendix and from it I have prepared the diagram shewn by taking the average velocities for the two periods of each day. (See Chart No.1.)

The diagram of the Influenza spread is not traced in

sufficient short periods to allow for accurate comparison but it will be noticed that Woodside is the only district shewing two fairly equal crests before and after New Year. This is the district intermediate between Akroydon and Haley Hill, and that would indicate that some factor of greater importance than mere loss of continuity between districts led to the arrest of the spread about New Year. It seems fairly reasonable to accept the view that the High and Continuous winds which are shewn to have occurred about then was the probable cause of this arrest.

From conversation I have had with other practitioners in this neighbourhood I am now convinced that this household wave was by no means an isolated occurrence, and if it had been possible to get the willing co-operation of general practitioners it would have been found to have occurred elsewhere; but in seeking to find an explanation for this wave of household infection it seems much easier to state definitely what apparently had no cause in its production, than to state the actual cause of this spread.
It can be seen that although it is usually suggested that the intermingling of the people at work, in places of entertainment, or overcrowding in public conveyances, are important factors in the spread, these would have had little or no connection with this household wave.

Casual observation might lead one to suppose that the spread was due to actual contagion from one house to another. At first I regarded it simply as due to "neighbourliness", but later on I became convinced that this could at most, only be a partial explanation of the spread. It cannot for example, explain the "clumping". In many of the households affected in a "clump" absolute denial was given of being in any of the other affected houses, and this could readily be believed, for, owing to the general fear of the epidemic spread by newspaper reports and other methods, if the epidemic was known to be present in a house, the house was usually shunned by neighbours. In many cases the houses were not in direct contact but separated by the breadth of the street or by garden walls. It was easy to be supplied with the probable source of infection;for during the whole winter in populous areas there must have been very few who were not time and again in contact with infective persons, but why people within small radii of one another, of all ages and of different occupations, not coming in contact with one another should develop synchronous attacks still remains a mystery to me. Even to accept the theory that infection is carried in a fine spray from one individual, through the act of coughing or sneezing, to another who is thereby infected through the mouth or nose, one must accept that this fine spray can be

carried much greater distances than is generally supposed, but allowing this to be established, the cause, or causes, of the high virulence of the household wave still remains to be investigated. It will occur to many that this same phenomenon was described by Defoe in his "Memoirs of the Plague", and "which must be accounted on the whole as veracious". ‡

Defoe makes use of the bills of mortality to demonstrate that there was a slow progress of the disease from East to West, "and like a dark cloud that passes over our heads, which as it thickens and overcasts the air at one end, clears up at the other end." *

The general conclusion at that period was that it was an effluvia which rose up from the soil. Since then the relationship of the flea to the spread of the plague has been established.

If therefore, influenza is spread through direct infection from man to man, it will be noticed that two distinct diseases, with different means of spread, have produced a series of similar phenomena. This would appear to indicate that the isolation of a micro-organism or the establishing of its methods of propogation may not be of the same prime importance as the discovery of the factors which produce those phenomena.

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‡ Creighton's "History of the Epidemics". Vol.1.

* Defoe. "Memoirs of the Plague".

SYMPTOMS OF THE INFECTION.

Although the ordinary symptoms of an attack of Influenza are well-known and have been frequently described, in this attempt to give a connected account of the epidemic it may not be out of place to give a brief summary of those symptoms, even at the risk of passing over familiar ground.

In describing those symptoms, and as it now appears to me that one may be able to indicate to a certain extent the individuals who are likely to develop the so called "complications", and as those complications appear to bear considerable relationship to the manifestations of an ordinary influenzal attack, I have made use of the terms "primary" and "secondary" stages of infection, chiefly to indicate the objection which there may be to the view that those complications are more or less accidental to an ordinary epidemic and superimposed on the symptoms of an attack of influenza.

It is suggested that a possible explanation of the main distinction between those two stages is that the "primary" is the stage where infection is external to the tissues of the body being confined to the respiratory or alimentary tracts with little or no toxic absorption, and that the "secondary" stage is the stage of toxaemia, possibly accompanied by invasion either into the lung tissue or into the general tissues of the body of the influenzal

micro-organism, or of micro-organisms associated with the specific attacking micro-organism.

The suggestion is put forward with great diffidence and is based purely on clinical observations and deductions therefrom. It is not based on any bacteriological investigation, for so long as we are ignorant of the causal organism conclusive tests cannot be made; but by the use of those terms and so classifying all the observed phenomena of the recent epidemic it enables me, without needless reiteration, to discuss the relationship of the one stage to the other, with special reference to the prevention of the latter.

THE PRIMARY STAGE.

The earliest symptoms of an attack of influenza, in the majority of cases, appeared to be a slight sensation of dryness in the nostrils accompanied in a large number of cases by fits of sneezing. The dryness appeared to last for a few hours and was not usually observed by the patient, although most on questioning recalled the fits of sneezing. This was followed by an increased flow of secretion from the eyes and nose and considerable injection of the conjunctiva was then present. Dryness in the nostrils was followed a few hours later by pain and dryness in the throat, though sometimes the pain and dryness in the throat appeared to be the initial symptoms preceeding the flow of secretion from the nose.

Then a hard dry cough commenced which gave a feeling of pain over the front of the chest, usually described as "rawness of the chest". The actual area of pain varied greatly in different individuals but was chiefly limited to the region of the sternum, radiating outwards to a varying degree on both sides. The skin in the region of pain was tender to pinching. This condition remained during the period of dry cough and passed away when expectoration became free and easy.

During the first twenty-four hours there were usually complaints of chilliness, " a cold feeling running down the back" was a common description. In some, those attacks might almost have been described as rigors.

Associated with those symptoms there was usually a rise of temperature ranging upwards to about 104° and I noted that where there was a copious flow of secretion from the eyes and nostrils there was seldom a high temperature.

Epistaxis occurred frequently but did not appear of much significance; it did not occur in any case which ran a prolonged course or ended fatally.

Patients now complained of headache, pain between shoulders, backache, pain in the limbs, loss of the senses of smell and taste, loss of appetite, vomiting, diarrhoea, mental depression and sleeplessness. All these symptoms were seldom present in any one

case but were present in a varying degree in the majority.

The headache was not confined to any particular area of the skull; some complained of frontal, some vertical, others occipital, and many said it was "all over". Headache was a commoner symptom than either backache or pain in the shoulders, but the pain between shoulders was always the one to which patients sought to draw attention. As most people associate pain anywhere in the region of the lungs with pneumonia I found that it was fear of this condition which made most of the patients draw my attention to it.

The pain in the limbs varied in intensity from a slight feeling of tiredness to pain so severe that patients sought to restrict movement and in the latter condition one might easily mistake the symptoms for an attack of acute rheumatism, but the pain was confined to muscles and there was absence of swelling of the joints.

In regard to the loss of the senses of smell and taste, the patients who came to see me in consultation were more worried about the loss of the sense of taste than that of the accompanying symtoms of loss of smell and appetite. Loss of appetite was general, but in many this was accompanied by nausea, sickness and occasionally vomiting.

Diarrhoea occurred in many and usually followed in those

cases where there had been considerable sickness and vomiting. Patients with marked gastric symptoms all ran a favourable course.

The mental depression varied from a simple case of loss of feeling of well-being to the case in which the patient stated he felt as if he had no desire to live.

Examination of the chest at this stage revealed breathing of the vesicular type; râles were present at the beginning of inspiration. The amount of moisture present gradually increased, râles becoming very abundant. In a number of cases in the older type of patient, where there appeared to be difficulty in getting rid of the secretion, the amount of moisture in the lung gradually increased and in many percussion revealed dulness at both bases and a condition resembling oedema of the lung manifested itself. This condition may be described as a hypostatic pneumonia but for the following reasons I think this would be a doubtful term.

(1) There was no noticeable increase of temperature.

(2) It did not appear to be associated with perceptible cardiac failure.

(3) In all cases where it occurred the patient recovered and this is not common in hypostatic pneumonia.

(4) A colleague (Dr.Hodgson) who had noted the condition, on reading over these notes informed me that the area of dulness was not always equal in both lungs and did not appear to bear any relationship to the posture of the patient.

The condition possibly arises in the old through dulling of the cough reflex. The satisfactory course of those patients would suggest any association with inflammatory changes in the lung as being doubtful.

Circulatory System during Primary Stage.

In the majority of cases there was no evidence during this stage of any involvement of the heart; increase of pulse rate was not out of proportion to the rise of temperature: in one or two cases with chronic heart affections the patients appeared to stand the attack as well as the average individual. Mr. I. (app.No.18) who has been under my care for the past three years with a marked regurgitant murmur at the aortic area, ran a normal and very satisfactory course. * In one patient, O.H., on the fourth day of illness when I visited he had newly sat up in bed to take a cup of tea; he said he was feeling much better and after talking for a few minutes I noticed he was growing pale. He said he felt faint; I advised him to lie down. The pulse dropped to 40 beats per minute. The exact condition present I do not know, there were no adventitious sounds present and in a few minutes the heart came back to its normal rate and the patient had an uneventful recovery.

* His wife who was ill at the same time and recovered, suffered from a mitral stenosis.

Digestive System.

This has already been described along with the other symptoms

Genito-Urinary System.

I believe that some observers have described presence of albuminuria in a large number of cases. I have found no evidence of this. Certain of the patients who passed through the illness had previously suffered from chronic kidney trouble. I did not make a routine examination of urine but examinations were made in all cases of serious illness and repeated examinations of those suffering from any sequelae. I never found any albumin but large quantities of phosphates were always present.

Menstrual periods were apt to come prematurely and be excessive.

In pregnant women many threatened abortion and in a few this occurred.

Duration of Primary Stage.

This varied considerably in different patients. In the severest, improvement began to manifest itself in about four days and the patient was able to resume his normal occupation within a fortnight. Large numbers however, were able to attend to their duties during the course of the attack. Relapse, which was fairly common, was generally confined to the milder type of case: thus many patients in seeking advice, informed me that for a few days they had suffered from what they regarded as a mild attack of influenza and after they had begun to improve they had suddenly

taken the attack in a worse form.

THE SECONDARY STAGE.

This stage I have divided into three main classes:-

1. Pneumonic - Lobar pneumonic and broncho-pneumonic.
2. Nervous.
3. Toxic.

Taking each type separately, the cases seen would scarcely justify a report; it is the intention therefore, rather to endeavour to indicate a certain relationship which appears to exist between the whole of those types as a class and the ordinary influenzal attack and the relationship of this class to the sporadic and household types of infection. Of those types the broncho-pneumonic appeared to belong to a type distinct from the others. Thus, in the broncho-pneumonic the patient had been suffering from acute bronchitis and about the third to fifth day began to shew greater distress, there was a rise in pulse rate and temperature, cough and respiration became more difficult and on examination of the lung patchy consolidation was found. The broncho-pneumonic type was the only type which appeared to follow a fairly normal primary stage. Broncho-pneumonia was not confined to any one age but was more common among children than adults. It was a grave condition but not so serious as that of lobar-pneumonia.

Nervous and Toxic cases were classed under the groups according to whether symptoms pointed to involvement of the central nervous system or pointed to a general toxaemia.
Lobar pneumonia, the nervous and toxic groups has this in common, in all of them the primary symptoms of influenza were not marked and as already pointed out, their relationship to the influenza epidemic was chiefly based on deduction from infectivity.

In the nervous type there was a high temperature ranging from 103° to 105°, slight cough was present, patient was usually lethargic, there was absence of knee jerks, Kernig's sign was positive, pupils were dilated but shewed a slight reaction to light; rigidity of the neck and stiffening of the muscles at the back of thigh generally developed and headache was intense.
One of the first cases occurred in that of A.H. (app. No.15) and this case was obscure, but in view of the fact that within three days after the commencement of his illness the other two members of the household developed synchronous and typical attacks of influenza made me feel that the boy was suffering from an influenzal condition.
So again in the case of the boy F.W. (app. No.16) two members of the household subsequently developed ordinary symptoms of influenza.

In the Toxic type the chief complaint of the patient was that of lassitude but there was little or no mental depression. There was no pain in back or legs. The face early developed an ashen appearance. I had very few cases of this type, the most marked case

being that of T.H. (app. No.17). In this case considerable influenza was present in the neighbourhood and the man, a moulder, had been working in close contact with others who were suffering from influenza. The only complaint of this patient was the feeling of tiredness; mentally he appeared quite bright and said he felt able to get up, and the relatives refused to credit my grave prognosis.

A brief summary may here be given of the apparent relationship of those two stages.

(a) That all patients with well-marked primary symptoms ran a favourable course, that is to say, severity of primary symptoms to gravity of prognosis was in inverse proportion, and that patients with the so-called gastric type of influenza never developed the secondary stage.

(b) That environment or mode of treatment which appeared to give relief to those symptoms was detrimental to the welfare of the patient and appeared to be predisppsing factors in the production of the secondary stage.

(c) That the secondary stage (or complications of influenza) developed in those cases in which one would be led to suppose it would be least likely to appear if severity of symptoms of the primary stage bore a direct relationship to the amount of toxaemia present.

(d) That in patients developing the secondary stage most of the symptoms of the primary stage disappeared. The flow of secretion from the nostrils was arrested, sneezing stopped, there was loss of nausea and vomiting and loss of pain in the limbs.*

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* (Examination of the observations detailed in this thesis will reveal that those observations can fairly easily be separated into two types, (1) observations which were more or less mechanical and incapable of fundamental errors and which may even to the present time

be more or less corroborated, and (2) those which might be regarded as mere assertions and which might be prejudiced by the anticipations of the observer.

In the first type might be included most of the statistics given in this paper, thus with a minimum of medical knowledge a simple record of individuals calling for medical attention would have revealed a wave of illness which would more or less correspond with the household wave shewn in the diagram; similarly with the death rate, though greater or less medical skill might have revealed a lower or higher death rate, it would not have materially altered the ratio of deaths occurring amongst housewives to that occurring amongst industrial workers.

To the second type will belong certain of the observations detailed above and for this reason it is necessary, as far as possible, to seek corroboration in the observations of others, or to indicate where the statement appears to be confirmed by observations which may be regarded as belonging to the first and more satisfactory type of observation.)

CONSIDERATION OF PHENOMENA.

Analysis of the probable significance of the symptoms of the primary stage may be rendered easier by dividing those symptoms into the two groups of Subjective and Objective symptoms.

The chief subjective symptoms are:-

1. Chilliness of the back.
2. Pain in the head, back and limbs.
3. Loss of smell, taste and appetite.
4. Mental depression.
5. Sleeplessness.

The chief objective symptoms are:-

1. Sneezing.
2. Increased flow of secretion from eyes and nose with hyperaemia of mucus membrane.
3. Cough and expectoration.
4. Vomiting.
5. Diarrhoea.
6. Increase of temperature.

It will, I think, be generally accepted that these objective symptoms, with the exception of increase of temperature, can be produced by local irritants of the respiratory and alimentary tracts.

Throughout this thesis it has been my endeavour to separate definite observations made from explanations and suggestions which these observations may seem to justify, so that however far one may disagree with the suggestion conveyed in this paper, it would not obscure those observations which seem worthy of further investigation, and if possible, of explanation.

On the other hand, the subjective symptoms, with the exception of loss of smell, possibly due to increased moisture on the mucus membrane, are generally regarded as manifestations of a toxaemia. If such be the case, this curious state of affairs during the initial stages of an attack of influenza may be summarised thus; - "that while the body is possessed of protective mechanisms which through reflex stimulation can be called into action to rid the body of noxious substances, in the case of an attack of influenza the symptoms of those reflex actions only manifest themselves when the noxious substance has actually gained access to the body and that the severity of those symptoms is an indication of the toxaemia thus produced."

While I do not wish to prejudice further investigation by any premature conclusions I may be permitted to indicate where this commonly accepted opinion may be erroneous, for it would appear that this has very considerable bearing on appropriate treatment.

Certain of the symptoms I found were confined to the primary stage and were never seen in the secondary stage, while other of the symptoms appeared to be common to both.

The symptoms apparently confined to the primary stage were:-

1. Sneezing, increased flow of secretion from eyes and nose.
2. Nausea, sickness, vomiting and diarrhoea.
3. Pain in limbs and region of the back.
4. Mental depression.

The symptoms common to both stages were;-

1. Headache.
2. Loss of appetite.
3. Increase of temperature.
4. Cough and bronchial secretion.
5. Sleeplessness.

As increase of temperature is generally regarded as an indication of toxic absorption, it is worth noting its relationship to the symptoms of the primary stage: in many with well-marked primary symptoms there was little or no increase of temperature, thus of the 149 (private and insurance) who visited me at the Surgery many of them had no increase of temperature when examined. They did not remain a day in bed and many of them did not stay off work and none passed into the secondary stage. On the other hand, I never saw a patient with a temperature of 105° who shewed any of the pure primary symptoms. This has been previously noticed by others. Thus; " In the febrile type, the pyrexia which is almost the sole manifestation of the disease, may be very protracted, lasting in rare instances for several weeks".*

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* Monro. "Manual of Medicine".

"The fever in influenza is very variable but it is important to recognise that it may be the only manifestation of the disease."* But further I also observed that the primary symptoms disappeared when the temperature reached this height.

It will be generally accepted that the increased flow of secretion, the vomiting and diarrhoea, by getting rid of the toxins, prevents excessive rise of temperature, for there can be very small absorption of toxin against flow of lymph stream, but to argue from this that it is the toxaemia which produces the symptoms may be erroneous, for why do they disappear in the presence of excessive temperature ? - does not this appear to indicate that a toxaemia has a tendency to suppress those symptoms because of a poisoning which dulls or blocks the reflexes producing the symptoms. This may be the explanation why patients with marked gastro-intestinal symptoms did well, that those were sympathetic reflexes owing to the close relationship of the alimentary to the olfactory reflexes, and might be taken as an indication that if there was any toxaemia present it was very slight.

To consider from a physiological standpoint the subjective symptoms in the primary stage which were purely primary, seems useless, as I do not know what produces them, nor have I seen any satisfactory explanation of their cause. If the pains in the limbs

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* Ostler. "Principles of Medicine."

and region of the back are caused through a toxaemia, either by producing symptoms of exhaustion or by the toxins producing irritation of the muscle sheaths, then I cannot understand why those pains should disappear with the onset of the secondary stage; surely they would be thrown into greater evidence. Because those pains cannot at present be explained from a physiological standpoint that should give no justification for more or less dismissing them as an indication of proof of a toxaemia. Much investigation is still necessary in regard to this matter.

A similar observation has been made by Kestevan during the epidemic in Australia. In the course of his article he states - "one is at a loss to comprehend the subsistence of the aches and pains while other symptoms take their place and come into prominence, if the newer symptoms are due to graver infection and intoxication by the same organism." *

Similarly with the mental depression, though most illnesses produce loss of feeling of well-being, what I fail to understand is

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* Lancet. Dec.27th, 1919. p.119, par.5.

The original draft of this thesis was prepared in July, 1919, and shewn to Sir James MacKenzie then, so that this observation has been made by two independent observers.

why it should be associated rather with severity of primary symptoms than severity of illness. A.S.(app.No.2) was warned of his critical condition so that I might be able to persuade him to go to Hospital and he suggested that I was purposely exaggerating the gravity of his illness. His death occurred within 24 hours. T.H. (app.No.17) told his wife that she was unduly alarmed and saw no reason why she should be anxious for other advice as he felt very little the matter with him.

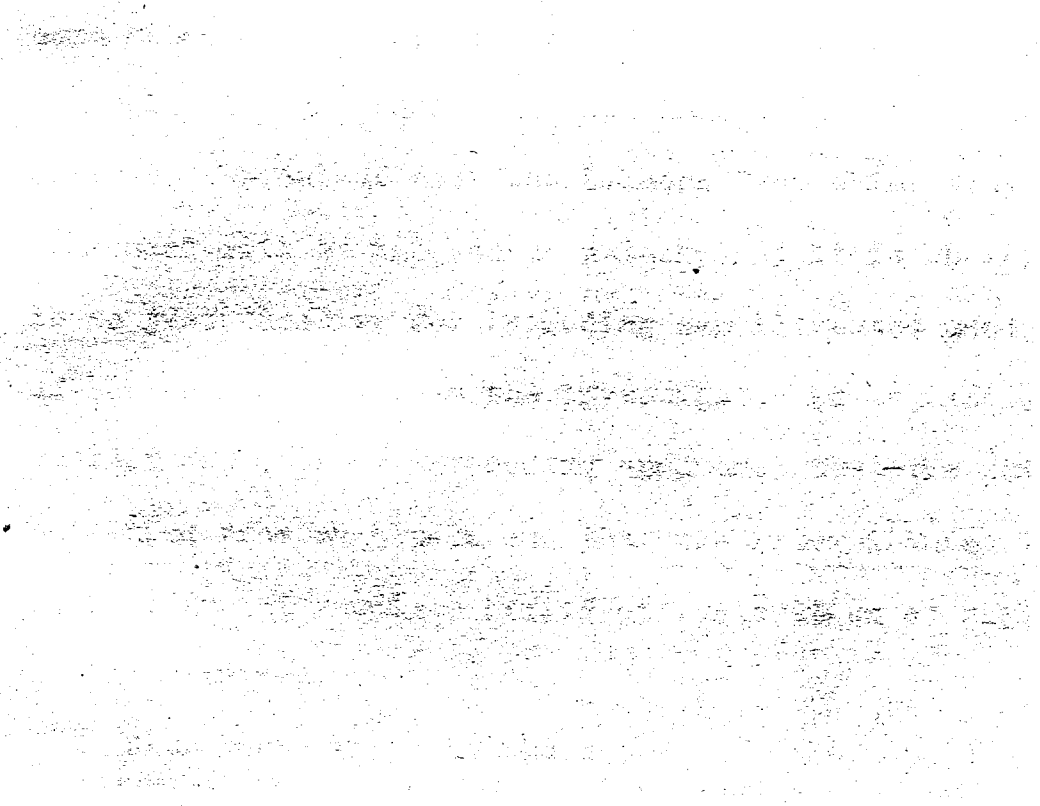
Patients very persistently called my attention to this symptom and my description of an influenzal attack would be incomplete without some reference to it.

One would like to draw attention to the fact that painful emotion produces in many the objective symptoms present in the primary stage of influenza. Why a psychological disturbance should be associated with physiological manifestations is difficult to understand, unless these emotions are associated with the primitive arcs of self preservation, the body reacting to rid itself of something which has produced a noxious sensation; if such is the case, then it is not difficult to understand that when those protective agencies are called into action to rid the body of a noxious substance, a disturbance should be produced in the mental state similar to that which inversely will produce those physical symptoms.

To consider the primary stage as a whole one must observe that it does not lend itself to pathological investigation for the symptoms preceeding death are quite different from those which occur in a person passing through a normal attack. Further, there is little in those symptoms to indicate a specific disease. Many of them appear in most of the infective fevers in the early stages. Thus in the case of measles, during the winter of 1917 I made observations on about 130 cases and with the exception of the rash and Koplik's spots I do not know of any symptom that is not common to influenza. Indeed, until the appearance of the rash I do not know of any sign or symptom which would enable one to say whether a patient is suffering from measles or influenza.

Again it is often urged that influenza should be differentiated from a common cold, but apart from the higher degree of infectivity I have been unable to find from any source of information how this can be accomplished. If influenza and a common cold are not caused by the same micro-organism or micro-organisms does that not appear to indicate that those symptoms which manifest themselves during the primary stage of influenza, during a common cold, and during the stage of invasion of measles are symptoms non-specific in character and the indicators of certain inherited reactions of the human body which should manifest themselves whenever any irritant lodges in the respiratory tracts, or possibly in any adverse physical condition which has led to undue chilling of the body.

If such be the case it should warn physicians who are looking to the bacteriologist for chief assistance in dealing with influenzal epidemics how difficult it may be ever to reach any final conclusion in regard to the specific organism which causes those symptoms.



SEQUELAE.

There is no attempt here to describe the various sequelae which are said to follow influenzal attacks. It has been my purpose to limit the description here to those illnesses which appeared to follow after the attack of influenza and occurred amongst patients who came personally under my observation during the attack. This reservation is necessary, for since the epidemic many patients have come to me with complaints which they attributed to the effects of the epidemic, and indeed at all times it is common to find among patients the belief that the illness from which they are suffering commenced with an influenzal attack; but it is obvious that there is no justification for including such illnesses among the sequelae of the epidemic, unless the investigator is satisfied that the patient was without preceeding symptoms, that the patient actually suffexred from an attack and that the later illness developed without an intermediate period of restoration of normal health having occurred.

With these reservations accepted, this then can be said that among patients who came under my observation during the epidemic, the sequelae appear to be practically negligible.

There has occurred however, among several of them, a group of

symptoms to which I have failed to find any reference in current literature and for which I am still unable to give any explanation. This group of symptoms seemed to occur among those who for business or household reasons, attempted to return to their duties before feeling capable of doing so. (vide app. Nos. 19, 20, 21 and 22.)

Complaint. The patient complained of feeling tired on very slight exertion, felt faint with a craving for food; troubled with frequent shiverings followed by profuse sweats which were cold and clammy. On examination I was never able to find any increase of temperature and in one or two cases the temperature was taken immediately after a shivering attack and before the sweating commenced. The pulse range seldom exceeded 80 per minute, was soft, easily compressed and of small volume.

The Heart. Apex beat was generally difficult to find; the left edge of cardiac dulness was usually found outside the nipple line: a v.s. murmur was present, best heard at the apex, and could be traced slightly toward the axilla.

The Digestive System appeared to be good; most of the patients looked fairly well nourished and generally gained weight. In one case, that of Mrs. T. (app. No. 21) she said she weighed more than she had done for several years. Patients ate well and slept fairly well.

Examination of Urine. In all those, examination was negative, no albumin and no sugar was found, but there was abundance of phosphates.

The improvement was generally noticed by a prolonging of the interval between the shivering attacks and less exhaustion after the sweating. At first, shivering attacks might occur three or four times a day, gradually diminishing to about one every three or four days until they finally disappeared. There was a corresponding improvement in the heart condition and none appeared to be permanently injured.

A curious feature of this stage was intermittent feeling of depression and exhilaration. On visiting the patient one day he looked depressed and full of grave doubts as to any hope of recovery and the following day he looked bright and was full of optimism with regard to his illness. In most of them, as soon as they were fit to travel they went to a seaside resort and all reported much benefit from the change. At the present date all those patients, (with the exception of R.S. app. No.20) report improvement in health. ✱

✱ Lately I persuaded this patient to consult Professor Griffiths of Leeds, who kindly took him into his wards at the Infirmary for further observation. However, at the end of ten days the patient expressed a desire to come home. The opinion of Prof. Griffiths was that there was no evidence of the presence of any organic trouble in the heart and that the condition was probably due to some obscure vasomotor disturbance.

If any value is to be attached to the explanation of the symptoms occurring during the primary stage, this group of symptoms occurring as a sequelae is obviously difficult of explanation, but it would be unfortunate indeed if an observer should seek to fail to record certain observations simply because those observations did not apparently fit in with his theories. There was not a large number of cases so that investigation was limited. Whether the symptoms complained of have an organic foundation or are purely functional and therefore may be closely related to a condition of shook, I cannot suggest. It seems strange that all of them which I have seen should occur in patients who had considerable family or business anxieties during the period of illness, that there should be little or no loss of appetite, and that the patients to all appearances should look well.

The only other sequela I have noticed is a large loss of hair among women. This is not permanent in many cases but whether all have recovered I cannot yet say.

TREATMENT.

A very considerable proportion of the literature dealing with influenza has naturally been devoted to the subject of treatment, and considering the large variety of drugs, and other more recent methods of treatment which have been advocated, it may be taken that none appear to be very satisfactory or very specific in their action. Very little space is devoted here to the consideration of those various methods of treatment, for the reason it was noticed that when the infection was limited to the symptoms of the primary stage the amount of bodily suffering was not of an overwhelming nature and the period of incapacity was not such as to seriously inconvenience the vast majority of patients; but on the other hand, when symptoms of the secondary stage began to manifest themselves the outlook could only be regarded with feelings of the gravest anxiety. It would therefore appear that the first and most essential aim of treatment is to prevent the onset of the secondary stage, and during the last few months of the epdiemic I felt justified in devoting most of my attention to this problem. As I had then recognised the danger of household infection in its relationship to fatal cases, two objects were kept in view:-

1. To prevent the influenzal patient developing a secondary stage of infection.

2. To prevent the spread of infection to other inmates of the house or to mitigate the danger of that infection.

I now feel persuaded to believe thatthe two problems are intimately connected and it may be permissible therefore, to briefly summarise some of the observations already recorded in this thesis which caused me to investigate those problems and which would appear to justify the lines of proceedure adopted in preventative treatment.

(1) That in the July period when the infection was chiefly confined to industrial workers, and when infection appeared to spread through contact at work, the infection had little tendency to spread through the individual home, and there were no deaths from the infection.

(2) That during the winter periods a sporadic case seldom required to be visited, that he had little tendency to affect a home, that he had no tendency to affect the neighbourhood and that the death rate among sporadic cases was negligible.

(3) That during the household wave the majority of the members of a household were more or less affected, but that as a rule the first case in any one house was milder than later cases.

(4) That there was a definite relationship between the household wave and cases developing the secondary stage of infection.

(5) That the death rate among housewives (i.e, home workers) who required visiting was less than one per cent but that the

death rate among industrial workers who required visiting was equal to nearly nine per cent.

(6) That none of the patients who were first seen in consultation at the surgery, no matter how serious the symptoms may have appeared to be, subsequently developed symptoms of the secondary stage, and certainly none died.

(7) That among patients suffering from the primary stage those did best who were troubled most with the flow of nasal secretion and recurrent paroxysms of sneezing.

(8) That in a considerable number of cases which came under my observation the abnormal flow of nasal secretion and recurrent paroxysms of sneezing were the only symptoms of the infection which manifested themselves.

(9) That most patients who developed the secondary stage had few primary symptoms.

(10) That in patients who were suffering from the secondary stage there were none of the symptoms present which have been described as purely primary.

As the presence or absence of the free flow of nasal secretion appears to have a very intimate bearing to the subsequent course of illness, it seems necessary to grasp the significance

of this symptom.* It is open to two explanations, either that it can be regarded as due to pathological changes resulting from a mild localised infection in the mucus membrane of the nose, leading to the ordinary symptoms of catarrh, or that it is a physiological reaction to an irritant with little or, more probably, no pathological changes present. If the former be the cause in cases where those changes were absent at the commencement of the illness, one would expect that in some cases it should occur when the symptoms indicated severe infection of other parts of the repiratory tract. I failed to find this occur in any case observed.

If the latter be the cause then one would expect it to be a fairly early symptom and not present in those cases where a toxaemia had interfered with the normal reactions of the body.

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* Kestevan states in his paper:- "Coryza, formerly regarded as an integral process in the disease, has been remarkable for its absence from my series. I have only seen 11 cases. Moreover, it appears probable that a coryza may confer a degree of immunity. I have several times noticed that in families visited by influenza, one or two members with coryza escaped. Two of the cases of this that I had noted in the first wave, however, came under my care in the second wave. In neither case were any other members of the family reinfected." (Lancet. Dec.27th, 1919, p. 1189).

Though I find it impossible to exclude so called "coryza" and regard it as a separate illness by reason of its relationship to infectivity, and most observers are agreed on this, the above observation is interesting as it appears to corroborate the observation of mine that first members of a family escaped with a milder infection, and further, this absence of nasal symptoms may account for the more serious manifestations of the illness in Australia.

Further it would seem natural to suppose that by careful observation one should be able to detect some physiological reaction of the body to a noxious substance before that noxious substance is able to produce pathological change, no matter how slight or how brief that reaction may be.

If therefore, this free flow of secretion is a physiological reaction, apparently capable in many cases of terminating the infection it should have an important bearing on all manifestations of the epidemic and for that reason one may be permitted to digress a little to state a few considerations which may appear to be elementary but which appear necessary for connected argument.

Normal inspiration is through the nostrils. The mucus membrane is lined with ciliated columnar epithelium. This variety of epithelium forms the superficial layer of the repiratory tract with the exception of the alveoli which is lined with pavement epithelium. For the preservation of healthy cells there are certain essential factors; a normal temperature, moisture and food. Those three factors are more or less controlled by the flow of lymph. If the air be cold and dry it will be necessary that there should be a greater flow of lymph to maintain temperature and moisture than if it be warm and moist and this agrees with the common observation that where the air is cold and dry there is a greater

flow of moisture through the nostrils than where the air is warm and moist. ‡ It is known that the sense of smell in man is very delicate "$\frac{3}{100,000,000}$ of a grain of musk can be distinctly smelled," ✳ that is to say, it is capable of producing such a reaction on the nervous system as to stimulate the higher centres of the brain, but/as one is justified in presuming that all sensations are primarily for the self preservation of the host, every foreign body landing on a normal mucus membrane will produce a sensation of varying degree in the host.

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‡ Leonard Hill, in the British Medical Journal of March 1st, 1919, states;- "In researches on the influence of atmospheric conditions on the nose, I have put forward the important influence which cool air - cool and therefore of low vapour tension - has of bringing more arterial blood to the respiratory membrane and increasing evaporation from and therefore flow of lymph through it. Warm, moist atmospheres are against this washing and immunizing defence. In this, I claim, lies one explanation of the good effects of open air treatment and the ill effect of crowded tenements ".

It may be necessary to state that the views expressed in this thesis were formed before the appearance of the above article. I have no recollection of reading his article of April, 1916. The above quotation is given however, as an explanation of the phenomena. It does not appear however, to be the full explanation for anyone has observed that under certain climatic conditions the flow of lymph is so rapid that only a minor proportion of the lymph is evaporated on the mucus membrane - "the nose runs" -

✳ Halliburton. - Handbook of Physiology, p. 791.

The human body, in common with all forms of life, is healthiest, and therefore sensations are most acute in its natural environment, and the detection of a noxious substance should be most readily recognised in that envirbnment to which normal sensations has become accustomed. The normal environment of man is either natural or acquired. His natural environment is that of an open air existance, but either through industrial conditions or through a desire for greater bodily comfort, his environment has been greatly modified and most men live for the greater part of each day under acquired conditions; but that man is still essentially an open air animal has been well illustrated by the improvement in the health of the majority of men called up for military service and by the conditions under which that service had to be carried out.

In the epidemic the majority of the first individuals to be infected would receive the infection in their normal environment. In proportion as the symptoms of this infection led to disagreeable sensation in like proportion the patient, believing those symptoms to be the cause of his illness, would seek to modify his condition so as to give relief to his illness. This is best obtained in the moist warm atmosphere of the average sick room. This is not his normal environment and so would lead to lowering of bodily health with the lowering of resistance of individual cells and lessened

ciliary infectivity. On the other hand, the condition would be beneficial to the micro-organisms; it is not so apt to be washed out by the flow of secretion. Its toxin to a much greater degree must be carried into the system of the body, leading to further suppression of the symptoms and a further lowering of cell resistance to the infection. In this way one of the vicious circles of disease is probably completed.

This abnormal atmospheric condition will play an important part in infection;for those conditions must retard processes of attenuation of the virulence of the micro-organism when passing from host to host and the still air will allow for a greater density of infection which one would expect should lead to greater intensity of attack.

Treatment should therefor aim at the isolation and the placing of patients in their natural environment and the raising of the resistance of the body cell. Increased resistance of the body cell can be obtained by:-

1. Rest in bed. This increases the ratio between the anabolic and katabolic processes of the body.

2. Stimulation of the excretory organs of the body so as to rid it of its own body poisons. (This probably explains the benefit which most patients claimed from a profuse sweat, not necessarily ridding the body so much of the toxins of the infection but ridding the body of the products of its metabolic processes more rapidly.

3. Maintenance, by artificial means, of the normal temperature of the body.

4. The preparation and administration of foods suitable for proper digestion.

Such would be ideal methods of dealing with infection but it was the application of some of those methods without being able to apply them all that led, I believe, to most of the disastrous results of the epidemic. It is possible, I think, to indicate how this happened and how there is every reason for believing that physicians in actual contact with infected cases could, by judging every case on its own merits, while possibly unable to prevent the spread of the epidemic, do much to attenuate the virulence of infection.

Attention has already been drawn to the facts that the summer epidemic occurring among industrial workers did not to any extent infect individual homes and no death ensued; that sporadic cases occurring during the winter had very slight tendency to infect the home and no tendency to infect the neighbourhood; that during the household waves first cases were, as a rule, not so serious as subsequent cases in any one home, and that the industrial worker was apt to suffer an infection which led to serious consequences. In the first case this would indicate that persons deriving infection from a source outside the home, received the infection as a general rule from persons suffering from a mild form of the illness, and

this is supported by the fact that none of the "walking cases" seen by me developed a serious illness, but further light can be thrown on those phenomena if the mode of life of the various sections of the community be considered in regard to seasonal variation.

During the summer months the housewife leads an existence apparently nearer to the natural than the industrial worker. She keeps the doors and the windows of the house open for the greater part of the day and her household duties being lighter in summer than in winter she spends a very considerable portion of each day in the open air in more or less profitable conversation with her neighbours.

In winter the conditions are reversed; it is too cold to stand about the doors, there is an increase of household duties and generally doors and windows are kept shut, so that the average industrial worker now lives under conditions nearer to the natural than the housewife. This then would explain why the housewife (and children) practically escaped the infection during the summer and contracted it during the winter, but it does not seem to explain why the mortality was then lower among the housewives than among the industrial workers. However, consideration of the relationship of home conditions to those two sections of the community can afford some explanation. The housewife passes through the illness in an environment which is anything but natural but which during the winter months became normal to her through acquirement.

This environment in the presence of the infection, through attempts to shut out draughts and moisten the atmosphere, may be altered adversely to the natural, but this adverse alteration in a smaller variation from the normal environment of the housewife than from that of the industrial worker. This is probably another important factor in explaining why the deaths should nearly always occur among individuals who contracted infection when infection was present in the home (see page 52 par.2 /) the outlook being prejudiced from the commencement owing to diminished sensations, resulting from the abnormal conditions.

Application of those principles.

To apply those principles in treatment, and at the same time seek to give the best advice to the patient, every case had to be considered on its own merits and very often a compromise had to be made. It is evident that when a walking case called for treatment the home conditions of the patient had to be considered. If the patient could have been assured of a well ventilated bedroom to himself without producing overcrowding amongst the rest of the inmates, then the proper course would have been to advise the patient to go home and rest in best, but anyone with a knowledge of the houses of the industrial population knows that this can be obtained only in a small percentage of cases. Therefore, if the

patient felt capable of a little outdoor exercise I did not encourage him to stay in bed or remain too much indoors. In his own home this would prevent so high a density of infection and the production of abnormal conditions. †

Many of those patients came from homes where normally pads are placed along windowsills and newspapers stuffed into keyholes to keep out draughts, and when an illness occurs a screen is placed round the bed, and if I had asked those people to follow the advice given in the Memoranda of the Royal College of Physicians ✳ I think I should have been advising them to court disaster.

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† It may be urged that this advice was apt to lead to greater spread of the infection among the population but against this it might be urged on the one hand, if infection cannot be prevented it is surely best to receive the infection from a mild case, and on the other hand, the ethical issue may be raised of our duty as physicians It is only natural that a patient should put the welfare of his own home first and is our duty not a duty to an individual and to a family and that wherever the interests of our patients or their families appear to conflict with the interests of the community, is it not our duty to safeguard the interests of the family ? As the basis of a community is the family this antagonism of interest is probably more apparent than real.

✳ Lancet. and British Medical Journal, Nov. 16th, 1918.
At the time the memoranda was issued I thought the expression "draughts are harmful" was unfortunate, and still consider it so. It appears to me that the danger from a draught is simply the common danger resulting from localised or general chilling of the body and that where by appropriate means this chilling is prevented, draughts, implying as it does a purer current of air, ought always to be beneficial.

When called to visit a patient the first thing considered was the condition of the atmosphere. The people were advised to open the windows, remove all screens and if possible a through current of air was sought after by opening front and back windows and intermediate doors. I know that very often as soon as I had left the old prejudices asserted themselves but I ensured that at least during one period of the day the atmosphere of the room was changed.

It was further impressed upon the occupants that the need for open windows and through currents of air was as necessary for their welfare as for the patient, and I advised the inmates that if any of them felt chilled they should wear additional wraps rather than close the windows. Often the advice caused offence by the insistance on this point but that considerable success was obtained can be illustrated by the fact that no serious illness developed in any patient if I had been in attendance on the home during the period of incubation of that illness, and there was only one family in which more than one death occurred. (app. No. 5.)

That success was very marked where the advice was strictly adhered to may be illustrated by three cases:-

1. Patient living in a one-roomed cottage along with two children, aet 10 and 3: influenzal symptoms were present in the child aet. 10. After visiting in the forenoon I was again called in to see the patient late at night and found she had developed severe bronchial symptoms. The room was hot and stuffy, there was no

ventilation owing to the fact that the window was enclosed in one frame which was not made to open. A rolling pin was borrowed from one of the neighbours and a pane of glass smashed out. On the following day the air of the room was cool and comparatively fresh, both patients showed improvement and the child aet.3 did not develop the symptoms.

2. A family of nine (six adult) residing in a house with three bedrooms, the whole family sleeping within a circle of 12 ft. When visited two were in bed and the mother was obviously infected. Serious warning was given of the danger in such a household, but fortunately, in this case I knew that any instructions given would be carried out: every window was opened and all inside doors, and remained open during the period of infection. None of the rest of the family developed symptoms. Two developed symptoms three months later during the second wave and four have escaped so far.

3. Patient was suffering from Lobar pneumonia and very seriously ill when first seen. She had been nursing a married sister who was said to have been suffering from influenza and pneumonia. Patient was lying in a small room where there was only space for a single bed and no furniture. She could not be shifted to any other bedroom. The door of the room was kept open and all upstairs windows;but patient was not then in a direct current of air. She died two days later.
Two other inmates escaped but her aunt who was nursing her developed symptoms of an ordinary attack the day following the girl's death and was attended by me at her own home. The same precautions were taken, she ran a normal course and there was no further spread of that infection.

The advice given appeared to be in such direct opposition to that supplied by the newspapers and by the local Health Authorities that it led to much discussion, and, so far as I was concerned, considerable waste of time, but it was certainly a pleasing feature that in the later stages of the epidemic people seemed more ready to appreciate the value of the open window.

I think we are far too ready to overlook the fact that much of

the prejudice to open windows arises from the housewife's desire to keep a clean home. With the habitual atmosphere of the average city the open window seems to her to be an expensive luxury.

Drug treatment.

So far as the use of drugs is concerned I did not carry out any systematic investigation. In the latter part of the epidemic it appeared to me that the drugs which would be most serviceable would be those which could stimulate cough and increase the flow of secretions; how far any of the drugs ordinarily in use for this condition may be of value was outside the scope of the investigations.

Vaccines.

In regard to the use of the vaccine which was placed at our disposal about New Year, I did not use it, for by that time my investigations were developing on very definite lines. To one who had come to feel that the manifestations of the primary symptoms of an influenza are manifestations of reaction of healthy organisms, and who was seeking to analyse all observed phenomena for confirmation or repudiation of this conception, it was evident that the use of vaccines should be left to the investigation of others and that their independent reports could be used as a test of the views expressed here

At the present date the reports appear to be that vaccines have had little effect in preventing the spread of influenza, but

when used, a smaller percentage develop"complications". To the investigators this appears to be more or less an admission of failure of their value, but in the light of the views expressed here this may be a mistaken opinion and that a greater success has been gained than is thought, for it may be that while a vaccine has not been obtained of sufficient potency to replace physiological reaction, a vaccine has been obtained which, by the development of immune substance, has sufficiently aided the defensive mechanism of the body, that where infection actually enters the body the system is thus rendered more effectively able to deal with that infection. Theoretically therefore, vaccines may be of value but in actual practice I do not see what use can be made of them. At the present time any attempt to forecast an epidemic is mere guess work and it would take many months to vaccinate a population. When the epidemic is actually present most practitioners will find their time fully occupied attending to the sick and anyone neglecting their patients to vaccinate apparently healthy people would, I am afraid, come under grave censure.

As the argument is put forward in this paper that the presence of the micro-organism or its products in the circulating fluids of the body has little to do with the processes of the primary stage, it may be asked how cure is effected. So far as I feel unable to enter into this as fully as the question demands, but

from analogy with other micro-organisms which are known to be common guests in the respiratory tract, it may be that a local cell resistance is gained which is able to deal effectively with the micro-organism and prevent its dangerous propagation. Thus, the pneumococcus and the pneumo-bacillus are known to be present in the respiratory tracts of many healthy individuals, yet the fact that they may be subject to attacks of lobar pneumonia proves that the tissues of the body apart from the respiratory tract, possess little or no immunity and that it is necessary if cure is to be effected the ordinary processes of immunisation must take place.

Treatment in Secondary Stages.

Treatment followed the usual lines advised in those cases, and no specific investigations were carried out. It appears to me however, that in industrial centres those cases could be much better treated in hospital. Two cases of lobar pneumonia, with delirium, which I considered hopeless, recovered on removal to hospital, and this may have been due to the alteration in their surroundings. Those cases, as a rule, cannot get the best of treatment in the industrial home and they are a great source of danger to the other inmates.

Treatment of Sequelae.

In those cases the patient was put to bed and rest was

prescribed until improvement in the condition of the heart was noticed. A dry diet was prescribed; it was noticed generally that milk diet did not agree with the patient. As soon as the patient showed improvement he was advised to take short walking exercise in the open air.

GENERAL OBSERVATIONS & CONCLUSION.

In the presence of an epidemic it seems to me that all attempts at creating a panic should be discouraged. Any alteration in the normal routine of a community leading to unknown effects may do more harm than good; for example, the closing of places of entertainment may act detrimentally by increasing the hours of congestion in the home, and the fear of the infection engendered in the mind of an individual by such actions may cause him to codle himself and lead to the adoption of a mode of life to which he is not accustomed.

The wise physician, for sound reasons, usually seeks to minimise rather than magnify the dangers of an illness to his patients, and so, much of the recent press campaign of the Ministry of Health, if it is to be taken as an illustration of its actual behaviour in the presence of an epidemic, is to be deplored. Fortunately, the medical profession need feel little responsibility

for the actions of the Ministry, but that can only qualify the regret.

So far as I am aware the views expressed in this paper are more or less the views of an individual and are not backed by any consensus of opinion. For this reason I have been unable to supply many sources of reference but have had to rely mainly on personal observations and deductions therefrom. It may be however, that certain opinions expressed have been derived from a source which has been forgotten.

I wish to express my thanks to Sir James MacKenzie and Professor Ralph Stockman for valuable criticisms which have led to certain modifications and structural alterations of the original paper. It is scarcely necessary to suggest however, that this need not imply any association with the views here expressed.

A P P E N D I X.

The brief notes given here refer especially to certain factors which appeared to be associated with the development of the secondary stage. No attempt is made to describe the course of the illness for the reason already given. (page 29)
A more detailed history is given of those patients suffering from that illness described under "Sequelae".

NO. 1. P.S. 2, Havelock Street, aet 7.

First attended October 24th. 1918.
House consists of a kitchen and one bedroom; six ill in the bedroom, including mother; three children lay in one bed.
P. was the fourth child to develop the infection and when seen all were in a critical condition. There was little or no ventilation, the fire-place was sealed and the window was latched.
P. was lying between two others. The mother was advised to allow one or two of them to be removed to hospital but she would not give her consent until after P. died, when two were removed to hospital. With the exception of P. all recovered.

NO. 2. A.S., 4, Ashfield Court. aet. 35.

First attended October 19th, 1918.
Young man living alone; uncle to P.S., 2, Havelock Street, (vide app. No.1).
When first seen he had a temperature of 102; complained of headache and backache. Primary symptoms were not marked.
There was nothing indicative of any mischief in the lung.

NO. 2. (contd)

Two days afterwards temperature rose to 104 and there were now definite signs of consolidation at the base of the right lung.
The man lay in a foul atmosphere and was neglected.
He was advised to go into hospital but refused. He became delirious and died on October 22nd, 1918.
In this case the want of proper attention seemed to prevent the man having any chance of recovery.

NO. 3. F.H., 20, Parker Street. aet. 15/12.

First attended October 27th, 1918.
Mother was attended on October 26th, and was found to be suffering from influenza: temperature was 102 and she stated she had been ill for a day or two.
On the 27th F. became ill. There was marked lassitude. Pulse 140 and temperature 101. There was no evidence of any involvement of the lung and the child died on October 29th.
The room was hot and stuffy when first visited.

NO. 4. W.C., 6, Clive Street, aet. 52.

First attended November 4th, 1918.
When first seen this man was suffering from Lobar Pneumonia and was dangerously ill. There was a large family in the house and his wife was suffering from influenza, apparently in a mild form, when first visited. The atmosphere was hot and stuffy and it was impossible to persuade the people to open the windows.
The man was an alcoholic and rapidly became delirious; he died on November 7th.

No. 5. H.W.H., 60, Copley Street. aet. 9/12.

First attended November 9th, 1918.
Lived with aunt Mrs. S; six of family all living

No.5 (contd)

in one room.
The children S. were the first to be attended for influenza, and the day after I was called in G.H. aet. 7, and H.H. aet. 9/12. developed a high temperature with symptoms of acute bronchitis. Three days later there was evidence of broncho-pneumonia in both children.
H. died on the 13th November and G. on the 19th.

No.6. A.B., 1, Nicholson's Court. aet. 12.

First attended November 14th, 1918.
One of a family of eight in a two-roomed house in a back court; one younger child was suffering from influenza.
The symptoms were pyrexia, temperature reaching to 105, Kernig's sign was present, slight rigidity of neck, pupils were dilated with a slight response to light.
The girl early became semi-comatose with occasional fits of screaming, and she died November 19th, 1918.

No.7. W.P., 24, Prospect Street. aet.3.

First attended November 17th, 1918.
One-roomed house and ventilation poor.
When first seen broncho-pneumonia was present. Her grandmother was suffering from an ordinary attack of influenza.
Patient died on November 21st.

No.8. J.H., 19, Sarah Street. aet. 27.

First attended November 22nd, 1918.
When first seen husband and wife were both in bed; wife was in bed two days previous to husband.
He complained of severe headache with short irritating cough.
He suffered from chronic otitis media.
The bedroom was small and was further reduced in size owing to a portion of it being boarded off for an aviary. Large curtains were stretched across the room, which I had removed

No.8 (contd)

and patients were asked to keep windows open, but generally on calling the windows were found to be shut.
On the second day he developed lobar pneumonia and died November 26th, 1918.

No.9. J.N., 24, Woodside Terrace. aet. 50.

First attended November 27th, 1918.
Two roomed house. Had been ill for two days before being attended. House was hot and ventilation poor.
The origin of infection in this case was not known.
Patchy consolidation was present and he died on November 30th, 1918
His wife suffered from an ordinary attack of the infection but recovered.

No.10. E.B., 4, The Clough. aet 49.

First attended December 2nd, 1918.
Two roomed cottage. Complained of headache, backache, pain between shoulders and in lumbar region. Temperature 102.
He had been a heavy drinker.
His wife was advised to open up the house but on calling the following day there was no improvement in the atmosphere; his wife made the excuse that she was afraid he would catch a "chill".
Patient looked worse and there were early indications of consolidation.
He died December 4th, 1918.

No.11. A.B., 54, Fern Street, aet 35.

First visited November 21st, 1918.
When first seen she was suffering from lobar pneumonia.
A two-roomed house; patient was lying in bed with all windows shut and screen round the bed. I found it impossible to persuade the inmates to open the windows or remove the screen.
There was no indication of resolution of the lung, and patient died on the 12th day, December 5th, 1918.

No.12. Mrs. D., 13, Woodside Crescent. aet. 65.

First seen February 2nd, 1919.
The husband had been suffering from influenza and been confined to bed for four days.
The sick room was very stuffy, the windows shut, and there were large hanging curtains on both sides of the bed.
she complained of headache, backache and pains in the limbs.
Pulse was 120 and temperature 103. Patient had a mitral stenosis.
She died from lobar pneumonia on February 8th, 1919.

No.13. I.W., aet.31, Syphilitic.

First seen on February 18th, 1919.
Lived in one-roomed house with husband and child.
Husband had recently returned from active service.
The patient commenced with ordinary symptoms of influenza.
Windows were kept shut and a screen put round the bed and pads along the window sills. It was quite impossible to get them to ventilate the house.
Husband went out to work during the day and wife was left to the casual attendance of neighbours.
I tried to persuade removal to hospital but failed.
Consolidation developed in right lung and she died on February 21st, 1919.

No.14. F.H., Collier Topping. aet 31.

First seen March 31st, 1919.
Two roomed house, large rooms; eight adults in family.
Girl was sparely built and had been much under me during last four years suffering from various complaints, which seemed to be associated with lack of proper nourishment.
On second day of seeing her she developed symptoms of consolidation and died April 4th, 1919.

No.15. A.H., 4, Back West View. aet 7.

First seen October 4th, 1918.
Was very sleepy and complained of headache; mother stated

No.15, (contd)

he had had a fright three days before and thought condition was due to this. Pulse was 120, temperature 99, respiration 26. Kernig's sign appeared to be slightly positive; knee jerks were absent and he complained of slight pain in back of neck; no phusical signs in lungs.
On the 7th he was slightly better.
Mrs. H, mother, and Mrs.S, sister, were found to be suffering from attacks of influenza.
The boy gradually improved and by the 10th was able to get out of bed.

NO. 16. F. W., 39, Beverley Terrace (No.275) aet. 15.

First seen January 9th, 1919.
Patient complained of headache, pains in back of neck and stiffness of legs. Temperature was 103. A very slight rash was present on arms and legs, consisting of a few discrete rose-red coloured spots about 3/16 ins. diameter.
He complained of slight pain in throat and had slight difficulty in swallowing. There was an absence of knee jerks and slight retraction of leg muscles. Pupils responded to light.
Nothing abnormal was found in the chest.
Dr. Hodgson saw the patient along with me on the 11th, when some spinal fluid was withdrawn. The fluid did not appear to be under any abnormal pressure and was clear. A report on the examination of the fluid was negative.
He was given injection of "Flechner's" serum.
There was an imporvement on the following day and recovery was uneventful.
The mother subsequently developed influenza.

NO. 17. T.H., 39, Salisbury Place, (Pa.132) aet. 49.

First seen January 6th, 1919.
Complained of slight headache and felt tired. There was an absence of primary symptoms; there was slight pain in the throat and fauces were hyperaemic. Pulse 80, temperature 99.
The patient said he did not feel very ill but was advised to keep his bed. I did not see him the following day as I did

No.17. (contd).

not regard it as a serious case. On the 8th when I called his face was pale and had a slight anxious expression upon it but patient said he felt very much better and wanted to get up. Pulse was 100 per minute and temperature 99.
His wife informed me that during the night he had "wandered a good deal".
The apex beat could scarcely be palpated; I could find nothing present in either lung and knee jerks were absent. A grave prognosis was made and at the request of his brother-in-law Dr.Campbell of Bradford was called in consultation; he saw Mr.H. the following day and corroborated my opinion and was also unable to find anything abnormal in the lung.
The patient died on the 10th.

No.18. Mr. I., 15, Woodside Place. aet 61.

Was first seen November 23rd, 1918.
Complained of headache, backache and ordinary symptoms of influenza.
This man had been under my care for the past two years and had aortic incompetency with sclerosis of the arteries.
Owing to the heart condition I felt considerable anxiety about this case but the windows of the bedroom - which was small - were kept open and a through draught was ensured.
Recovery was uneventful.

Mrs. I., wife of the above, aet. 47.
Seen on the 25th November, 1918.
Developed similar influenzal symptoms and was confined to the same bed as her husband.
She suffers from Mitral stenosis.
Recovery was uneventful.

No.19. Mrs. M., 29, Earl Street. aet. 42.

First seen December 23rd, 1918.
Living in room and kitchen house; five of family.
When first seen she informed me that she had had what she considered an attack of influenza but owing to family duties was unable to go to bed.
She now complained of being exhausted on slight effort, troubled with shivering attacks followed by profuse sweats

No.19. (contd)

which were cold and clammy; they usually occurred at night and left her very exhausted. Pulse was 76, of small volume and of low tension.
The Heart;- Apex beat was found in nipple line, was difficult to palpate; area of cardiac dulness appeared to be slightly increased. The first sound was soft and slightly prolonged.
She was advised to go to bed and was in bed for about six weeks. Once or twice during that interval she tried to get up but felt too weak to stay out of bed more than an hour.
She was troubled with a slight cough but I could find nothing present in the lungs.
The sweats which at first occurred twice or three times during every night, gradually diminished in frequency and she felt less exhausted after an attack.
There was gradual improvement in the volume of the pulse and in the sounds of the heart.
She was more or less under my care until March 15th.
When she was last seen she had not fully recovered her former health but she was able to follow her household duties.

Her husband, J. insurance patient of service doctor, developed influenza during the epidemic of July, 1918.
He had similar symptoms to those of Mrs.M. and was I think, the first case I had of this type. I met him recently when he told me he still felt weak and did not feel able to go back to his former occupation.

No.20. Mr. S., 21, Hall Street North. aet. 36.

First seen February 17th, 1919.
Patient had then ordinary symptoms of influenza; he was not in bed but said he felt he ought to be there.
I advised him to remain off his work but on calling two days later he had gone to work.
I saw him again on March 21st. He now complained of extreme weakneaa, shivering attacks and profuse sweats, which were cold and clammy; headache, sickness and vomiting. Pulse was regular, rate 80 per minute; temperature was normal. Apex beat was difficult to locate and heart appeared to be slightly dilated; v.s. murmur at apex, which could be traced slightly towards axilla.
Patient admitted he had not felt well since influenzal attack

No.20. (contd).

and that it had taken him all his time to remain at work. This patient is still under my care (March, 1920) and is the only patient who has been continuously under my care since the epidemic.
The course of the illness was marked by a day or two of mental depression followed by a day of mental exhilaration, when the patient felt he should be able to get up and resume work.
During the month of May I was called in to see him one night about midnight. His wife thought he was in a state of extremis; she stated he had had a shivering attack followed by a very profuse sweat and had fainted. When I saw him about 15 minutes after this he looked very exhausted. Pulse was 70 per minute; temperature normal.

As soon as improvement was evident in the condition of the heart I advised him to take exercise in the open air. Improvement was marked by a longer interval between the rigors and less exhaustion after the sweating attacks.
Beyond a very marked abundance of phosphates nothing abnormal was ever found in the urine.
On July 4th he went to Morecambe for a change. He returned from Morecambe slightly improved but sweating was still present. About October the sweating developed a curious feature; if he lay on either side the uppermost side shewed the sweating and the other side no indication, one hand being dry and the other moist.
As already mentioned (p.43) I sent him to see Professor Griffiths at Leeds.
At the present time he is able to take short walks but is troubled with slight attacks of vertigo, and this is always preceeded by a fear that he is to develop an attack of giddiness. There has been no apparent alteration in the nervous reflexes for many months; there is a slight exaggeration of knee jerks. The murmur is still present and blood pressure has always been about 130/135 m.m.
Recently he has commenced Swedish drill under the instruction of his brother and thinks that he is some better, but the whole case is very perplexing.

No.21. Mrs. T., 111, Haley Hill. aet.42.

First seen December 2nd, 1918.
Ran a prolonged course; complained of easy exhaustion, total lack of energy; appetite was good and she gradually gained weight.
Troubled with very profuse sweats and giddiness; sweats were cold and clammy and came on at any time during the day. They seemed to have no particular relationship to diet or exercise.
Pulse was regular, ran to about 80 per minute, v.s. murmur, and the left dulness was outside nipple line.
The interval between the attacks of sweating and giddiness gradually increased and diminished in intensity.
She went to Blackpool end of March with considerable improvement to her health.
June 9th, 1919, she looked well but was still easily exhausted.
She has not attended me since then.

No.22. Mrs. M., 4, Fernfield Terrace. aet. 40.

First seen March 12th, 1919.
She had been away nursing sister who had epidemic influenza.
Complained of pains all over body. Temperature 99, pulse 80.
She ran a normal course for the first week and got out of bed being anxious to resume her duties, but had a relapse and went back to bed. Temperature remained normal; pulse 80/90 per minute. The left edge of cardiac dulness ½" outside nipple line; v.s. murmur present at apex slightly conducted towards axilla.
She complained of sickness, feeling of extreme exhaustion and cold clammy sweats. Some days she felt an improvement and felt able to get up, followed next day by extreme depression.
There was a gradual improvement throughout, characterised by sweating diminishing in intensity with longer intervals between, and at the end of April she went for a holiday.
May 20th. Very much improved; heart lies within normal limits and no adventitious sounds now present.

No.23. Mrs. H., 3, Back Smith Street. aet.33.

Three of family living in one roomed cottage.
When first seen October 25th, 1918, two were attacked, Mrs.H. aet.33 and A. aet 10. Primary symptoms were present in

No. 23. (contd).

both. On visiting the following day Mrs. H. was found to be much worse and had acute bronchitis.
The room was hot and stuffy and there was no ventilation owing to the fact that the window was in one piece and not made to open. I borrowed a rolling pin from one of the neighbours present and smashed out a pane of glass.
On calling the following day the air of the room was fresh and cool. Both patients were slightly improved.
Baby aet. 3 did not develop attack.
Recovery was uneventful.

NO. 24. C. family, 68, Woodside View.

Husband and wife and seven of a family.
There was a family of nine residing in a house with three bedrooms, one of which had two double beds and the others were small rooms with only sufficient space for a bed and no place for furniture. First seen November 5th, 1918.
When called in to see them P. aet 15 and E. aet. 18 were in bed and Mrs. C. also appeared to be suffering from the complaint. I warned them of the seriousness of an infection occurring in a house like this and advised them to open all windows and inside doors as far as possible, and on calling next day I noticed these instructions had been carried out.
None of the rest of the family developed symptoms and this could not have been due to any natural immunity for two subsequently developed it in March.
The same precautions were again taken and thus four of the family have so far escaped the infection.

NO. 25. N.S., 13, Chester Place (Aet.18.

First seen March 10th, 1919.
She had been from home nursing her sister who was said to be suffering from influenza and pneumonia.
When first seen she was dangerously ill: she was lying in a very small bedroom with no ventilation. Temperature was 104. Lobar pneumonia was present.
She died on March 15th, 1919, after about four days illness.

This case is commented upon on page 58.

INTENSITY OF WIND. OCTOBER, 1918 to APRIL, 1919.

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OBSERVATIONS MADE TWICE DAILY - SUNDAYS EXCEPTED.

WIND FORCE to BEAUFORT SCALE.

0 - Calm.
1. - Light Air.
2. - Light Breeze.
3. - Gentle Breeze.
4. - Moderate Breeze.
5. - Fresh Breeze.
6. - Strong Breeze.
7. - Moderate Gale.
8. - Fresh Gale.
9. - Strong Gale.
10. - Whole Gale.
11. - Storm.
12. - Hurricane.

Date.	OCTOBER Wind. 10a.m.	4p.m.	Fog.	NOVEMBER Wind. 10a.m.	4p.m.	Fog.	DECEMBER Wind. 10a.m.	4p.m.	Fog.	JANUARY. Wind. 10a.m.	4p.m.	Fog.
1.	2.	2.		1.	2.		-	-		4.	0.	
2.	2.	0.		4.	4.		2.	2.		7.	6.	
3.	4.	4.		-	-		2.	3.		1.	0.	
4.	3.	2.		2.	3.		1.	0.		3.	0.	
5.	4.	1.		2.	1.		3.	1.		-	-	
6.	-	-		1.	0.		1.	2.		0	0.	
7.	5.	5.		1.	1.		1.	1.		1.	0.	
8.	2.	3.		1.	2.		-	-		0.	0.	
9.	5.	0.		2.	0.		1.	1.		7.	7.	
10.	4.	3.		-	-		1.	1.		1.	1.	
11.	1.	1.		2.	0.		0.	0.		1.	1.	
12.	1.	2.		0.	0.		4.	6.		-	-	
13.	-	-		0.	0.		0.	2.		0.	0.	
14.	1.	1.		0.	0.		1.	1.		1.	0.	
15.	1.	1.		0.	1.	Fog.	-	-		1.	0.	
16.	1.	0.		1.	1.		3.	3.		1	1.	
17.	1.	1.		-	-		1.	1.		5.	3.	
18.	0.	1.		1...	1.		1.	0.		1.	1.	
19.	1.	1.		0.	0.	Fog.	1.	1.		-	-	
20.	-	-		1.	0.		1.	1.		2.	0.	
21.	1.	1.		0.	1.		1.	1.		0.	0.	
22.	0.	1.		1.	1.		-	-		0.	0.	
23.	0.	0.		0.	0.	Fog.	5.	6.		0.	0.	
24.	0.	1.		-	-		2.	1.		1.	2.	
25.	1.	1.		1.	1.		0.	0.		0.	1.	
26.	1.	0.		0.	0.	Fog.	0.	0.		-	-	
27.	-	-		0.	0.		3.	4.		1.	1.	
28.	1.	1.		0.	0.		3.	3.		1.	1.	
29.	1.	0.		0.	1.		-	-		2.	0.	
30.	2.	0.		1.	1.	Fog.	2.	1.		1.	2.	
31.	1.	1.					3.	4.		1.	2.	

Date.	FEBRUARY Wind. 10a.m.	4p.m.	Fog.	MARCH Wind. 10a.m.	4p.m.	Fog.	APRIL. Wind. 10a.m.	4p.m.	Fog.
1.	1.	1.		1.	4.		1.	2.	
2.	-	-		-	-		1.	0.	
3.	0.	1.		1.	2.		0.	0.	
4.	0.	0.		2.	2.		0.	1.	
5.	0.	0.		0.	0.		1.	6.	
6.	0.	1.		1.	6.		-	-	
7.	2.	2.		3.	3.		2.	0.	
8.	2.	2.		1.	2.		1.	2.	
9.	-	-		-	-		2.	0.	
10.	0.	1.		4.	7.		2.	0.	
11.	0.	0.		4.	1.		6.	5.	
12.	2.	0.		7.	0.		3.	6.	
13.	0.	0.	Fog.	3.	2.		-	-	
14.	0.	0.		4.	2.		2.	0.	
15.	0.	0.	Fog.	2.	2.		2.	3.	
16.	-	-		-	-		4.	0.	
17.	5.	5.		4.	2.		0.	0.	
18.	2.	1.		1.	0.		0.	0.	
19.	1.	0.		4.	0.		1.	2.	
20.	0.	0.	Fog.	7.	7.		0.	0.	
21.	1.	1.		4.	4.		1.	0.	
22.	0.	0.		2.	1.		2.	0.	
23.	-	-		-	-		2.	0.	
24.	1.	1.		1.	2.		1.	2.	
25.	2.	2.		2.	2.		4.	4.	
26.	2.	0.		2.	0.		3.	6.	
27.	1.	1.		7.	8.		-	-	
28.	0.	1.		4.	4.		3.	4.	
29.				3.	3.		5.	6.	
30.				-	-		2.	0.	
31.				2.	1.				