PRINCESS BECOMES PATRON OF NEW LUNG FOUNDATION

"It's a bit like having a baby," was the Princess of Wales' reaction to blowing into a Vitalograph spirometer when she visited the Brompton Hospital recently in her role as Patron of the British Lung Foundation. Her remark was prompted by exhortations of "push, push, push"! Having blown into the spirometer twice, the Princess was assured that she was "supernormal" from a respiratory viewpoint. (Report on the visit — page 3).
Vitalograph's portable spirometer, the Vitalograph-COMPACT, has received a prestigious British Design Award for 1987.

A panel of nine judges, chaired by Professor Colin Roberts PhD, Professor of Biochemical Engineering, King's College Hospital, London, chose the Vitalograph-COMPACT for the award out of a field of 30 candidates.

Principle reason for the judges' decision: "the well thought through concept, resulting in a portable spirometer which graphically displays flow volume loops and can be used conveniently at the patient's bedside". Design features which make the COMPACT "easy to use by the operator and not intimidating to the patient" were also cited.

Choice of Indices
The exceptional ease of operation which distinguishes the COMPACT is combined with a sophisticated choice of 25 inspiratory and expiratory lung function indices, direct MVV, pre and post bronchodilator/provocation comparison measured and predicted.

Other unique features of the Vitalograph-COMPACT include real-time display of flow/volume and volume/time curves on a large easy to read screen, results which can be printed out subsequently to form a permanent record and a user-calibration facility.

Procedures for selecting a program or for changing a program at will are displayed on screen and are equally quick and easy for the operator to follow.

Ask for a Demonstration
See and try the award winning Vitalograph-COMPACT yourself. To arrange your demonstration simply contact your local Vitalograph dealer or one of the following Vitalograph offices:

Malds Moreton House · Buckingham MK18 1SW

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<thead>
<tr>
<th>Local Office</th>
<th>Telephone</th>
<th>Telex</th>
<th>Telex (VITAL D)</th>
<th>Toll Free</th>
<th>Telex (VITA E)</th>
<th>Telex (VITAL B G)</th>
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<td></td>
<td>(0280) 813691</td>
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<td>212466 (VITAL D)</td>
<td>1-800-255-6626</td>
<td>26832 (VITA E)</td>
<td>(0280) 815609</td>
<td>(040) 540 30 26/27</td>
<td>(013) 888-4221</td>
<td>(065) 29611</td>
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<td>Jacobsenweg 12 · 2000 Hamburg 54</td>
<td>(040) 540 30 26/27</td>
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<td>(040) 540 65 32</td>
<td>(065) 29289</td>
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ROYAL VISIT
A REPORT BY
Dr. Malcolm Green

The British Lung Foundation was registered as a charity in November 1984 with the primary aims of increasing awareness of the importance of the lung and lung diseases, and to raise money for respiratory research (RNB 28/2). By January 1986 the Foundation felt it was sufficiently well established to ask the Princess of Wales to become Patron. They were delighted when she accepted, and even more pleased when she expressed an interest in learning more about the lung, and about lung research, in order to play an active role as Patron. With this in mind the Brompton Hospital was approached to host a visit by the Princess on behalf of the British Lung Foundation. They willingly agreed.

The day of the visit, September 18th, arrived bright and sunny and HRH likewise arrived bright and beautiful at exactly 10.00 a.m. She was introduced to officials of the British Lung Foundation, the Dean and the General Manager and was escorted to the Conference Room of the Institute where Dr. Malcolm Green gave a brief dissertation on the lungs, their purpose, and how they go wrong. He outlined some of the common lung diseases including asthma, bronchitis, pneumonia and fibrosis and showed slides, including pictures of the damage done to the lungs by cigarettes. The Princess asked questions during his talk, and expressed the view that some of these pictures should be shown on television to make more people aware of the importance of lungs, and the dangers of cigarette smoking.

“Cinderella Speciality”

The Director of the British Lung Foundation, Mr. Peter Davies, then outlined the structure of the Foundation, described its fund-raising ambitions and the dire need for more money and resources in this much neglected “Cinderella speciality”. The Princess appeared convinced by this argument and set out with interest to visit some of the Cardiothoracic Institute research laboratories.

First was the paediatric unit where she was introduced to Emma Hickling, a nine-year old girl who had recently had SLE and had needed ventilation. Paediatric research was described by Dr. John Warner. In the department of allergy and clinical immunology, Her Royal Highness was introduced by Prof. Barry Kay to Dr. Joan Longbottom and other researchers and shown pictures of research work into the “Green Nimity Midge” which causes allergy in the Sudan. Next was a visit to the cell separator under the care of Dr. Pat Haslam; the machine sorts out cells from lung washes, by a laser process. The workings were described by Mr. David Parker, a research assistant funded by the British Lung Foundation.

Her Royal Highness was next shown the respiratory muscle laboratory and introduced to a patient, suitably named Brian Royal. He has diaphragm weakness and explained his symptoms which he first noticed when swimming. The Princess saw a demonstration of respiratory muscle testing and then tested her own vital capacity with excellent results. The film of her blowing into the spirometer was subsequently shown on national television news throughout the afternoon and evening. The Foundation learned that it was shown in Australia, Hong Kong and New Zealand, and may well have been shown elsewhere around the world! The photographs were published in most of the British national tabloids, and the event was reported in newspapers far and wide.

From respiratory muscles to cystic fibrosis where Her Royal Highness met Sister Fran Duncan, and a patient, Henrietta Hellwell, whose birthday it was. The Princess then was taken by Sister Mosley to the iron lung room where she chatted to Mrs. Lillian Beach, who was lying in the iron lung. This scene was also photographed and the pictures published in a variety of newspapers. The party next visited the department of occupational medicine to see methods for challenge testing. The Princess met Martin Nugen, a patient with isocyanate sensitivity. She then moved to a three-bedded ward to meet some in-patients with a variety of lung problems. In the fibroptic bronchoscopy room, Dr. John Collins demonstrated how the bronchoscope is passed and exhibited a recent trophy, a small piece of Lego removed from the lung of a 14-year-old boy that week. The Princess met the boy and his mother, Mrs. Murray.

Interested

Throughout her tour the Princess appeared happy, relaxed and interested. She stopped and talked to many of the staff and patients, and on one occasion saw Mrs. Murray again, about to light a cigarette; the Princess of Wales immediately took the opportunity to persuade her to give up smoking. Mrs. Murray’s subsequent determination and success in stopping smoking was portrayed in great detail by the Daily Mirror newspaper!

Finally, the Princess of Wales met further members of the British Lung Foundation Executive and Council in the Boardroom, together with other members of the hospital staff. She was presented with small British Lung Foundation sweatshirts in smart blue, with the red balloon British Lung Foundation emblem for Prince William and Prince Harry. The Princess then left the hospital by the main entrance and walked in brilliant sunshine past the considerable crowds of staff and patients, talking and smiling to the clicking of numerous cameras.

The visit of the Princess of Wales was judged an enormous success by all concerned. She showed her deep interest in the British Lung Foundation, and appears determined to help make known the importance of respiratory disorders in the community. She made all the people she came in contact with feel pleased and happy, and the overwhelming impression was that she brought style, beauty and commitment to the British Lung Foundation on this September bright morning.
FLOW-VOLUME CURVE COMPARISONS AT ABSOLUTE LUNG VOLUMES

By Dr. Ole F. Pedersen

Since the recognition of the unique relationship between expiratory pressure, lung volume, and maximal expiratory flow by Fry and Hyatt in the late fifties, the flow-volume curve has become an important tool in measuring the degree of respiratory disability; the method is simple and can be applied in wide-range screening studies of groups at risk.

Although the measurement itself is simple, the understanding of the physiology behind changes in the appearances of the maximum expiratory flow-volume (MEFV) curve is far from complete. Three main factors, however, seem to be in operation:

One is the elastic recoil pressure of the lungs that increases with the degree of lung inflation.

Another is the frictional pressure loss caused by resistance to airflow in the part of the airway between the alveoli at the peripheral end of the airway and the site in the airway, where, during the expiratory effort, the elastic airway is compressed forming a check valve or flow limiting segment.

The third factor is the cross-sectional area and the compliance of the airway at that point. It is easy to imagine that when the airway is very flaccid, it gets more easily compressed and therefore permits a smaller maximal flow.

Accordingly, the MEFV-curve is determined by all three factors, and when considering a given change in maximal flow, each of the three factors can be blamed.

The elastic recoil pressure, however, is linked rather closely with the thoracic gas volume. Under circumstances where this relationship is not expected to change, comparison of MEFV-curves at fixed thoracic gas volumes will minimize changes due to elastic recoil pressure. Observed differences will thus reflect changes in dynamic properties of the airways.

It is well known that during a severe bronchoconstriction the residual volume increases due to trapped gas in the lungs. Under the same circumstances the total lung capacity may or may not increase. The observed increase of TLC when measured in a body plethysmograph in subjects with airway obstruction have recently been questioned. The observed increase may be due to lack of pressure equilibrium between the lungs and the mouth TLC for an individual subject is, therefore, probably the most reproducible lung volume. This is also recognized in other spirometric investigations and provides a good reason for comparing MEFV-curves aligned at TLC when "within subject" variation is examined.

Table 1. The different parameters ranked according to the sensitivity by which the observed maximal drug effects are detected.

<table>
<thead>
<tr>
<th>Rank of sensitivity</th>
<th>Normal</th>
<th>Asthma</th>
<th>Bronchitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MEF 60% TLC</td>
<td>MEF 50% FVC</td>
<td>MEF 50% FVC</td>
</tr>
<tr>
<td></td>
<td>(11.17)</td>
<td>(6.58)</td>
<td>(3.98)</td>
</tr>
<tr>
<td>2</td>
<td>MEF 50% VC</td>
<td>FEV1</td>
<td>MEF 60% TLC</td>
</tr>
<tr>
<td></td>
<td>(8.69)</td>
<td>(5.62)</td>
<td>(3.60)</td>
</tr>
<tr>
<td>3</td>
<td>FEV1</td>
<td>MEF 50% VC</td>
<td>FEV1</td>
</tr>
<tr>
<td></td>
<td>(8.34)</td>
<td>(5.00)</td>
<td>(3.55)</td>
</tr>
<tr>
<td>4</td>
<td>MEF 50% FVC</td>
<td>MEF 75% TLC</td>
<td>MEF 50% VC</td>
</tr>
<tr>
<td></td>
<td>(7.41)</td>
<td>(4.98)</td>
<td>(3.30)</td>
</tr>
<tr>
<td>5</td>
<td>MEF 75% TLC</td>
<td>MEF 60% TLC</td>
<td>MEF 75% TLC</td>
</tr>
<tr>
<td></td>
<td>(7.26)</td>
<td>(4.03)</td>
<td>(3.21)</td>
</tr>
<tr>
<td>6</td>
<td>FVC</td>
<td>FVC</td>
<td>FVC</td>
</tr>
<tr>
<td></td>
<td>(5.84)</td>
<td>(3.51)</td>
<td>(2.70)</td>
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</tbody>
</table>

The figures in parentheses are the t-values.

Almost 20 years ago Bouhuys et al found that measurements of maximum flow at constant lung inflation (i.e. litres of thoracic gas volume) showed larger changes both after constriction and after dilatation than measurements of PEFR, FEV1, and MEF at 50% expired FVC. The reason for this larger difference (Δ) is obvious from Fig. 1.

The fact that the difference becomes larger does not necessarily mean that it becomes more significant. More measurements are involved when TGV is determined in addition to the MEFV-curve measurement, and this both adds to the variability and the complexity of the measurement.

A simplification making the assumption that TLC is unchanged between interventions (which appeared to be almost true in the experiments of Bouhuys et al) forms the basis for comparing MEFV-curves aligned at TLC. Flows can then be compared at fixed volumes below TLC. There is no convention for which volume to choose if only a single value is wanted. It would be in accordance with the ideas of Bouhuys to choose a volume comparable to 60% TLC. In practice this could be done by measuring at the actual TLC minus 40% of predicted TLC.

The ability of different tests to detect drug-induced changes can be measured by the t-value with which a given change can be detected. In a study of the bronchodilating effects of different drugs we calculated the t-values for their maximal effects measured with two sets of parameters from the MEFV-curve and the corresponding time-volume curve. One set consisted of FEV1, MEF at 50% FVC, and FVC and only depended on the actual performance. The other consisted of MEF at 50% VC, MEF at 75% TLC, and MEF at 60% TLC, where the volumes were determined by subtracting from the actual TLC 100 minus the given percentage of VC or TLC determined at the initial spirometry. In the latter case, therefore, the curves were compared at fixed volumes below the actual TLC.

We found the rank of sensitivity
shown in Table I. It is seen that if MEF
at 60% TLC is excluded, the tests seem
to have the same sensitivity in the
asthmatic and bronchitic subjects, with
MEF at 50% FVC as the most sensitive
choice, and FVC as the least sensitive.
Measuring at a fixed volume below
TLC in patients did not seem to
provide a better resolution. This was
contrary to the findings in the normals
where MEF at 60% TLC and MEF at
50% VC are on the top of the list.
The conclusion based on this study,
therefore, is that it cannot be said that
one method is always better than the
other.

For convenience lung function
results are usually expressed in
numbers. Numbers are convenient
because they can be easily processed in
computers. Numbers, however, are not
easily handled in the human mind.
Visual patterns are much more easily
grasped. The configuration of the
MEFV-curve cannot be easily expressed in numbers, but is important
to study, because it contains valuable
information about the physiological
properties of the airways and lungs. \textsuperscript{10,11}
Therefore a visual display is more
valuable than single numbers measured
on the curve.

In our laboratory we have developed
a method to average 2-5 MEFV-curves to
minimize ‘noise’ and to make it
possible to perform a statistical
analysis of changes in any part of
the curve.

Fig. 2 shows a comparison of two
mean MEFV-curves each based on
three measurements from a normal
subject before and after exposure to
the organic solvent n-decane in an
exposure chamber. The markings
reveal that the curves are significantly
different during the upper middle part
of the FVC indicating the central
airways are affected \textsuperscript{11}

More insight into the physiology and
pathology of the lungs and airways
may possibly be gained in the future
from the study of MEFV-curves. What
you learn from them will depend on the
glasses you wear, and what you look
for when you study them. At the
present time I believe that small
changes in lung function manifest
themselves earliest by small changes in
configuration of the MEFV-curve; one
should not be narrow-sighted and
focus only on a few points on the
curve.

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CIGARETTE SMOKING AND THE RESPIRATORY THERAPIST

By Dr. David L. Sachs

You owe your job to the cigarette-manufacturing industry. Its product sees to it that enough patients are in our respiratory intensive care units and medical and surgical services to keep you and me busy. The simple fact is that cigarette smoking is the major cause of emphysema, chronic bronchitis, and lung cancer. Cigarette smoking is also the single greatest modifiable risk factor behind fatal heart attacks, accounting for nearly one third of these.

During the year 1984, approximately 385,000 persons in the United States died of cigarette-caused illnesses. This compares with about 165,000 deaths caused by influenza and accidents. In one year, nearly seven times more Americans die of cigarette-caused illnesses than were killed in the Vietnam conflict. In my practice of outpatient pulmonary medicine and inpatient critical care medicine, 70% of the patients whom I see need my professional services only because they smoked or still smoke cigarettes.

According to the utilization logs that we keep at University Hospitals of Cleveland, between 50% and 70% of respiratory therapy services would not have been necessary had people not smoked cigarettes. In dollar terms nationwide in 1983, illnesses caused and aggravated by cigarette smoking cost approximately $30 billion; they also accounted for nearly 13% of all hospital costs.

**Helping patients stop**

So what can you do to help patients stop smoking? This topic is not one which is generally addressed in respiratory therapy schools. I have not seen it as a regular curricular item; it is barely a part of most medical school curricula. I have never seen smoking-cessation service listed on any respiratory therapy department's roster of services or on its price book. It should be there.

**Attitude**

What is important, first and foremost, is the attitude you project toward your patients. A flip or cavalier attitude toward cigarette smoking can undermine the resolve to stop smoking that has taken a patient years to develop. Whether you want to admit it or not, the image that you project is extremely important to patients. Numerous large surveys have clearly shown that Americans expect their health care providers — physicians, nurses, and respiratory therapists, for example — to set non-smoking examples. From your patients' perspective, the attitudes that you evince regarding smoking do affect your professional credibility. In their eyes, there is no better way for you to state your view on smoking than by what you do in public; smoke or not smoke. You have, presumably, read the available literature and are aware of the consequences of choosing to smoke. You are aware, for example, that if you smoke cigarettes you will have a one-in-three chance of contracting a fatal, cigarette-produced illness during your lifetime. But that is a decision and a choice you have consciously made, presumably after having weighed the risks and benefits of smoking cigarettes. To put the odds in another perspective, you have decided that playing Russian roulette with a three-chamber revolver is worth the risk to you.

Your patients do not know the literature or the medical facts as you do. While most smokers know that smoking is not healthy, a surprising percentage — some 60% to 80% — do not know that cigarettes are the major cause of lung cancer, chronic bronchitis, and emphysema. When a cigarette smoker sees a health professional, whether physician or respiratory therapist, who is in "uniform" and smoking, that professional provides a very convenient rationalization for the smoker to continue smoking — and undermines professional credibility in the process. The rationalization simply goes: "Smoking really can't be all that bad for my health; otherwise, that respiratory therapist who was just in my room wouldn't smoke." What you and I decide to do in private, on our own time, is our business; when we are in front of patients and their families, however, what we do is their business. We have a responsibility to them which supersedes our personal rights. We have to be non-smoking examples for our patients. We also have to provide them with the moral support and encouragement that they need to stop smoking. This can have very tangible benefits.

**Study**

For example, in an excellent study at the University of Edinburgh of patients admitted to the coronary care unit with a documented heart attack, half received firm, unequivocal advice from the attending physician that if they wanted their best chance to live, they had to stop smoking, and, moreover, that one of the major reasons they had had a heart attack was because they smoked cigarettes. This firm advice was reinforced by all the other health professionals who had contact with the
patients during their stay in the coronary care unit. The other half of the patients received “standard” advice, which was less definitive and more ambiguous and was not particularly reinforced by the other health professionals taking care of the patients. The outcome? Three years after their heart attacks, 63% of the patients who received the firm, clear advice to stop smoking were still nonsmokers and had never resumed smoking after leaving the coronary care unit. In contrast, only 28% of the patients who received the standard advice were still not smoking. Patients who have had a heart attack are particularly amenable to positive advice to stop smoking when they are in the coronary care unit.

Reasonable

Similar studies involving patients admitted to medical intensive care units with respiratory failure have not been done. However, until they are done, it is reasonable to assume that results would be similar. For example, as standard practice in our medical intensive care unit at University Hospitals of Cleveland, once a patient who smokes and has been admitted with respiratory failure regains consciousness, I establish rapport with him or her. I make sure that these patients understand that the reason they are on a respirator is because they are suffering from an acute worsening of their lung disease, which was caused by cigarette smoking, and that they can help avoid such worsening in the future by stopping smoking. Obviously, both timing and psychologic receptiveness of the patients are very important. Furthermore, there is no point in making a person feel guilty. Rather the object is to show these patients that there are steps that are within their power to take once they are extubated so that they do not have to go through this ordeal again. Obviously, I cannot guarantee that a particular patient will never again have a bout of acute respiratory failure; what we are talking about is decreasing relative risks. That is why I use statements such as “If you wish to give yourself the best chance to avoid being intubated and being put on a ventilator in the future, never smoke again in any form as long as you live.” Such a statement is very clear, straightforward, and factually accurate. It gets around the problem of trying to explain relative risks and probabilities to patients. Psychologic studies have shown that most patients do not relate very well to probabilistic concepts.

Therefore, it is important for you, as a respiratory therapist, to be in a position immediately to reinforce a physician’s advice to stop smoking. If an attending physician has not discussed this area with a patient, it would be appropriate for you to find out from the physician why he or she has not done so.

Hypnosis, clinics, and manuals

Patients may ask you if you know of any ways to stop smoking. They may tell you that they have tried to stop cold turkey without success. Hypnosis has benefited some patients and generally does not cost more than $60 to $100. Unfortunately, there are no good studies in the scientific literature to document its success. Possibly as many as 20% of smokers who undergo hypnosis will stop smoking. We have several psychiatrists in the Cleveland area who use hypnotism to help patients stop smoking, and I have had no hesitancy in referring patients to them.

Program

If hypnotism does not succeed, a commercial program may be tried. There are two which are generally available throughout the United States and are probably worthwhile: SmokEnders and Shick. Neither program will divulge its treatment methodology, claiming that it is a trade secret. While neither program is inexpensive (in the range of $300 to $750 for the full treatment course), the cost of cigarettes to a two-pack-a-day smoker is between $500 and $800 annually.

Numerous self-help manuals are available for cigarette smokers. Some are produced by the American Lung Association, the American Cancer Society, and similar voluntary organizations. Also, many books are available to help people stop smoking. Some of these may be relatively effective, others may not. Very few have been studied to provide any information regarding their success or which patients will most likely benefit from them. This is an area of priority research for the National Cancer Institute. Most studies which have looked at self-help manuals show only a 5% to 10% success rate one year later. At present, the best that can be said is that self-help manuals are about three times more effective when they are used with supervision by a psychologist or a physician.

Aversive conditioning/nicotine gum

Smoking-cessation research has made major strides in the past ten years, and you can expect to see even more impressive gains in the next decade. Major advances have involved aversive conditioning techniques which use the cigarette itself as an aversive conditioning tool. This approach has shown initial success rates as high as 90%, with long-term success rates at two years as high as 50% to 60%. Another major advance has been pharmacologic, using nicotine in a gum base to enable two-stage weaning from cigarettes. During the first phase, when the patient is using nicotine gum, the physiologic dependence on nicotine is served while the patient deals with the psychologic loss of cigarettes. Then, three months after beginning to use nicotine gum, the patient slowly tapers it, stopping after four months. This gum, Nicorette, which has been widely available in Europe and more recently in Canada, is now available by prescription in the United States.

One study using nicotine gum and placebo gum showed that 38% of the patients who received the nicotine chewing gum stopped smoking and remained nonsmokers for one year. Only 14% receiving placebo gum stopped smoking.

Exciting research is going on regarding the role of β-endorphin in reinforcing cigarette smoking. It appears that nicotine from cigarettes stimulates β-endorphin release in the CNS and the β-endorphin acts as a pharmacologic reinforcer of cigarette smoking. Whether blocking β-endorphin release will lessen desire to smoke is under investigation.

Dr. Sachs is clinical assistant professor of medicine, division of respiratory medicine, Stanford University School of Medicine, Calif., and director, Smoking Cessation Research Institute, Palo Alto, Calif. When this report was prepared, Dr. Sachs was medical director adult respiratory therapy department, and associate chief, medical intensive care unit, University Hospitals of Cleveland.


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‘PNEUMOBIL’: MOBILE RESPIRATORY TESTING

First Progress Report March-May, 1986

BY DR. KLAUS KLEIN AND DR. HANS WERNER VOSS

Lung function testing is still the step-child of medical diagnosties, even though the socio-economic cost of airway diseases is high. In the Federal Republic of Germany the proportion attributable to chronic obstructive airway diseases is in the order of 15 to 17 thousand million DM per year. But now in a unique co-operative project industry, science, research and the health insurance companies will demonstrate the necessity and the value of lung function testing; in the coming years, a specially equipped bus, the PNEUMOBIL will be out and about to carry out lung function tests in all sections of the population.

The Project
Up to now in the field of airway diseases there has been no decisive breakthrough achieved in preventive measures. The socio-economic losses which arise from this disease are, nevertheless, quite considerable.

1. It causes the loss of 30 million working days amongst the nine million employees with compulsory health insurance.
2. Airway diseases account for 28% of all sick notes and are thus top of the league.
3. Every year approximately 12,000 patients take early retirement on account of airway diseases.
4. Every year 55,000 courses of treatment are given for asthma.
5. 45,000 people die in the Federal Republic every year as a consequence of airway diseases.

In spite of these alarming figures, according to Prof. Nolte; only one in three of all specialists in internal medicine and one in 10 of all general practitioners measures simple lung function parameters in his own practice. The aim of the mobile lung function screening unit is, amongst other things, to draw the attention of a wider public to the necessity and value of this type of preventive measure. This project, the only one of its kind in the world, has only been possible with co-operation of industry, which has made the equipment available, science and research, which has contributed the know-how, and the health insurance companies through which access has been obtained to the widest possible sections of the population. The “PNEUMOBIL” working party is made up of the following team members:

- Environment, Health and Communication, Cologne.
- Institute for Natural Sciences and their Application, Biology Dept., University of Cologne.
- Bad Reichenhall Research Institute for Airway diseases.
- Vitalicgraph - Buckingham-Hamburg, Spirometers.
- Boehringer Ingelheim KG, airway research.
- Health Insurance Corporation.

Material and Methods
The main item of “PNEUMOBIL” Lung function screening is the mobile “PNEUMOBIL” unit itself. What is involved here is a 7.5 t truck in the inside of which four cabins have been installed. Three of these cabins house identical monitoring units. The fourth cabin is available to an accompanying doctor. Here the patients are treated or advised. Each of the three monitoring units consists of:

- 1 Vitalograph-S Spirometer.
- 1 Computer which receives, analyzes and outputs the data from the monitoring equipment.
- 1 Printer.

The monitoring equipment mentioned above is a wedge-shaped bellows-spirometer which is both robust and accurate; thus the equipment lends itself well to mass screening. During the test, one-time safety mouthpieces are used to prevent the danger of contamination from air flowing back out of the machine. From each test an analogue tracing of the measured data is put onto a Vitalogram chart. The data are transferred via an interface to a computer, type Compaq 286, which analyzes the data and stores the readings on external media (diskettes).
Total random sample — Position in May 1986

47%  
\[ n = 3858 \]

53%  
\[ n = 4409 \]

Fig. 1

Summary of the locations in which lung function screening was carried out (values in brackets: number of cases evaluated).

- Minden (1149)
- Düsseldorf (2549)
- Wuppertal (1236)
- Neuss (1279)
- Remscheid (482)
- Ingelheim (104)
- Memmingen (495)

Fig. 3

In a Federation-wide "Pneumobil" lung function screening, 8267 cases have so far been evaluated.

Each person being tested receives, via the on-line printer (Star SG-10) his own personal print-out. The test consists of two parts, which each person being tested must undergo. In the first half of the test the vital capacity is measured. Here attention is paid to a slow, even and maximum expiration with particular emphasis on the positive cooperation of those being tested. The measurement of the vital capacity is repeated several times, and the measured value stored is the best value of the series of readings. In the second half of the test a forced expiratory test is carried out. Those being tested are asked to breathe out using maximum effort, as quickly as they are able. This test is also repeated several times. The maximum values are stored. The following parameters are measured:

- Vital capacity (VC)
- Forced vital capacity (FVC)
- Forced expiratory volume in the first second (FEV₁)
- Forced expiratory ratio (FEV₁/VC%)
- Forced mean expiratory flow (FEF₂₅₋₇₅%)
- Forced expiratory flow (FEF₇₅₋₈₅%)
- Peak expiratory flow (PEF)

Age distribution

Where readings fall below certain threshold values (EGKS) a consultation/treatment is given by the doctor in attendance. Then the patient is offered, with his consent, a bronchodilator (Berodual, Berotec or Atrovent). About ten minutes later, the lung function test is carried out once again at the same monitoring unit. Subsequent to this, the person being tested receives a comparison print-out of his pre- and post-test results, which are then discussed with the doctor. The results are summarized in a doctor's letter. This is given to the patient by the project doctor to be handed on to the doctor who is treating him.

(continued on page 10)
The measured values stored on the diskettes are transferred using a computer program developed by the author into a format which allows the data to be further processed using commercial Software products (Lotus 1-2-3, Lotus Symphony). From there the transfer to statistical programs (SPSS) via ASCII files is possible.

Schleswig-Holstein, Hamburg, Bremen, Westfalen

If the smoking habits of the groups of population examined are considered, it can be seen that considerably more of the male population smoke than the female population. The proportion of smokers or ex-smokers (Fig. 5) in the male population was over 60%; in the female population it was only 35%. The question on regular sporting activities was answered affirmatively by 42% of the men and 37% of the women (Fig. 6). Of the 8267 people so far tested a total of 642, about eight % submitted to a bronchodilation test (Fig. 7). The age distribution in the test is shown in Fig. 8. Subsequently the frequency of population groups with certain characteristics in the bronchodiilation test was investigated. Here it became clear that the proportion of smokers is very high (Fig. 9), the proportion of active sportsmen, however, is relatively small (Fig. 10). In addition, it seemed interesting to us to investigate by what percentage the forced expiratory ratio (FEV/VC%) was improved by using a bronchodilator drug. A general
improvement was discernible in 72% of all treated patients (Fig. 11). The percentage distribution is shown in Fig. 12. Additionally, the parameter “smoking” seems to have an influence on the effect of a bronchodilator drug. Thus, if one examines the effect of smoking on the percentage improvements of the relative value per second with a sex, it can be seen that with men as well as with women, non-smokers react better to treatment with a bronchodilator drug than smokers. The average improvement in non-smokers is higher than that of smokers by a factor of about 2 (Fig. 13).

Conclusion
According to Th. Hausen (see RNB 28/1), the diagnosis of airway diseases depends to a very high degree on expressions of complaint on the part of the patient. However, with the assistance of spirometry it is frequently possible to recognise airway diseases in advance, even when there is no actual suffering apparent. In this way patients can be guided to early therapy. Furthermore, it may be emphasised

(continued on page 12)
that the bronchodilator test represents a good tool for arriving at decisive diagnoses. It must, however, be emphasised, that spirometry cannot give one hundred per cent diagnoses. For this reason it was decided at a meeting of Pneumologists in Bochum (May 1986) after consultation with various specialists (including Professor Nolte and Professor Ulmer), to acquire a further mobile unit in addition to the Pneumobil, equipped with a body plethysmograph.

In the coming months then, various parameters are to be examined in detail for their influence on lung function.

References

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D 5000 Köln 41

Overall summary
Improvement of the relative value per second (FEV₁/VC%) after treatment with bronchodilator

Fig. 11

<table>
<thead>
<tr>
<th>Percentage improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 5%</td>
</tr>
<tr>
<td>174</td>
</tr>
</tbody>
</table>

Fig. 12

Influence of smoking on the effect of a bronchodilator

Fig. 13
The message of these new style “pro non-smoking” advertisements is novel, stimulating, soft-selling but very clear. For 60 seconds we see a variety of exhilarating sports including scuba diving, hang gliding, board diving, wave jumping, sail boarding, karate, gymnastics, surfing, water skiing and much more... performed by a selection of Australia's top nonsmoking athletes. The message is clear: “Nonsmokers breathe easy”.

The advertisements have been tested on school children and found to be very effective in altering children's perception of nonsmoking versus smoking. They now form a part of a five-lesson school's program operating in over a quarter of Australian secondary schools and being rapidly taken up by schools in New Zealand and the United Kingdom. The source of these advertisements? What was a small voluntary anti-smoking agency, consisting entirely of young doctors and hospital staff, who got together with concerned sporting personalities and hired professionals to design a film and distribute the advertisements and program.

**Lung Testing**

Readers may remember the article (RNB 26/2) concerning the Puffability People lung testing and lecturing that was being undertaken on a large scale in Western Australia by a group of voluntary doctors, nurses, physiotherapists and other young hospital staff. The program was a successful interest-stimulator (undertaken in shopping centres, fairs and large public places) resulting in over two percent of Western Australia's population being tested, counselled and/or lectured to. The program received a very positive community response and much support including the donation of some of the computerised spirometers by Vitalograph in the United Kingdom. The net result was that with carefully trained professional volunteers and coordination of the members of the public — along with a ten minute explanation of the interpretation of lung function results and other facets of tobacco induced disease — that this was a remarkably popular and effective community-based method of communicating with the adult population.

**Logistics**

The main drawbacks of the project are the phenomenal logistics and relative expense of running the program. This includes specific training of voluntary medical and paramedical staff and their careful initial selection (extreme extroverts usually fitted the bill!), moving and setting up of several tonnes of equipment housed in two large trailers, etc.

The group found both an awareness of the progressive decrease in lung function occurring in smokers and an increased awareness of the major risks associated with smoking to be an effective tool with adults. They, however, became aware of a great need for a different approach with children and adolescents.

The group thereafter expanded by recruiting the support of prominent nonsmoking sports men and women (some of whom were also involved in the lung function testing program) gaining the support and/or involvement of the East Torrens District Cricket Club in South Australia (famed as the premier South Australian Club which refused tobacco sponsorship), ACOSH (Australian Council on Smoking and Health) in South Australia and also the backing of some prominent businessmen and an expanding membership of doctors and other supporters across Australia.

After gaining the largely voluntary professional services of musicians, advertising agents, film directors, producers, camera men, marketing experts and many others, work on the Breathe Easy program commenced. The brief—design a positive, dynamic program to make nonsmoking appealing to children and adolescents and use an avenue that will compete with and eventually eliminate the tobacco companies from their current dominance in the sporting arena. After much consideration a decision was made to associate the act of Breathing Easy with that of nonsmoking. The first task was the production of the “Breathe Easy” advertisements.

**Enjoyable**

This was unquestionably the most enjoyable undertaking of all the roles undertaken by the volunteers. Young doctors and nurses used to slaving away in shopping centres, operating spirometers and undertaking lecture programs found themselves relaxing on board yachts on the river at sunset, mixing with various sporting personalities and generally having a lot more fun. However filming, while being exciting and novel, did involve a lot of work. Filming for the series of advertisements involved numerous sites set up over a period of more than three months in some instances, waiting day-by-day for the perfect conditions. Our sailboard wave jumpers, for example, were in telephone communication with the underwater film team daily for a period of over 10 weeks waiting for the perfect waves, wind strength and direction to occur. Settings included a cold grey wet morning on the Canning River to achieve mirror surface conditions, a near roaring gale off Western Australia’s Leighton Beach in

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search of appropriate surf and a somewhat spartan experience for Ingrid who spent the whole of one day surging out of the clear blue Maytime waters of Rottnest Island to gain four or five seconds of excellent footage. One of the most dramatic settings was the filming of the karate sequences. The 30-man Breathe Easy karate team performed for half a day under the blazing sun deep in the Mullaloo sandhills. The day culminated with some absolutely magical moments as the golden sun set behind a sand ridge while the three State karate champions performed the kata Nihanchin® in perfect unison.

Undoubtedly the greatest logistical exercise and best remembered event of the filming sessions was a massive undertaking to film some scenes scuba diving, surf skiing, sailboarding, swimming, canoeing and sailing off Western Australia’s Rottnest Island one crisp, clear April weekend. Six boats including two yachts transported 100 people including three film crews, a scuba diving team, numerous sailboards, surf skis, surf boards and other appendages to the island where the whole of one day became a mass of frenzied filming activity. A dawn start and after-dusk finish left an exhausted but somewhat jubilant team of youngsters with the memories of a very new experience.

Acclaimed

Since their release the advertisements have received much acclaim and have been used as part of the massive international schools program as well as having been screened on television and the soundtrack used on radio.

They are, however, designed to accompany a major sports sponsorship program; the advertisements clarify the message of the benefits of nonsmoking, the target group being children and young adolescents. Such a project necessitates government cooperation to be a major success, and the Board of Breathe Easy are currently negotiating methods for undertaking such a program.

Footnote:
Although primarily designed to be a clarification of a sports sponsorship message, the advertisements stand alone very well as a nonsmoking message to children and adolescents. Breathe Easy would be very happy to release broadcast-quality copies of the advertisements to any governmental or voluntary agencies elsewhere in the world who may wish to utilise the advertisements for screening via their media. Schools and/or other interested parties may also purchase the special schools anti-smoking program and associated curriculum formed by joint co-operation with the Americans for Nonsmokers Rights Foundation in California, by writing to the Foundation or to Breathe Easy at 16 Sulman Road, Wembley Downs, Western Australia, 6010.

VITALOGRAPH-COMPACT: AN EVALUATION

By Judith A. Roget and Catherine M. Shield

Presented to the Australasian Society of Respiratory Therapy 1986 Annual Scientific Meeting

The Vitalograph-Compact spirometer (VCS) is described by the manufacturers as a portable spirometer for lung function screening. Flow is sensed by an unheated Fleisch-type pneumotach with a differential pressure transducer. Volume is obtained by digital integration. Spirometer features include an 8085 microprocessor, a 12.5cm x 6.5cm liquid crystal display, tactile membrane keypads, a small graphics printer (paper width 6cm), flow-volume curve graphic overlays during FVC measurements, a maximum test duration of 20 seconds, a syringe calibration routine and an easy to use menu system. Customisation options include selection of one of five sets of mean predicted values, manual or VCS selection of the best test and choice of the parameters to be displayed and printed. The volume accuracy is specified as ±3% or 50ml (whichever is the greater) and flow as ±3% up to 15 L/sec.

Accuracy was assessed by using an explosive decompression device (EDDE) to generate six standard FVC manoeuvres (ranges: FVC 1.34-4.25 L, FEV1 0.60-4.00 L, FEF25-75% 0.49-5.97 L/sec, FEF50% 0.31-3.64 L/sec) and the results from the VCS were compared to those from our laboratory standard Tektronix 4051 system which is based on the Hewlett Packard Lung Function Analyser (4051). Maximum volume difference for FVC, FEV1, FEV5 and FEF25-75% was less than 0.10 L and maximum flow difference for FEF50% was less than 0.16 L/sec. Variability was assessed by using EDDE to generate one standard FVC manoeuvre in duplicate and by testing one laboratory subject on 10 occasions over one week. The mean values and the coefficients of variation (C of V) from the two spirometers were:

<table>
<thead>
<tr>
<th>EDDE</th>
<th>VC</th>
<th>FEV1</th>
<th>FVC</th>
<th>FEV5</th>
<th>FEF25-75%</th>
<th>FEF50%</th>
<th>FEF75%</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean 4051</td>
<td>3.68</td>
<td>3.94</td>
<td></td>
<td>2.59</td>
<td>4.37</td>
<td>4.63</td>
<td>2.92</td>
</tr>
<tr>
<td>mean VCS</td>
<td>3.71</td>
<td>3.94</td>
<td></td>
<td>2.63</td>
<td>4.49</td>
<td>4.67</td>
<td>3.01</td>
</tr>
<tr>
<td>C of V% 4051</td>
<td>0.7</td>
<td>0.6</td>
<td></td>
<td>0.7</td>
<td>0.6</td>
<td>0.7</td>
<td>1.0</td>
</tr>
<tr>
<td>C of V% VCS</td>
<td>1.8</td>
<td>1.6</td>
<td></td>
<td>1.8</td>
<td>1.7</td>
<td>1.8</td>
<td>2.0</td>
</tr>
<tr>
<td>SUBJECT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean 4051</td>
<td>3.70</td>
<td>3.01</td>
<td>3.69</td>
<td>2.39</td>
<td>3.06</td>
<td>3.82</td>
<td>1.18</td>
</tr>
<tr>
<td>mean VCS</td>
<td>3.80</td>
<td>2.97</td>
<td>3.62</td>
<td>2.32</td>
<td>3.11</td>
<td>3.82</td>
<td>1.18</td>
</tr>
<tr>
<td>C of V% 4051</td>
<td>0.8</td>
<td>0.8</td>
<td>0.9</td>
<td>1.0</td>
<td>3.6</td>
<td>4.1</td>
<td>6.5</td>
</tr>
<tr>
<td>C of V% VCS</td>
<td>3.1</td>
<td>1.9</td>
<td>1.5</td>
<td>2.7</td>
<td>3.6</td>
<td>4.4</td>
<td>5.5</td>
</tr>
</tbody>
</table>

Using EDDE, the C of V's for the VCS were less than 2.0% as compared to less than 1.0% for the 4051 and this was statistically significant (p<0.05). The SUBJECT's C of V's were more...
We have rated the Vitalograph-Compact using a coarse scale of up to four asterisks. Four asterisks signifies excellent i.e. no problems.

**** Except for the slow VC measurement, the PRINCIPLE OF MEASUREMENT with an unheated Fleisch type pneumotach gave accuracy and test flexibility. We were concerned that more blows by the patients would be required to obtain reproducibility because of the unheated pneumotach but this was not a problem in our patient comparison when slow VCs were performed both before and after the FVC manoeuvres and when there were sufficient patient tests performed to keep the pneumotach temperature higher than ambient.

The MEASUREMENT RANGE is adequate for all applications. Resolution was not stated; certainly it is sufficient for the specified accuracy but as it is unspecified we elected to omit this rating.

*** There was no problem with LINEARITY over the range we studied; however, the stability could be a problem if calibration was attempted after patient testing. In practice we checked the calibration at the beginning of each day to overcome this. Because of this, we rated this as three asterisks.

**** The SOFTWARE DESIGN was excellent and was a pleasure to use.

*** The VISUAL FEEDBACK required good lighting, careful positioning of the display and still lacked sufficient amplitude and resolution for visual detection of the end of the manoeuvre. However, as this is a portable unit we still gave it three asterisks.

*** The tactile membrane KEYS tended to be slow and unresponsive, but again, it is a portable unit and we gave it three asterisks.

**** CALIBRATION was easy to perform as was the performance check using EDDE. Data extraction was all performed by the Vitalograph-Compact so the operator has no extra calculations to perform.

**** The result PRESENTATION was excellent for a portable spirometer and it was particularly nice to be able to suppress the mean predicted values by entering zero for the age if they were not required or were unsuitable.

*** The test FLEXIBILITY offered should have been excellent. We did not evaluate the Maximum Voluntary Ventilation measurement because it is not a test commonly performed in this laboratory. We were unable to assess the maximal inspiratory flow-volume curve because the Vitalograph-Compact routine depended on visual determination of end FVC, rather than software determination, and so flexibility rated only three asterisks.

*** It would have made this evaluation easier if the technical documentation had included some statements about using an unheated pneumotach, if it had listed the criteria for the software detection of the start and end of the blow, the sampling rates and the digital resolution. We awarded three asterisks to the TECHNICAL MANUAL and four asterisks to the OPERATING MANUAL.

**** There were no problems with OPERATING THE SOFTWARE at all. Manual usage is not possible for this spirometer. The Vitalograph-Compact should prove robust and presumably parts and service will not be a problem.

**** The PRICE is under $4500 Australian and we believe that it represents value for money. The running costs should be minimal.

Would we buy a Vitalograph-Compact? Yes, if the problem with the slow VC is resolved then our laboratory would like to purchase this spirometer.

Editor’s Note: the manufacturers state that the software has since been modified to eliminate the problem with slow VC.

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Variable but reflected the same trend.

Eight patients were tested on the VCS and a second Hewlett Packard Lung Function Analyser (LFA 2) in an outpatient clinic and the results compared. According to our quality control program the LFA 2 calibration and performance is comparable to that of the 4051 system. The spirometer order was alternated.

The mean patient slow VC was 6.7% higher on the VCS than the 4051 while the FEV₁ and FVC were 2.4% and 3.9% lower. This means that the FEV₁/VC% would differ markedly between the two spirometers. In conclusion, the VCS is a well designed system which is easy to use and calibrate. With the exception of the slow VC measurement the accuracy was comparable to the 4051. The variability tended to be greater than the 4051 but was within acceptable limits as set for patient testing.

Respiratory News Bulletin
Editorial Office:
28A Heytesbury Lane,
Dublin 4, Ireland.

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Review articles are particularly welcome.
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