ASSOCIATION OF RESPIRATORY TECHNICIANS AND PHYSIOLOGISTS

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BREATH

CONTENTS

Breath is the journal of the Association of Respiratory Technicians and Physiologists. Original articles, reviews, correspondence or comment on subjects of scientific or general interest may be submitted to the Editor: D C S Hutchison, Chest Unit, King's College Hospital, London SE5 8RX. Material should preferably be typed on one side of the paper only, in treble spacing throughout. Photographs should be of good contrast, printed on glossy paper and unmounted. Tables and legends to figures should be typed on separate sheets.

Applications for advertisement space and for rates should be addressed to: Jane Jones, Respiratory Laboratory, London Chest Hospital, Bonner Road, London E2.

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STANDARDISATION OF SPIROMETRY

The Snowbird Workshop

A report which appeared in the American Review of Respiratory Disease, in May 1979[1], should be of interest to all those in the pulmonary measurement business. The Workshop was held at Snowbird in the State of Utah and its objective was to draw up standards for spirometry and to indicate the specifications which should be met by instrument manufacturers. Among the tests considered, were the vital capacity (VC), forced vital capacity (FVC), timed forced expiratory volume (FEV_t) and maximum voluntary ventilation (MVV). For each test, the instrument requirements and the means of calibration are indicated, though one might not agree with all the recommendations that were made.

For the vital capacity, the authors suggest a spirometer of at least 7 litres (BTPS) capable of measuring to an accuracy of 50 ml. One wonders whether this volume is really large enough and the authors in fact state that about 3% of their population may exceed this figure. It seems that one might as well settle for an 8 litre spirometer, which would be capable of measuring everybody without the technician having to waste time trying to fit the very large VC's onto the paper. The spirometer would be calibrated with an accurate syringe, of at least three litres in total volume.

Timed forced expiratory volumes

FEV_1 and similar indices should be measured with the same accuracy as the VC, as far as volume alone is concerned. But in addition, the rapidity of response now becomes an important feature and this will be determined largely by the airflow resistance and inertia of the instrument. Calibration therefore is more demanding and it was recommended that this be done by 'simulated exponential volume-time curves'; equipment for this purpose can now be obtained though not all pulmonary laboratories possess these at present.

Another important point which we often ignore: the FEV_t measurement is influenced by the point selected as the start of expiration. Zero time should be established by the 'back-extrapolation' method, that is by extrapolation of the steepest part of the downward slope of the spirogram to a horizontal line through the maximum inspiratory plateau[2]. This, of course implies that the FEV must be preceded by an inspiratory phase which is not possible on some spirometers in common use. Does this make any difference, one wonders?

Maximum Voluntary Ventilation

Recommendations are given for the MVV, but surely this measurement must have largely fallen out of use (at least in the UK). It is very hard on patients with any degree of disability and the results depend a great deal on motivation. If anyone still has a burning desire to do this test, the frequency response of the spirometer would have to be established using a pump producing a sinusoidal waveform — a further expense.

Recording

It is nice to see the recommendation that *permanent tracings* should be provided and that these should be stored and available for recall.

Nose-clips

Nose-clips are "recommended but not required". One can accept that the use of a nose-clip makes little difference to the FEV for instance. The authors go on to comment however, that "some subjects breath through the nose during testing when a closed circuit technique is being used". The nose-clip is therefore surely mandatory during such procedures and it would be sensible to use it on all occasions.

Technician Training

This was apparently discussed at length but detailed conclusions are not given. One gets the impression that there was no coordinated training programme at the time. It was suggested furthermore that one or two of the physicians supervising pulmonary function laboratories could do with a spot of training as well.

This paper is worth spending some time on even if one disagrees at a number of points. One so often takes calibration for granted and it must moreover, be a matter of *continuous* reassessment, a point not made in the paper. Even an instrument as simple as a spirometer can develop a leak and the fact that something is wrong may only dawn on the operator when quite absurd results start to emerge. The arguments are magnified when it comes to more complex tests like the CO transfer, where the results depend on the simultaneous correct operation of a number of separate components. The only satisfactory test equipment that has so far been devised is a pair of standard human lungs.

Finally, whose job is it to see that correct results are produced? We can always encourage the manufacturers to produce better instruments, but they have to be guided by the users on what tolerances are required for the particular job in hand. There is little point in them producing instruments with an accuracy which will never be called upon, as in producing instruments which are below the standard requirements. In short, dear user, the responsibility lies fairly and squarely on you!

REFERENCES

1. Snowbird Workshop on standardization of spirometry. Amer. Rev. Resp. Dis. 1979 *119* 831-838.
2. Smith, A.A., Gaensler, E.A. Timing of forced expiratory volume in one second. Amer. Rev. Resp. Dis. 1975 *112* 882-885.

MESSAGE FROM THE SECRETARY

Elections for Regional Organisers are now due and your representative should be contacting you in the near future. As your Regional Organiser is your ARTP Council Member, it is important that they are prepared to attend Council Meetings. At the recent Spring Meeting, the Council Meeting had to be cancelled, as only seven members attended (a quorum of the Council is eight); apologies were received from two members, but where were the other six? Please make sure the person you elect is prepared to represent you properly.

The Annual General Meeting is to be held on Saturday, 4th October 1980, at Walsgrave General Hospital, Coventry. If any member wishes to propose any Constitution amendments, they must let me have them in writing by 1st August 1980, at the latest.

Margaret Marples
Secretary

THE NATURAL HISTORY OF LUNG CANCER

Duncan M Geddes
Brompton and London Chest Hospitals

Introduction

Each year lung cancer kills more than 30,000 people in the United Kingdom and is the commonest malignant tumour in males. The death rate in men has increased steadily for the past 40 years and although this is now stable, the incidence of the disease in women continues to climb. Against this background it is depressing to realise that treatment today is no more effective than it was thirty years ago; of every 100 people with lung cancer more than 90 will die within five years.

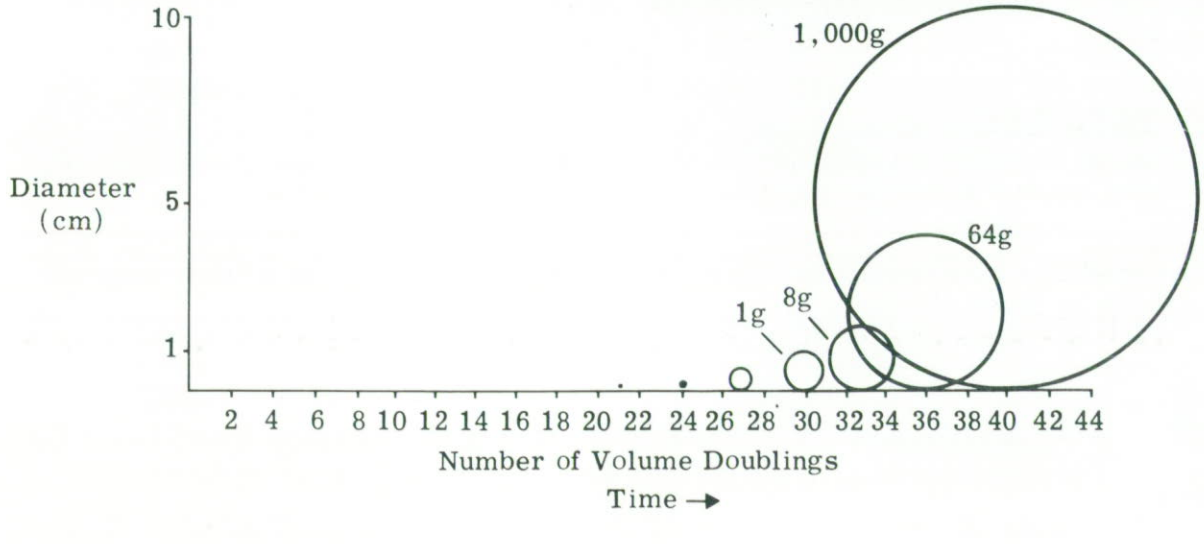
In trying to understand why the disease progresses so inexorably and why treatment is so ineffective, it is useful to know more about its natural history. Obviously when a patient develops lung cancer every effort is made to treat the disease. This makes direct observation of the natural history impossible and so an indirect approach is needed. Fortunately it is often possible to measure the size of lung cancers from chest x-rays and so the rate of tumour growth can be measured. From knowledge of pattern and rate of tumour growth a great deal can be learnt about the natural history of the disease.

The Exponential Model of Tumour Growth

This was first suggested by Collins in 1956. The hypothesis assumes a tumour to start from a single cell. This cell then divides to become two cells, each of which divides to become four, eight, sixteen and so on. If this process goes on at a constant rate, then the tumour growth will be exponential and its volume at any time can be easily calculated. The simplest way to describe the growth rate is the 'volume doubling time' — the time taken for the tumour to double. (Exponential growth is analogous to the exponential decay of a radioactive isotope; growth is described by the doubling time whereas decay is described by the half-life.)

At its simplest, this model predicts that a single cell of 100 μm will become a tumour of 1 mm in diameter after its volume has doubled 20 times. A further ten doublings will produce a tumour of about 1 cm in diameter and after ten more doublings the tumour will have a diameter of 10 cm with a total mass of around 1 Kg. This is shown in fig. 1. (See Appendix for mathematical analysis of the model.)

Figure 1: *Relationship of tumour diameter and weight to the number of cell doublings.*



Validation of the model

Growth rates have been plotted from observations of many thousands of tumours in animals and many hundreds in man. These growth curves confirm the broad principles of exponential growth and although other models of tumour growth have been proposed, none fit the observed facts better than a simple exponential model. The weaknesses of this simple approach are:

1) It is impossible to be certain that growth is exponential during the early microscopic life of a tumour when direct measurement cannot be made.
2) There is consistent tendency for growth to slow down as a tumour gets very large, probably because of poor delivery of nutrients. However, acceleration of growth is not seen.
3) The model breaks down when the centre of a large tumour dies or becomes infected, and when tumours are under hormonal control, e.g. cancer of the breast and prostate.

In spite of these reservations more than 90% of lung cancers appear to grow exponentially and it is fair to use this model for further calculations. Doubling times have been measured for over 200 primary lung cancers and the published reports are summarised in table I. The first important fact to emerge is that growth rates are very different for different histological types of lung cancer.

Table I: Primary lung cancer doubling times.

Histology	Squamous-cell	Adeno-carcinoma	Undifferentiated	Oat-cell	Other	Total
Number	111	60	42	5	10	228
Mean Doubling Time (days)	88	161	86	29	—	102

Calculating the natural history

If the growth rate and the size of a tumour are known it is possible to extrapolate back along the growth curve to the approximate date of malignant change and forward along the curve to discover the time at which the tumour is 1 Kg in size. On average death occurs at about this point. This is at first surprising but referral to fig 1 shows why. After 36 doublings the tumour is 64 g and most unlikely to cause death; after 44 doublings it will be about 16 Kg and quite incompatible with survival. Death therefore will occur within narrow limits during the growth of the tumour.

By taking the average size at diagnosis of 3 cm diameter and the average growth rate for each histological group the natural history can be calculated and is summarised in table II.

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Table II: Natural history of untreated lung cancer

Histology	Mean Doubling Time, T_2	Years from malignant change to	
		Diagnosis	Death
Squamous-cell	88	8.4	9.6
Adenocarcinoma	161	15.4	17.6
Oat-cell	29	2.8	3.2
All	102	9.8	11.2

The natural history is seen to be surprisingly lop-sided. On average 10 years pass between malignant change and diagnosis while there are only 1½ years between diagnosis and death. It is perhaps less surprising then, that the disease progresses so inexorably and that treatment is so ineffective. If the cancer has had ten years to spread and has seven eighths of its life behind it, treatment is coming somewhat late to have any material effect upon the outcome in the majority of patients. This long delay before diagnosis also helps to explain some other puzzling features of the disease. It takes 10 to 15 years for the increased risk of lung cancer to disappear after an individual stops smoking. This may be at least partly due to the 10 year delay before the cancer is large enough to be diagnosed. Similarly, recurrent cancer after surgery may take 5-10 years to show itself and so survival for five years after surgery is not a guarantee of cure.

Finally cancer in young men is often particularly "aggressive". This is to be expected since a fast growing "aggressive" cancer will be diagnosed relatively early when the patient is still young, while a slow growing tumour may need 20-30 years before it declares its presence.

The calculations of the natural history of lung cancer can be taken one stage further. It is possible to work out survival curves following diagnosis simply by calculating the percentage of tumours reaching 1 Kg in weight at different intervals after diagnosis. From these calculations there are three important conclusions.

1) The five year survival calculated from tumour growth rates above is between 5% and 10%. This is precisely the same as is observed in real life and suggests that treatment has very little overall effect on the disease.

2) Calculated survival by histological subgroup is very close to real life observations: the rapidly growing oat-cell cancer has a calculated and observed mortality of almost 100% within one year of diagnosis. This suggests that the differences between cancers is largely due to differences in growth rate.

3) If the calculations are done on the 25% of cancers with the slowest growth rates then a much better 5 year survival approaching 30% can be expected. This means that any selection of patients for a particular form of treatment which unintentionally selects for slow growth will produce impressive survival. It follows that comparison of different treatments is only valid after growth rates have been matched.

Conclusion

While analysis of cancer from growth rates alone is necessarily superficial and if carried too far could be very misleading, the approach does help in understanding the nature of the disease. Another look at fig 1 shows what must be done if cancer is to be cured. Either the whole tumour must be removed by surgery — technically impossible in at least 80% of patients with lung cancer — or some treatment must be given which progressively reduces the tumour size right back to zero. Research is now aiming at finding such effective drugs and also at developing methods of detection of very small masses of tumour. It will be at least 10-20 years before this approach brings real benefit to lung cancer sufferers. Alternatively if all smokers stopped today the disease would be almost unknown within 15 years.

REFERENCE

The Natural History of Lung Cancer. D M Geddes. Brit. J.Dis. Chest *73* 1 1979. (This includes further references to the subject.)

APPENDIX

The mathematics of the model are relatively simple.

The volume V of a sphere, diameter d, is:

$$V = \frac{\pi}{6} d^3 \qquad (1)$$

Where a tumor grows from V_0 to V_t in time t the volume at time t can be calculated using the exponential coefficient, b:

$$V_t = V_0 e^{bt} \qquad (2)$$

Expressing volume in terms of diameter equation 2 becomes:

$$\frac{\pi}{6} d_t^3 = \frac{\pi}{6} d_0^3 e^{bt}$$

That is: $d_t = d_0 e^{bt/3}$

Solving for: $b = \frac{3}{t} \log \frac{d_t}{d_0} \qquad (3)$

Tumour doubling time T_2 is the time for the tumour volume to double

$V_t = 2V_0$

$\therefore 2V_0 = V_0 e^{bT_2}$

Solving for T_2 : $\log 2 = bT_2$

Substituting for B (equation 3)

$$T_2 = \frac{t \log 2}{3 \log \frac{d_t}{d_0}}$$

Thus, the doubling time T_2 can be calculated from two diameter measurements d_0 and d_t separated by time interval t.

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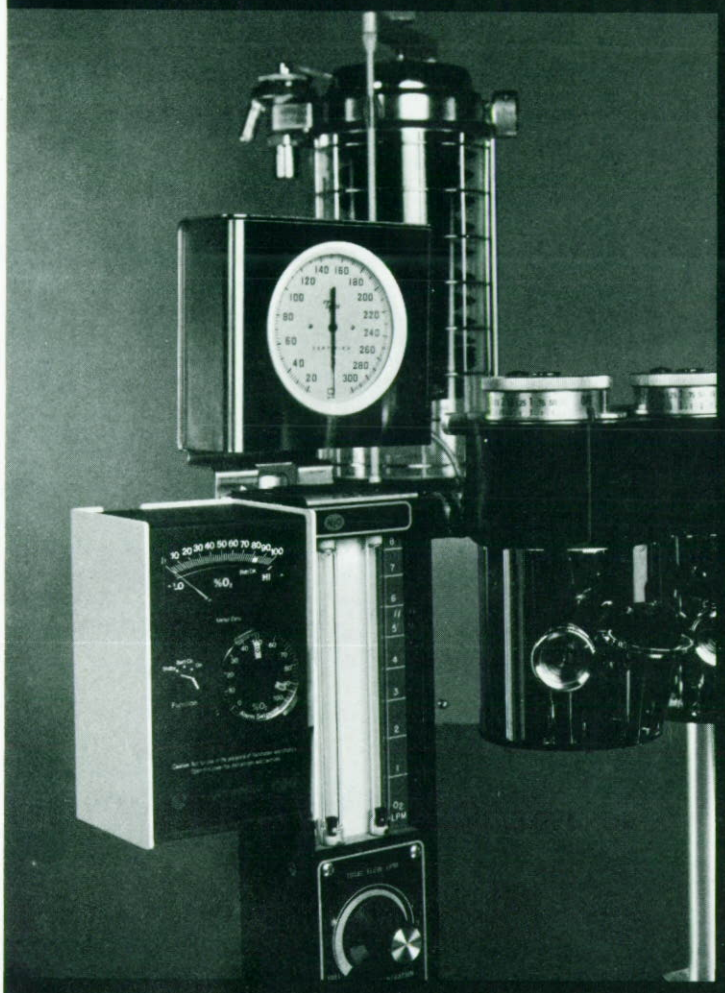

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A THERAPEUTIC 12 MINUTE WALK

A Case History

From Jane Jones
THE LONDON CHEST HOSPITAL, Bonner Road, London E2

A 70 year old man was admitted to the hospital in May 1979 with a two month history of breathlessness on exertion and left sided chest pain. He had no haemoptysis, cough or sputum and was pyrexic. Chest x-ray showed an opacity of the left upper lobe. Sputum cytology showed malignant squamous cells and bronchoschopy was normal. His lung function tests were as follows:

Table 1

	Patient	Predicted Normal
FEV_1 (litres)	2.7	2.9
VC (litres)	3.7	4.1
FEV/VC %	73%	66%

A left upper lobectomy and lingulectomy was performed in June. Post-operatively he had some dyspnoea and a pleural effusion requiring aspiration. He improved and was discharged at the end of June.

In April 1980 he presented with increasing general weakness and tiredness since his operation. His chest x-ray showed a slight shift of the mediastinum to the left. His lung function studies were as follows:

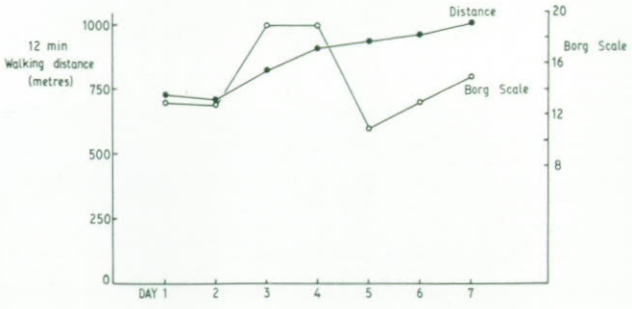
Table 2:

	Patient	Predicted Normal
FEV_1 (litres)	2.4	2.9
VC (litres)	3.4	4.1
FEV_1/VC %	71%	66%
tCO (ml/min/mm Hg)	11	26
VA (litres)	4.6	6.7

His effort intolerance grade was 4 (ref. 1). He appeared to be extremely breathless even at rest. His blood gases by earlobe capillary sample were PO_2 104 mm Hg, PCO_2 22 mm Hg and pH 7.62. As his breathlessness seemed out of proportion to his lung function studies it was decided to exercise him. We attempted to perform a progressive exercise test on a bicycle ergometer, monitoring his heart rate and ventilation. However he stopped cycling after only 3 minutes and it was obvious from his results that he had made very little effort physiologically. Therefore we decided that he should do the 12 minute walk (ref 2). The walk was carried out in a level hospital corridor as described by McGavin, Gupta and McHardy (Ref 2), using the Borg scale for perceived exertion (Ref 3) at the end of the test. A practise run was performed and it was noted that the patient was extremely lethargic, complained of pain in his left side at the site of his scar and that he was tearful. His Borg scale was 20.

As a result of all these investigations it was decided that the patient was basically unfit and his acute hyperventilation indicated that he was suffering from anxiety. He was prescribed Diazepam 2 mg tds and a daily 12 minute walk.

His physiotherapy involved walking up the stairs every day and a walk was performed for 12 minutes every morning for 7 days. The distance walked each day and the Borg scale for perceived exertion was plotted (Fig 1).



CONCLUSION

It was not possible to plot the change in the patient's mood! We found that after the first two days the patient began to look forward to the test and his exercise tolerance and confidence increased so much that he became increasingly cheerful. His Diazepam was discontinued. He was discharged on the afternoon of the last test by which time he was looking forward to returning home. He now felt well enough to walk out to the shops every day with his wife. He was encouraged to exercise regularly at home. His depression had improved and his breathlessness was markedly reduced.

One month later he was seen again in the Chest Clinic and his 12 minute walk was repeated. He achieved 1016 metres and His Borg Scale was 17. Apparently he has been walking every day and when questioned his effort intolerance grade was 1-2.

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1. Capel L.H. and Smart, J. *Lancet* 1959, *1*, 960
2. McGavin, C.R. Gupta, S.P, and McHardy, G.J.R. Brit.med.J., 1976 *1*, 822-823
3. Borg, G. *Scandinavian Journal of Rehabilitation Medicine* 1970, *2*, 92

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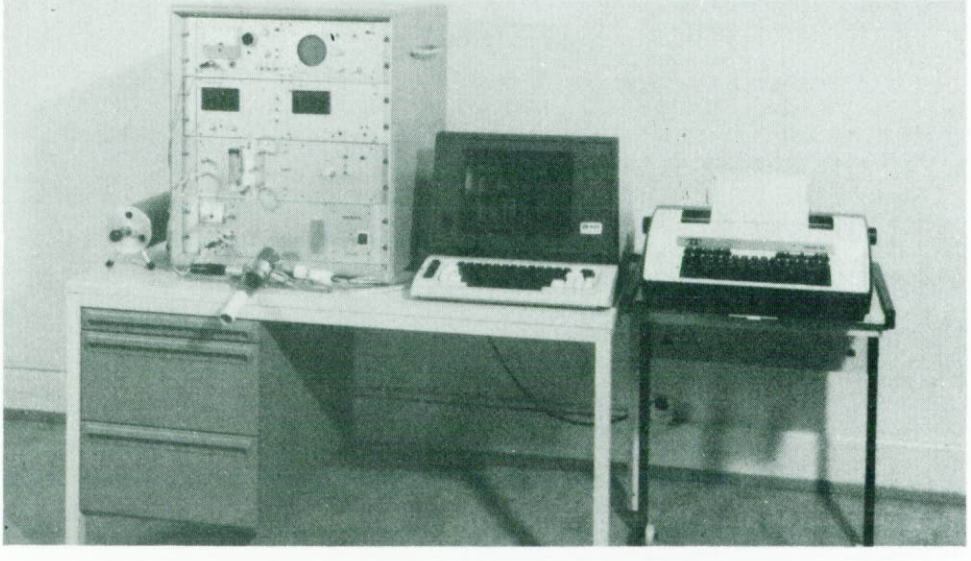

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HEALTH AND SAFETY IN RESPIRATORY LABORATORIES

Every department should now have a Health and Safety Policy, drawn up in a document which is read and understood by all staff. Kelvin Houston has sent us the Safety Manual from the Regional Lung Function Laboratory at Llandough Hospital from which we print some extracts: (Readers should please note that these extracts are published only for interest and discussion. Neither ***Breath,*** **nor the ARTP nor Mr Houston accept any legal responsibility arising out of use or misuse of these recommendations.)**

Comments and criticisms to the Editor, please.

Respiratory Physiology Equipment

(a) Rubber Mouthpieces:
At the end of each day used rubber mouthpieces should be immersed for a minimum time of 2 minutes in chlorhexidine gluconate 1 in 200 in spirit (70%) colourless and then rinsed thoroughly in water.

(b) Exercise 3-way Valve:
After each test, this should be immersed for a minimum time of 2 minutes in chlorhexidine gluconate 1 in 200 in spirit (70%) colourless and then rinsed thoroughly in water.

(c) Nose Clips
(d) Resparameter 3-way Tap
(e) Resparameter TL Mouthpiece Connector
(f) Transfer Test Machine Rotary Valve Box:
At the end of each day these should be wiped with a cotton wool ball which has been previously soaked in 70% alcohol. It should not be re-presented to the bottle of alcohol.

(g) Resparameter Valve Box:
As above with albuswab (cotton wool attached to stick).

(h) Vitalograph Tubes
(i) Transfer Test Machine Lung Volume Tubes and Tap
(j) Flow-Volume Tube:
At the end of each day these should be wiped at ends with cotton wool ball soaked in 70% alcohol and then a bung should be placed in one end of tube. Chlorhexidine gluconate 1 in 200 in spirit (70%) colourless should be poured in and the other end/ends bunged. The tube should be rotated/shaken for a minimum time of two minutes.

On no account should items be left immersed in hibitane in spirit in an open trough unattended and over long periods. It is highly inflammable.

Prior to disinfection, visible deposits should be removed by means of soap and water.

In the event of a patient with open tuberculosis exhaling into any equipment, that piece of equipment should be sent to the Anaesthetic Maintenance Department for sterilisation by means of ethylene oxide. It should be despatched for transit in a plastic bag clearly labelled as "Containing contaminated equipment for sterilisation".

BLOOD SAMPLES — PRECAUTIONS

Samples of blood sent to the Lung Function Laboratory should be treated with caution as all are potentially infective. The specimen should be matched up with the request form and taken to the blood gas analyser. The area must have a wash-hand basin (hot and cold), a supply of disposable rubber or plastic gloves, a phenolic disinfectant (e.g. 1% Sadol or a 1% hypochlorite solution e.g. Chloros 1 in 10) and absorbent wool or cellulose to deal with contamination or soiling of bench, table or floor from broken or leaking specimen. A pedal-operated bin (having removable plastic pail) with disposable plastic bag should be provided for discarded specimens, for soiled cellulose or wool and for disinfectant-soaked wool, cellulose and gloves (i.e. after the bench or table or floor has been swabbed with disinfectant).

A large disposable plastic bag will be necessary for any white coat that may be soiled.

Care should be taken to ensure that blood samples are brought to the Laboratory from outside and transported from reception to blood gas analyser by people who have a sound knowledge of hygiene and understand the potential dangers of handling the samples and are familiar with simple precautionary measures.

Blood samples should not be delivered to the Lung Function Laboratory in syringes to which a disposable needle is still attached. The disposable needle should be discarded in such a way that domestic and portering staff cannot be injured, e.g. into a separate metal or rigid waste or discard container.

When the blood has been taken from patient the disposable needle should be discarded and air bubbles within the sample should be removed by gently tapping the sample with nozzle in upright position and moving plunger towards nozzle, and absorbing any excess blood on absorbent wool (disposed of as previously stated above). Immediately this has been done a blind hub cap should be placed on nozzle unless sample is to be analysed straight away.

HIGH RISK SPECIMENS

Specimens of blood from certain patients are specially hazardous as a source of infection for staff members. Patients suffering from viral hepatitis, patients in haemodialysis units in which serum hepatitis is a hazard and other "high risk" patients, e.g. from drug addiction and haemophilia centres, are in this category.

It may be necessary to designate senior technicians to handle these specimens and they alone will examine them.

Specimens and request forms from such high risk patients must bear a distinguishing colour disc or label and great care must be exercised at all times over:
(a) The taking of the specimen.
(b) Removal of disposable needle.
(c) Removal of air bubbles.
(d) Transit of specimen to blood gas analyser.
(e) Receipt of specimen.
(f) Examination of specimen.
(g) Disposal of all high risk specimens.

Gloves must always be worn when handling these dangerous specimens. The hands must always be washed thoroughly and treated by rinsing any contaminated skin surface with 1% hypochlorite solution (e.g. Chloros 1 in 10) followed by thorough washing after handling all such specimens.

Any accidents relating to all such specimens must be reported immediately. They must be effectively dealt with and suitably treated at once. For example, any samples that have leaked or broken in transit should, after consulting the sender or consultant in charge, be placed in a further plastic bag which should be sealed and incinerated or autoclaved.

Rubber or plastic gloves should be worn when cleaning up and 1% hypochlorite solution or 2% glutaraldehyde (Cidex) or 10% formalin (4% formaldehyde) should be used as a disinfectant on contaminated bench, counter or floor. Everything should then be disposed of in a sealed plastic bag.

At the same time it should be remembered that:
- ordinary routine laboratory specimens, unmarked and in no way singled out, can be of high infectivity;
- all specimens must be regarded as highly infective;
- all specimens must be handled with great care because in routine work it is not known which specimen is highly infective and which is not, until after investigations have been made and the diagnosis established.

BREATHING IN HAREFIELD

Andrea L Morgan
RESPIRATORY PHYSIOLOGY DEPARTMENT, HAREFIELD HOSPITAL

Harefield in the Past

Unlike almost every other place in the old county of Middlesex, Harefield has succeeded in maintaining its separate identity as a village. Though only 15 miles from London, it is not joined onto it by surburban houses, but it is still surrounded by farmland. The village seems to have grown up around a few large houses. This seems still to be the case, there being a few major employers in the parish.

In the past the major influences were the Newdigate, Breakspear and Ashby families. At one time though, in 1585, John Newdigate exchanged his manor with Alice Countess of Derby. It was she who brought many Elizabethan personalities to the parish and instigated a number of good works including the building of the almshouses. Now however, the Ministry of Defence, Hillingdon Area Health Authority and light industry are the major employers. The Ministry occupies a large 18th century mansion known as Harefield House and the industrial centre is on the canal where there have been mills for over 900 years. The hospital is in extensive grounds once called Harefield Park.

In 1700 George Cooke, the Chief Prothonotary of the Court of Common Pleas (Yes, this really was his title!) came from Kent to Harefield and purchased an estate of 126 acres known as Belhammonds. His son George added a further 400 acres and his grandson, Lieutenant-General Sir George Cooke, who lost an arm at the battle of Waterloo, changed the name to Harefield Park. On his death in 1837 the property passed into the hands of his nephew, William Frederick Vernon, who restored the property in 1862. The Vernons then sold Harefield Park to Charles Billyard Leake, an Australian resident in England, before the 1914-18 war.

Harefield in Two World Wars

In 1914, Billyard Leake offered the house and grounds as a home for convalescent wounded soldiers (Fig 1). By June 1915, it had become the No 1 Australian Auxiliary hospital designed to hold 150 under summer conditions and 50 in winter. In fact at its height there were 1,000 beds. The work of the hospital was laid down as:

Fig 1
Anzac patients in front of what is now the Doctors' residence.

1. Rest house to recuperate after sickness or injury for all grades of officers and men.
2. Depot for collecting invalids for return to Australia.

As the war progressed so the work expanded until all normal hospital functions were assumed by August 1918, when it had become a centre for ear, nose and throat diseases. The hospital was housed in large wooden huts dispersed throughout the grounds there being nearly 50 in all. They included workshops, garages, stores, canteen, cook house, detention room and mortuary.

The hospital and its staff came under great strain during the influenza epidemic in 1918 with the highest monthly record in October and November of that year, due entirely to the epidemic. Military funerals were conducted for those who died at the hospital, the burials taking place in Harefield Parish Churchyard.

On Anzac Day in 1918, a Commanding Officers' Parade of staff and walking patients, headed by the unit band, marched through the village to the churchyard. The troops drew up in a hollow square under the Australian flag and the two chaplains attached to the hospital conducted a memorial service. It was attended by many prominent Harefield residents, friends of the hospital and nursing staff.

A memorial service is still held each Anzac day in the Australian War Cemetery. The Australian flag is flown, wreaths of remembrance are placed at the foot of the obelisk and posies of flowers on the graves, as at that first service.

The Middlesex County Council purchased Harefield Park and built a splendid 300 bed sanatorium which was opened by Henry Duke of Gloucester in 1937. During the second World War, another 300 bed emergency general hospital was built in the northern part of the grounds. It had its own theatres and residences and was for civilian patients evacuated from London. Today only two wards are used (for geriatric patients) while the rest is utilised by various hospital departments and offices, including the area supplies department.

The original 18th century mansion is still occupied by resident medical staff and there is a nurses' home on the premises. Sisters and some technicians live in the village in two old houses. One is of Georgian origin whilst Manor Court is a greatly modified 16th century farm house. Although the hospital has no ghosts, Manor Court is said to have a couple though in all the time I have lived there I have not seen them.

Early Days in Respiratory Physiology

The Respiratory Physiology Department opened on February 1st 1961 on the appointment of Mr P Lockwood under the Consultant coverage of Dr H Riches, who had decided that breathing tests should be taken out of the hands of junior medical staff. The department was first established in a small room which, at that time also housed the Chief Cardiology technician.

The apparatus in 1961 consisted of:

1. Two old Palmer spirometers
2. One Godart Katapherometer
3. One EIL pH meter still in its packing case!

Routine spirometric tests and lung volume by the Helium dilution method were soon being done, but on two separate occasions until confidence in the methodology had been gained. Attempts were also made to use the pH meter with a Mendel syringe electrode but this was most unsuitable. Then, once a carbon monoxide meter was available, a rebreathing method for diffusion was devised.

Open Heart Surgery

By 1963 open heart surgery had begun, putting pressure on the department for blood gas analysis. A Severinghaus carbon dioxide electrode was acquired, incorporated into a handmade trolley and soon joined by a pH electrode. The oxygen electrode was added at a later date. The Harefield Ruler was also introduced at this time to aid in the forced ventilation calculations.

The opening of the new theatre and x-ray block in 1967 corresponded with several changes in the department. Firstly, the blood gas apparatus was replaced by an Astrup trolley and secondly, Francis Boother was appointed as a technician. At that time the number of patients remained fairly stable at 400 per annum but there was an increase in the number of blood gases to over 2,200 by 1970.

An Expanding Department

In 1971 Mrs Boother was replaced by Mrs Haynes and, as time spent in the theatre measuring blood gases increased, the routine was broken, so that samples were then sent to the department for analysis. The amount of apparatus then began to increase with the purchase of a Body Plethysmograph and a Lexington Respiratory Resistance unit. At the same time an MRC grant was obtained to investigate lung function changes after valve replacement, so that a Morgan Resparameter and a Bicycle Ergometer were bought. In 1974 Dr Nath was appointed as the Consultant in Respiratory Medicine giving further impetus to the acquisition of new apparatus and the implementation of new methods. Hugh Lloyd then replaced Mrs Haynes in 1975 whilst an IL 413 replaced the Astrup trolley.

In 1976 the department moved to more spacious premises allowing for more equipment to be bought. A Morgan Transfer Test III was purchased through Hemel Hempstead Chest Clinic and a second technician, Graham Williams, was appointed on a research grant.

In 1977 a second Resparameter was acquired from Charing Cross Hospital, Graham left and the anaesthetic department received their ABL11 blood gas analyser which was installed in the theatre suite. However it is maintained by this department. This meant that the number of blood gases done in the department dropped from 3,240 to 1,000. In December 1978, Graham had been replaced on a permanent basis by myself. The following figures give an idea of the work load as it was last year.

		No. of Patients	No. of blood-gases
In-Patients:	New:	474	469
	Total:	565	1058
Out-patients:	New:	215	36
	Total:	302	38

The routine tests done are: Forced ventilation
Spirometry
Flow-Volume loops
Transfer Factor
Blood Gases

There are also facilities for: Respiratory Resistance
CO_2 Response
Closing Volumes
Ventilation-Perfusion Ratio
Exercise Tests
Body Plethysmography

Impressions of an American Respiratory Therapist in London

or How I learned to drop my H's and not The Bomb

Elizabeth Gross
LONDON CHEST HOSPITAL

When people first learned that I was about to relocate to London for a few years, they tried their best to encourage me with statements like: "Respiratory Therapy doesn't exist in Britain; you'll *never* find a job," or "The closest you'll get to aerosol therapy will be drizzling rain," or "Resuscitation? — You'll be lucky if you get to revive a stack of dirty dishes."

Armed with such a wealth of helpful and encouraging information, I set out for London, looking forward to the prospect of months of job-hunting with no success and, finally, having to waitress or "revive" some dishes.

Through a series of fortunate contacts, however, I found a job as a research assistant in only a few weeks' time and thus thought the worst was over. This was because I made certain assumptions which proved to be wrong.

The first assumption was that when one works for a living one gets paid. How silly of me to think that, especially when I was being paid by the NHS. I had begun to work at the end of October; I was finally paid at the end of January. Having no money at Christmas, however, was a challenge to my creativity. I was democratic and sent everyone collapsible, portable, hand-painted paper facsimiles of London's famous double-deckers! No one's thanked me yet, but the trans-Atlantic postal service is notoriously slow.

Next, I assumed that everyone would be thrilled to see another alien gainfully employed. Wrong again. The folks at the Alien Registration Office were more concerned that my husband and I had different surnames. "That's illegal in England," said the young woman handling my case. In reality, it is not illegal, but she simply did not know where to put my file. I almost told her where she could put it but instead remained civilized and told her about the magic of cross-referencing.

Next came the matter of a National Insurance number. Due to my now increasing experience with English bureaucracy, I assumed that I would have to discuss "cross-referencing" of different surnames with them as well, to say nothing of attaching my national insurance number to the money they had already deducted from my pay slips. So I went prepared for any emergency, armed with passport, marriage licence, pay slips, magnifying glass, oxygen cylinder and a megaphone. Much to my surprise, (and I must add, my disappointment) there was no confusion at all. Since my husband is a student, he pays no national insurance, has no file number, and the money deducted from my pay is recorded in my name.

Finally came the battle of the century with the Inland Revenue people. My husband and I assumed that they would know all the laws concerning foreign students receiving grants in this country, especially those to do with reciprocal tax exemption between the U.S. and England. How dumb can anyone be! Not only did it take eight months, about 4,000 letters (I *do* tend to exaggerate) and several phone calls, but in that time both of our incomes were taxed as normal. We both feel lucky, however, to have had this resolved so quickly, for, at the current rate of inflation, the money finally refunded would hve been enough for only a pint or two at our local pub.

I am, by the way, thinking of changing jobs. I will be opening up the Bureau to Advise Aliens (BAA) for those too sheepish to approach the authorities. I can be reached Monday-Friday, opening hours, at my local pub. All queries gladly answered.

Spring Meeting of the Association

The Spring Meeting took place at Harefield Hospital on Saturday April 19th 1980. We are much indebted to Peter Lockwood and his colleagues for arranging the meeting which was a most enjoyable occasion.

We are very grateful to the following firms who sponsored the meeting and put on demonstrations:

Gould Medical UK; Instrumentation Laboratory (UK) Ltd; Lifecare Hospital Supplies Ltd; P K Morgan Ltd.

The following communications were given by members of the staff of Harefield Hospital.

The history of Harefield and its hospital
Miss Andrea Morgan
Respiratory Physiology Department
Harefield has a long history and famous names keep turning up. Nicolas Breakspear, first and only English Pope lived there, Milton wrote there, Edward VII visited there and George III got lost there. (For all this and more, see article elsewhere in this issue.)

The importance of blood gas estimations in cardiac surgery
Dr Ann Triscott
Consultant Anaesthetist
Cardiac surgery at Harefield is of course always news and Dr Triscott gave us an interesting account of its development since 1961 when the first by-pass operation was carried out. Where would they have been without the Respiratory Physiology Department?

Experiences visiting Thoracic Centres in China
Mr Steven Westaby
Senior Registrar, Cardio-Thoracic Surgery
Mr Westaby gave us a fascinating account of his visit to one of the centres of thoracic surgery in Canton. Everybody has heard tales about acupuncture and this is indeed used in thoracic surgery, there being little experience of 'Western-style' anaesthetics. The patient needs to be admitted to hospital three weeks before the procedure for suitable indoctrination, which wouldn't improve our waiting lists, if introduced in this country. You need to be a pretty tough patient as well!

The pattern of crackles in lung disorders
Dr Abdul Nath
Consultant, Respiratory Physiology Department
The interpretation of the noises that go on in the chest was for very many years the province of the physician, armed with the authority of the stethoscope. With the introduction of sound recording techniques a good deal of the mystique has been removed and lung sounds can now be assessed like other physiological measurements.

Respiratory function in the thoracic surgical decision
Mr Peter Lockwood
Respiratory Physiology Department
The pulmonary physiology laboratory plays a very important role in the assessment of patients before surgery. Cancer of the lung is a disease of smokers (as you may have heard) and such patients are likely to have other smoking-associated lung diseases such as bronchitis and emphysema. Mr Lockwood has developed methods of assessing the 'risk factors' in patients due to undergo thoracic surgery. (For a more detailed article, see a later issue.)

A comparison of chest physiotherapy in Canada and Britain
Miss Ann Percival
Physiotherapy Department
As in so many fields, chest physiotherapy seems much more organised across the Atlantic. Miss Percival travelled many thousands of miles and visited 21 hospitals on a recent tour of Canada. There is more emphasis on Academic training and better facilities for research — they are even expected to produce a quota of papers!

ARTP NEWS

Jane Jones — Treasurer ARTP
Editor's Assistant — BREATH

We hope that you enjoy this issue of BREATH. We have solved our printing problems and we are going to make an effort to produce an issue every three months. This means that we MUST have material and if you want us to produce an interesting journal you must help. Please will you ask people for articles and write some yourselves. Articles can be scientific, controversial, amusing — ANYTHING!!! Please see what you can do.

FUTURE MEETINGS

FAMT: The General Meeting of the FAMT will take place at St Thomas's Hospital on 13th September 1980. It should be very interesting and Mr Terence English is going to talk on **Transplantation**. The cost with lunch will be £3.50 and there will be several firms demonstrating.

ARTP: The Annual General Meeting will be held at Walsgrave General Hospital Coventry on Saturday 4th October. Programmes will be circulated nearer the time. Lynne Clarke is organising the meeting and has arranged the following speakers:

Dr G. Jones — Consultant Physician, who is speaking on *The bronchial reactivity to inhaled histamine on asthmatic patients.*

David Hamilton — Physicist, who is speaking on *The Intra-breath behaviour of radioactive tracer gas in the lung.*

There will be a Council meeting at 1.30pm and the AGM will be at 2.00pm.

Please will Council members make an effort to attend because we will have a lot of things to discuss. We need eight council members to enable us to have a meeting and the attendance at Harefield was not sufficient.

May I also remind everyone else that it is very disappointing to the organiser if the attendance at meetings is low. A lot of work goes into the preparations and if only half the promised number turn up, it is very disheartening. I know — it happened to me! So please try to come. If you feel the meetings could be improved in some way, WHY NOT WRITE TO 'BREATH' and say what you want. Our finances are also rather limited and poor attendance costs us money.

SUBSCRIPTIONS

As Treasurer, may I remind you that subscriptions are due. £5 for Members and Associate Members and £3 for Junior Members. If you are in any doubt as to your status, please ring me on 01-980 4433 ext. 320.

We shall probably have to amend the subscription charge next year but this will be discussed at the AGM. Any amendments to the constitution must reach the Secretary six weeks before the AGM. So if you do not come, you will have no say in the running of your Society.

I do hope you enjoy this issue and please try to provide us with material. The next issue will be in October.