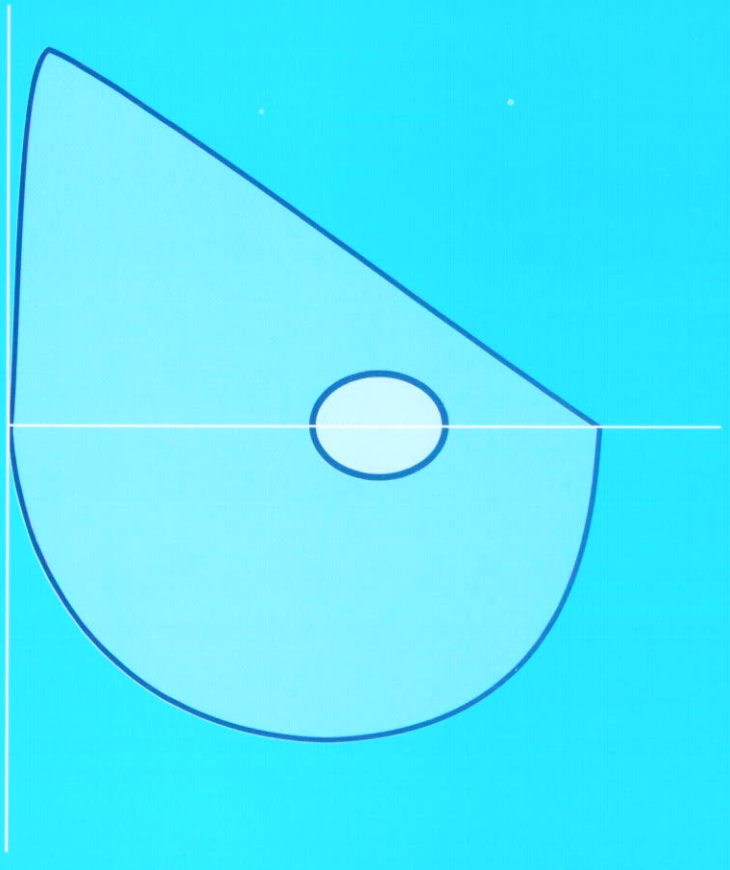
Vol.4 No.2 May 2002

Inspire



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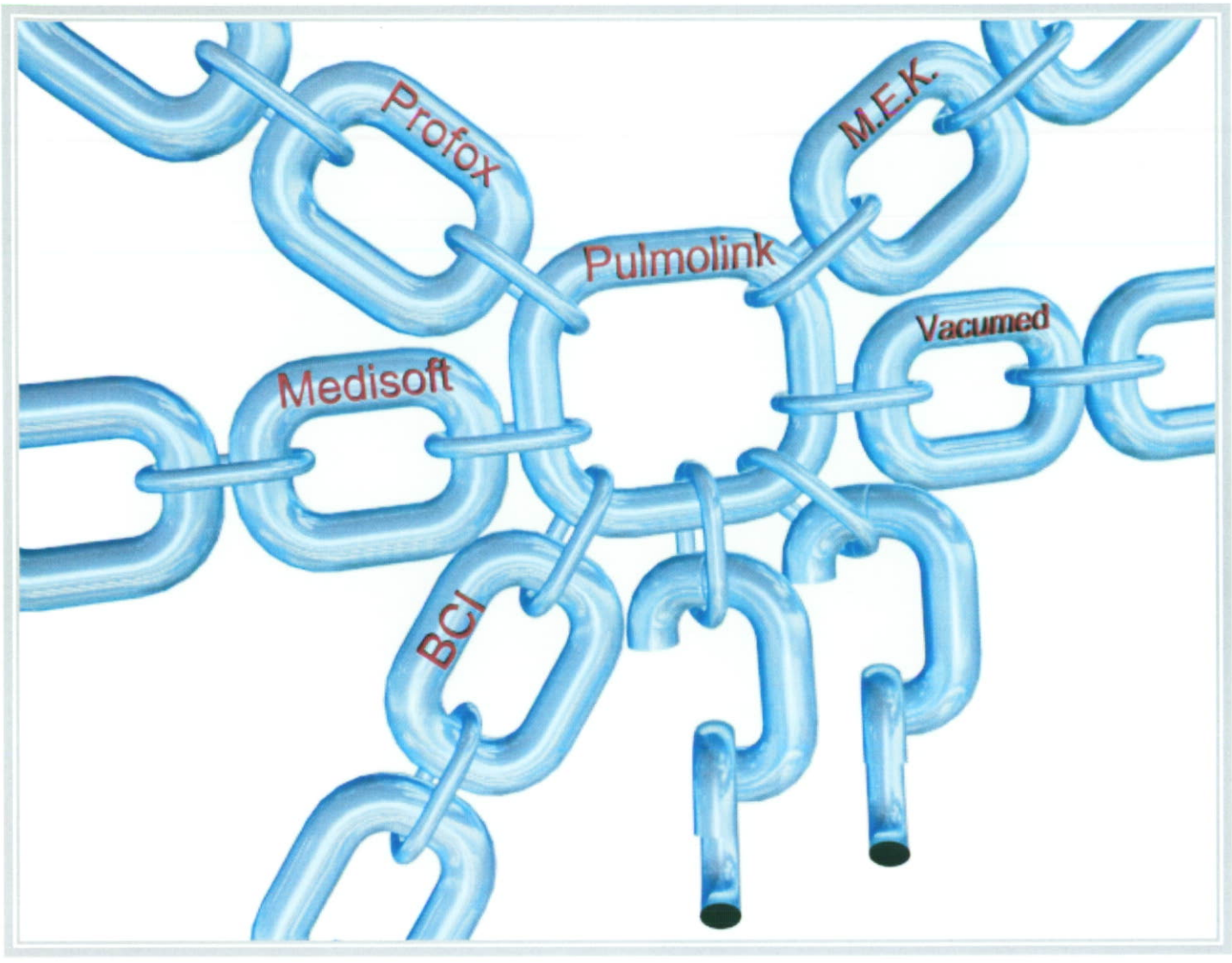

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FIRST WORD

Welcome to the spring edition of *Inspire*. Hopefully by now you will have all recovered from the ARTP Annual Conference and be thinking about funding issues for next year. Stratford upon Avon will be the spot – so, with such a theatrical venue, maybe we shall see the Executive in "doublet and hose"!! Alas poor Brendan. I knew him well, a man of infinite jest – at the expense of many a trusty manufacturer! Yet again all your feedback forms have been scrutinised to pull out the information on how we can improve things still further and make sure the meeting content reflects your needs.

This edition contains abstracts, meeting reports, AGM minutes and a good selection of photographs. Many thanks to Keith Butterfield for playing the paparazzi and getting some great shots (and a few not so glamorous shots – for which I have been well bribed to omit!). Also, thank you to the ARTP members who received bursary awards for the conference. Their extremely prompt responses in submitting articles in time for this edition has been appreciated.

Hopefully, for those of you who didn't manage to get to the conference, the reports will give you a good idea of how the pace has increased on National and Professional issues and encourage you to submit your forms for Voluntary Registration as soon as possible.

On the editorial front we are still looking for volunteers for regular features in the journal particularly for an e-mail forum report. Those who use the forum will know that there is a wealth of information available and many useful discussions taking place and it would be nice to mirror some of these in Inspire for those who do not have internet access.

Any contributions please send to:

Gill Butcher, Cardiorespiratory Unit, Queen's Hospital Burton, Belvedere Road, Burton on Trent, Staffs DE13 0RB
e-mail: inspire@artp.org.uk

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14th ANNUAL SCIENTIFIC MEETING
18th TO 20th SEPTEMBER 2002
Robinson College, Cambridge

e-mail : bssoffice@huntingdon52.freeserve.co.uk

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ALL CORRESPONDENCE TO

Mrs Jackie Hutchinson, ARTP Administrator,
202 Maney Hill Road, Sutton Coldfield, Birmingham, B72 1JX
Tel: 0121 241 1611 Fax: 0121 354 8326 e-mail: jackiehutchinson@aol.com

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The Interrupter Technique for Measuring Airway Resistance (Rint): "A Rose by Any Other Name Would Smell So Sweet"?

Pedr D Bridge, The Paediatric Pulmonary Research Laboratory, The Royal London Hospital, Whitechapel, E1 1BB.

The first published reference to Rint was by von Neergaard and Wirrz in 1927, but it seems likely that Prof Shakespeare already had some inkling (together with his quill pen) as to the problems ahead. This was a particularly bad time as it was only 3 minutes before the start of the East Enders and, understandably, the TV was turned on and the work not properly finished. There were, of course, more serious reasons why the technique never gained widespread acceptance. These were due, in part, to methodological problems with the rapidity of valve closure, the frequency response of the pressure transducer and the limited power of processors for pressure sampling and analysis. Also, the uncertainty of the physiological basis of what the interrupter was actually measuring was not clear.

There have been several epochs in the Rint story and, 75 years after its birth, it could be argued that Rint has gone from Bard to Verse. On the other hand, has the situation changed dramatically and should Rint devices now be in routine use in pulmonary laboratories? Only time will tell. Over the next few issues of Inspire, I hope to describe how the technology has reached a reasonable stage such that measurements can be made, acquired and processed acceptably well. At the same time there is plenty of scope for improvements. Also, the physiologic interpretation is relatively well understood even though there are still many unanswered questions. Having said that, much of the understanding has come, sadly, from experiments on animals and yet, rarely, are animals sent to be tested in routine laboratories!

Why the reference to the William's Rose? Rint has been said, by many, to *measure airway resistance* and, on balance, this is sufficient for a simplistic and pragmatic overview. However, it may be better to consider that Rint in fact *"reflects"* rather than "measures" resistance. Furthermore, is it really airway resistance that is being assessed or is it some other aspect of resistance related to the respiratory, pulmonary or total system? {Is this airway resistance, as we know it, Rint?} For simplicity, the terms "measurement" and "airway resistance" will be used in this article and I will come back to consider these terms and others, at a later stage.

Why might a pulmonary function laboratory need a Rint? The reliability of reporting of symptoms has been questioned and although objective lung function testing has been recommended there are said to be many instances when a diagnosis is made on symptom reporting only. This is likely to be worse in the case of very young children who present, typically, with vague respiratory symptoms, as there are few lung function tests for pre-school children. Therefore, there is a need for such a test. It is not only young children who may benefit from Rint testing but the majority of contemporary research and use of Rint is in young children. Other groups that may benefit from Rint are geriatrics, COPD and comatose patients. However, this is not necessarily the case and, even if it were, the validation would need to be re-done as appropriate. There is already evidence of the "quantum physiological leap" in the dark esoteric corridors of Rintology but more about that at a later stage. Irrespective of the known dangers of "extrapolation", it seems to me to be a necessary evil but how far can one extrapolate? Is this not especially unwise, when a little extra work can avoid or lessen the extrapolative process.

What are the strengths of Rint? As with any test, Rint is not without its drawbacks. Perhaps, for homework, you may wish to e-mail me as to what you feel are the weaknesses of Rint? However, its main advantages are that (a) it is undertaken during quiet tidal breathing and requires only passive co-operation (authors who say that Rint requires no co-operation must be living in a parallel universe undertaking Rint testing in androids); (b) there is no evidence to suggest that measuring Rint alters bronchomotor tone; (c) generally, testing does not provoke coughing and is well accepted even in patients who do not feel well enough to undertake spirometry; (d) Rint devices are portable and similar in price to spirometers.

What do we need to know about Resistance? From school days most of us will remember Home's law stating that once you start working, "If you arrive early at work you are allowed to leave late to compensate". N.B. Higher mathematics teaches us that a minus and a plus cancel each other out. This, in effect means that you are rarely at home and, hence, the nomenclature! However, from Ohm's law, Resistance = Volts / Amps (R=V/I). i.e. The magnitude of the resistance in a conductor is *defined* as the ratio, pressure differential function (pdf): resultant flow.

In our case, (i) the conductor is the airway; (ii) the pdf is the difference between alveolar pressure (Palv) and mouth pressure (Pmo) (or, in some texts, Pao for airway opening pressure); (iii) the resultant flow is readily measured at the mouth.

The only other equation of relevance is that resistance is inversely proportional to the fourth power of the radius of the conductor. ($R = r^{(-4)}$). Hence, a small increase in radius should result in a measurable decrease in resistance. Of course, in the case of assessing change due to bronchodilator, the situation is made complex by uncertainty of both the site of action of

the bronchodilator and the region of the airway measured by Rint. Rint is not only affected by the geometry of the airway but by several other factors that I will come back to in a subsequent article.

What is the problem in measuring airway resistance? Whereas the resultant flow and the open circuit Pmo are easy to measure with modern electronics and processors, Palv cannot be measured directly and non-invasively. Palv needs to be estimated and von Neergaard had the insight to postulate that during a brief interruption of airflow, a mouth pressure-time function {Pmo(t)} would result from which Palv, the driving pressure at the time of interruption, could be estimated. Thus the pdf (the driving pressure = Palv – Pmo(open circuit)) could be calculated and a resistance value could be derived as the ratio of this pdf to the resultant flow (already stored at the time of interruption).

How is Rint measured in the field? Truthfully, we tend not to measure Rint in the field as many of the patients are allergic to pollen and I would strongly recommend that the tests be undertaken in the laboratory! During quiet tidal breathing the flow is automatically occluded, typically 100ms, and a Pmo(t) results. The open circuit pressure and flow immediately before the interruption are automatically stored and Palv is estimated by the software from the resultant Pmo(t), according to the implemented algorithm. Many algorithms have been proposed for estimating Palv at the time of occlusion from the Pmo(t) and I will return to the pros and cons of some of these in a later article. From these 3 values, Rint can then be derived. In practice, a Rint measurement is usually taken as the mean (or median) of 6-10 interruptions. Validation of Pmo(t)s has been describe in the literature and manufactures software provides some quality assurance but it is not a trivial matter and I will return to this later.

Is Rint a feasible test? A test that can only be undertaken by a small percentage of the target population would be likely to show a bias and, thus, not recommended. Also, as response to bronchodilator (BDR) is a cornerstone of a diagnosis of asthma, we felt that feasibility would necessarily have to encompass full BDR testing. We have shown in a group of 2-5 yr olds, undertaking Rint for the first time, that assessment of BDR is feasible even in those as young as 2-3 yrs. [1] {These pre-school children took a similar time to complete the test as do older children tested using a spirometer.} This research was undertaken in a busy routine laboratory under clinical support conditions and, therefore, reflects the use of Rint in the community. At this stage, I should like to express my personal opinion that Rint is quite a crude measurement and is not likely to ever be useful as a tool for pure research.

A test that is feasible is of no use unless the results make sense according to both knowledge gained from previously accepted gold standards and predictions based on the systems being measured. "Does the punishment fit the crime?" Published research into Rint looks promising as (i) the limits of agreement of repeated measurements is considerably less than the change following bronchodilator; (ii) children with a history of wheeze have, on average, higher Rint values that controls (those with cough take up an intermediate position); (iii) Rint has been shown to decrease significantly after bronchodilator and increase significantly after challenge; (iv) Rint values are of the same order of magnitude as other measurements of resistance.

To put these four comments into perspective (i) Rint cannot be said to be an accurate measurement; (ii) there is considerable overlap, both at baseline and with BDR, between the various groups such as controls, coughers and wheezers; (iii) the use of Rint in challenge testing is contentious as Rint is thought likely to increasingly underestimate resistance according to the degree of airway narrowing; (iv) Rint can not be compared directly with oscillations techniques, plethysmography etc and can be seen to under or overestimate resistance measured by these other techniques.

In summary. The resistance of the respiratory system to air flow enables assessment of its overall mechanical behaviour. Rint is based on the assumption that during a rapid interruption of airflow, Palv can be estimated and airway resistance assessed. Developments in technology and an increased understanding of the underlying physiology have resulted in commercially available Rint devices. Results so far suggest that BDR testing using Rint is feasible even in pre-school children. Also, Rint measurements appear to be consistent with what would be predicted from both the underlying physiology and resistance measurements made using other techniques. However, the technique is crude, it depends on several assumptions which may break down under certain conditions (yet to be described), there is a need for recommendations and standards and there is still some uncertainty in what Rint is measuring.

As a Rint devotee, with reservations, I would suggest that lung function laboratories should Rint where many researchers have boldly Rinted before but not without considerable thought, discussion and caution.

[1] Bridge PD et al: Measurement of airway resistance using the interrupter technique in preschool children in the ambulatory setting. Eur Respir J, 1999; 13; 792-6.

This reference is a starting point providing a simple overview of the feasibility of Rint in pre-school children. Please e-mail me with any comments or if you would like further information or references : llanybont@planet-save.com

The views in this article are the opinions of the author only and are not intended to represent an official statement on behalf of the research unit at the Royal London Hospital.

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*S L Hill*** Ph.D. Consultant Clinical Scientist, Chairman BTS/ARTP Liaison Committee.*

On behalf of the National Asthma & Respiratory Training Centre, Warwick, CV34 4AB, & Association for Respiratory Technology & Physiology***

Lung Function Department, Nottingham City Hospital, Nottingham NG5 1PB & Lung Investigation Unit, Queen Elizabeth Hospital*, Birmingham B15 2TH.**

Address for correspondence: Dr B G Cooper, Lung Function Department, Nottingham City Hospital, Nottingham NG5 1PB

Aim
The aim of this study was to survey the current use of spirometry in the primary care setting and to determine the level of service provided both in terms of equipment utilised, volume of tests performed, protocols followed and perception of standards required for accurate and reliable spirometric measurements.

Introduction
The introduction of the British Thoracic Society (BTS) guidelines (1) for the management of chronic obstructive pulmonary disease (COPD) place an emphasis on the measurement of FEV1 together with other spirometric indices (FVC, VC and PEF) to determine the presence of airflow obstruction and the severity of impairment which has been related to the expected signs, symptoms and treatment algorithms. A greater role for primary care in the management of this heterogeneous disease is an integral part of the guidelines, which includes the performance of spirometry to obtain forced expiratory volumes (2). The measurement of spirometric parameters has historically been seen as the domain of secondary healthcare provision and in particular in specialist lung function laboratories where staff are trained in procedures, equipment specification and quality control and interpretation of test results. The introduction of the COPD guidelines however has seen an increase in the number of practice nurses undertaking these measurements even though there is emerging evidence of the poor quality of spirometry performed in primary care (3).

We wished to assess by questionnaire the current status in primary care practice of equipment, number of tests, training and other aspects of spirometry measurement amongst community based health professionals in the UK. By obtaining a "snapshot" of the measurement and use of spirometry in primary care we intended to highlight the areas of training and practice that may need addressing to improve the quality of spirometry in this healthcare setting.

Methods
A single-page, self-completion questionnaire was designed by the Association for Respiratory Technology & Physiology (ARTP) and the National Asthma & Respiratory Training Centre (NARTC) and was kept simple with clear choices. 8000 community based health professionals who were on the NARTC database, were sent a copy of the questionnaire which covered the following areas; (i) respondents occupation, (ii) utilisation of spirometry, (iii) number of patients tested per week, (iv) training received, (v) spirometer used, (vi) calibration and cleaning of spirometers and (vii) the use of predicted normal values.

The survey was sent out in August 1998 and all replies received by October 1998 were used in the analysis. Analysis was performed initially by a computerised database system (Research Quorum, Basingstoke, Hants, UK) that automatically scored the returned questionnaires, and then detailed manual analysis was used to examine and edit problematic replies. Summary tables and figures from the data are reported.

Results
Response
A total of 575 questionnaires were returned which represented a 7.2% response rate, by the closing date. The questionnaires were completed predominantly by practice nurses (507 of 575 returned; 88%), with the remainder being completed by general practitioners (1%) and from community nurses and respiratory nurse specialists (11%).

Users and frequency of use
About a third of practices (32%) responding did not own a spirometer at all, with two thirds (384 practices, 49%) owning at least one spirometer, with 13% and 4% owning two and three or more spirometers respectively. Five percent of respondents indicated that they had machines on loan.

Of the 353 total spirometers used 68% of the respondents used their spirometers between one and five times per week, with only 28% using them more than five times per week. Clearly the demand for spirometry in general practice at the time of this survey was low.

Equipment
The respondents were given a list of 14 commercially available spirometers to identify which machines they utilised, and collectively reported using only nine of the 14 models listed, and a further five models that had not been listed. Interestingly, 16% of spirometer users did not know the model of spirometer they used. Two companies, MicroMedical and Vitalograph, manufactured most of the spirometers utilised supplying 45% and 43% respectively.

Table 1 shows the details of the spirometers utilised. The denominator in Table 1 is determined as the total number of reported spirometer types used (denominator = 387) because some centres reported using several types of spirometer. Analysis of the type of spirometers utilised shows that flow-measuring devices were used predominantly - either rotary vane or pneumotachograph (70%), with volume-measuring devices representing only 13% of machines utilised, and three percent that were not clearly defined by type. Slightly more spirometers utilised were bench-top models (55%) rather than hand-held models (46%).

Calibration
48% of responders (154/352) reported routinely calibrating their spirometer, with 33% saying they did not and 19% not replying at all. When asked whether calibration was required 117/352 (33%) said it was unnecessary, but on further analysis replies depended upon which device was being utilised. MicroMedical products generally allow a verification but rarely a true calibration. Therefore only 15% of MicroMedical users reported performing verification manoeuvre or calibrating their machines, 48%

deemed it unnecessary, with the remainder not performing any verification testing. Users of Vitalograph products (who do recommend calibration of their equipment) showed that 86% of all machines in use are calibrated, with only 9% of users not reporting calibration procedures and the remainder feeling that calibration was unnecessary.

Of the 154 respondents who said they calibrated their machines, the frequency of calibration varied widely (Table 2). Disturbingly, 40% of respondents only calibrated their machines either monthly, quarterly or annually. Obviously the frequency of calibration depends upon the frequency of use and number of patients measured, but the acceptable practice of calibration at each session or daily (4,5) appears to be rarely practised.

Training
When asked whether they had received any training, (338/352) 96% of users reported that they had received some spirometry training. This approximately broke down into the different categories of users. [GPs 5/352 (1.4%); Nurses 288/35 (81.8%); Other 44/352 (2.3%)].

Of the 338 users who received spirometry training, the breakdown of the training received is shown in Table 3. 52% attended either a study day or visited a hospital laboratory, with a further 38% getting training either from the manufacturer or a nationally offered course.

.
The amount of time spent on training was only reported by a few of the responders. 11 reported less than one day, and 24 reported one to two days training but the data is too incomplete to draw any firm conclusions. Given the responses in Table 3, it is likely that over 246/338 (73%) attended at least a one day course provided by either a study day, at a laboratory or from a manufacturer. It is concerning that over 25% of users apparently received no training lasting more than one day

Those who returned responses regarding training showed a range of period of training received from less than one hour (three responses) up to two days in a limited number (10/338).

Cleaning & Service of the Spirometer
242/352 (69%) of users reported regular cleaning of their spirometer. The frequency of cleaning was again like calibration variable, and probably reflected the degree of use. The majority of respondents cleaned their spirometer after one week or more.

230/352 (65%) of users either maintained or serviced their spirometer. Nearly half (47%) did not service their spirometer annually (as a part of a maintenance agreement with manufacturers), with a further 7% servicing either three or six monthly.

Height measurement
The majority of respondents (404/577, 70%) did not measure height for use in determining predicted values. Only 78 out of the 352 who used spirometers (22%) measured height at all. The training in height measurement for those who performed the measurement was generally on a course, but 40% were non-specific about where their training was received.

Use of predicted values for spirometry
61% of spirometer users replied that their machine produced predicted values, with 34% reporting using no values. It is unknown which predicted values are used, but most Vitalograph and MicroMedical spirometers default to recognised European (ECSC) predicted values. Of the approximately one third of respondents reporting they did not use predicted values this was because they were not provided by the machine. These respondents utilised values supplied by either pharmaceutical companies 69/129 (53%), or ECSC values [19/129 (15%]. However, 16% did not know which values they used, and a further 16% never stated which values they used.

Discussion

Response
The response rate of 7.2% out of the 8000 circulated questionnaires is low, but it is highly likely that the majority of non-respondents did not perform or use spirometry, and therefore did not return their questionnaires. The reported respondent's occupation was dominated by nurses, with a few GPs and a small group from other categories. This implies that the survey at least reflects the views of practice nurses who will be playing a major role in implementing the BTS guidelines on COPD in primary care including the measurement of spirometry.

Users and frequency of use
It appears from this data that about a third of practices do not own a spirometer but this is likely to be an underestimate given the argument that non-users probably did not bother to return their questionnaires. Only a small proportion of practices own more than one spirometer. Anecdotally, it is known that several drug companies as part of clinical trials have given practices "loan" hand-held spirometers, and so it appears that ownership does not translate to use.

The number of patients studied routinely is relatively small and, as would be expected, the practices that owned more spirometers used them much more (i.e. 69% of practices with more than one spirometer tested more than 10 patients per week compared to 16% measuring only 1-2 patients per week.)

Equipment
The fact that two companies predominate the spirometer market in primary care is not entirely surprising, since the provision of equipment for use in clinical drug trials mentioned earlier would explain this pattern. However, it is highly likely that this will change rapidly as the healthcare industry responds to the demands resulting from the BTS COPD guidelines for more spirometry in primary care.

What is concerning is that the MicroMedical Micro and the Clement Clarke VM1 (collectively making up 27% of the machines utilised) do not measure (relaxed) vital capacity - which is a recommendation in the BTS COPD Guidelines. Most of the hand-held devices do not have hardcopy printouts of every effort, nor do many of them have a graphic display of each effort to help improve quality of the patient efforts. The errors of thermostability of pneumotachographs (6), and the poor reliability of rotating vane spirometers to measure volume (7) must be a concern particularly in a group of operators who may have had less than adequate training in spirometry.

Portability may not be such an important issue, since most centres used a desktop spirometer and many of these machines are actually portable anyway. Flow measuring devices predominate because of their low cost, apparent ease of use and widespread availability.

Calibration
It is alarming that many centres did not routinely calibrate their spirometers and did not think that calibration was important. The frequency of calibration suggests that it is not considered as essential by most users but the frequency of calibration depends upon the frequency of use and number of patients measured. This must be considered as an area for more training so that quality standards of practice can be implemented.

Training
Surprisingly, many users reported receiving some training in spirometry, but the level of training appears to fall short of the standards proposed by the recently introduced ARTP/BTS National Assessment in Spirometry which is aimed specifically at healthcare professionals undertaking spirometry measurements.

Cleaning & Service of the Spirometer
The attention to and frequency of cleaning of spirometers was variable, and probably reflected the degree of use. This is particularly concerning because community acquired infections are likely to be high and the risk of spreading TB or MRSA from patient to patient could be high. Clearly further training in this area should be considered paramount in future training programmes.

Maintenance or servicing of spirometers is also poor but this may not be such a problem given the generally good reliability of many of the commonly available spirometers used. However, without adequate quality control procedures, detection of faults, inaccuracy of measurement and malfunction must be a serious concern.

Height measurement
The large number of centres that did not receive training in accurate measurement of height for the purposes of determining predicted values is a major cause for concern. Correct height measurement, with extension of the vertebrae, the shoes removed and good posture can remove errors of up to 5-10 centimetres, which can translate to 500-750ml in estimates of predicted values. However, it was encouraging to see that some users reported being trained to measure height correctly.

Use of predicted values for spirometry
Unfortunately, it was not possible to find out which predicted values were actually used by each practice, but generally it appears to be whatever the default values were set up by the manufacturers.

Users reported using values supplied by pharmaceutical companies which can often be inappropriate out of date UK values or more recent US values, the fact that 16% did not know what values they used is of some concern.

This survey has highlighted the shortfalls in current spirometry practice in the primary care sector, prior to the impact of the BTS COPD Guidelines and can be used to help design appropriate training programs for practitioners of spirometry. Although no question was asked regarding the ARTP/BTS Guidelines for the measurement of Respiratory Function (5), it is likely that many practices are not aware of these guidelines and are therefore unlikely to refer to them to improve their practice. A follow-up study to assess the impact of more appropriate training from centres like NARTC as well as the ARTP/BTS Certificate in Spirometry will hopefully demonstrate improvements in the understanding and delivery of spirometry.

Conclusion

- Spirometry in primary care practice is relatively uncommon and most is performed by practice nurses.
- Most practices use the cheaper hand-held devices many of which do not measure relaxed vital capacity.
- Calibration/verification varies depending on the make of equipment being used.
- Many practices have received some training but the quality of the training is unknown.
- Only 50% of devices are cleaned or serviced spirometers.
- Height is rarely measured, thus casting doubt on the reliability of predicted values used and interpretation of results.
- A third of responders reported not using predicted values.
- The information from this study can be used to design and deliver appropriate training programmes in spirometry for primary care.
- There is an urgent need for appropriate training.

References

1. BTS Guidelines for the management of COPD. Thorax 1997; 52: S1-S28.
2. Rudolf M. Impact of BTS COPD Guidelines. Thorax 1998; 53: (Supp 4) A86.
3. Molyneux AWP, Ward MJ, Barber P. General practice based spirometry screening for chronic obstructive pulmonary disease (COPD). Thorax 1998; 53: (Supp 4) A85.
4. American Thoracic Society Statement. Standardization of spirometry 1994 update. Am J Respir Crit Care Med 1995; 152: 1107-1136.
5. ARTP/BTS Guidelines for the measurement of Respiratory Function. Resp Med 1994; 88: 165-194.
6. Von der Hardt H, Zywietz C. Reliability in pneumotachographic measurements. Respiration 1976; 33: 416-421.
7. Mella RJW, Swan AV, Clarke G, du Ve Florey C , Nelson AM. Suitability of a new turbine spirometer for epidemiological surveys in children. Bull Eur Physiopathol Respir 1985; 21: 43-47.

Table 1:
Details of Types of Spirometer Utilised

Make/Model	Type	Printout	Cost	Use Frequency
MICRO MEDICAL				**175/387 = 45%**
3300	RV / BT	Yes	A	74/387 = 19%
Micro	RV / HH	No	A	69/387 = 18%
MicroPlus	RV / HH	via PC	C	29/387 = 8%
MicroDL	RV / HH	via PC	C	2/387 = <1%
VITALOGRAPH				**166/387 = 43%**
Alpha	PT / BT	Yes	A	65/387 = 17%
Model S	WB/BT	Yes	A	30/387 = 8%
Model R	WB/BT	Yes	A	21/387 = 5%
Escort	PT/HH	via PC	B	22/387 = 5%
2120	PT/HH	via PC	B	20/387 = 5%
Spirotrac	PT/BT	via PC	A	2/387 = <1%
Other	Various	–	–	6/387 = <1%
CLEMENT CLARK				
(VM1)	PT/HH	via printer	C	34/387 = 9%
Other makes	Various	–		12/387 = 3%

Abbreviations: RV = rotating vane, PT = pneumotachograph, WB = wedge bellows, HH = hand held, BT = bench top. Costs: A = around £300; B = £900-£1000; C= £1200-£1500.

Table 2:
Frequency of Reported Spirometer Calibration

Frequency		n=	(%)
Daily	=	43	28%
Weekly	=	46	30%
Monthly	=	24	16%
Quarterly	=	14	9%
Annually	=	22	14%
Unspec.	=	7	5%

Table 3
Amount of Training in Spirometry Received

Training		(n=)	(%)
Study day	=	122/338	36%
Hospital Lab	=	88/338	26%
Manufacturer	=	82/338	24%
National course	=	46/338	14%
Other	=	18/338	5%

ARTP CONFERENCE REPORTS BLACKPOOL 2002

BURSARY ARTICLE BY MICHELE AGNEW CHIEF RESPIRATORY TECHNICIAN ST JAMES'S HOSPITAL, DUBLIN

The theme chosen for this year's conference aptly described the surroundings, although "gust" might have been more appropriate!

The conference was well attended, and the organising committee are to be congratulated for the high standard. The speakers were entertaining and covered topics from spirometry and reversibility to exercise physiology, sleep analysis and major lung diseases. The keynote speech on Lung Transplant by Dr. Brendan Madden described the need for lung function results prior to surgery and was a very positive start to the session.

New techniques were offered for appraisal – Rint and IOS. These seem to be finding a place in the greater scheme of things, but reference values and protocols are still quite a way off. Both techniques seem designed for the less able/compliant patient and can deliver a value of lung function where spirometry cannot be performed successfully. We await future developments with interest.

The availability of spirometry would appear to be an area that we will be hearing more about. Should we all set up 'spirometry clinics' for GP referrals?? Adrian Kendrick thinks (and I agree) that a technician-led service in a hospital setting is the 'gold standard' for this. Abnormal patients can be referred for further assessment to a Respiratory Physician.

Another 'service' area under the spotlight is Sleep. This area is expanding rapidly and we are all being asked to set up Sleep Labs to assess patients with sleep disordered breathing problems e.g. Obstructive Sleep Apnoea. Martin Allen outlined problems of training, equipment and future problems with registration and lab accreditation.

The question was further addressed by Sue Hill – does the future involve technicians being trained for lung function only, or sleep only, or exercise only? This seems to be the way the NHS is thinking, but surely this would narrow the scope of respiratory physiologists. Do we have enough staff to limit their range of duties? Would YOU be bored doing nothing but sleep studies or routine lung function? I think this whole area needs close evaluation.

The whole area of registration and lab accreditation is causing unrest. In the UK forms have been distributed and some completed and returned, so that there is no denying that 'all must register'.

Lab accreditation too is just bringing us all in line with acceptable standards of practice. We should all be accountable for what goes on in our labs and our staff should be performing in line with ERS/BTS guidelines. Equipment too should meet quality assurance standards so that we can confidently say our results are accurate.

In Ireland, as in the UK, the Department of Health has set up benchmarking committees and are shortly to commence registering of health care professionals. A group comprising of Respiratory, Cardiology, Vascular, Neurology and Gastro technicians is currently in talks with the Department so that we can help 'guide' their thinking on technicians. We want to ensure that we have an active part in determining standards in physiology labs and also in trying to grade a new career structure for technicians/lab managers.

The Association of Respiratory Technicians in Ireland is actively encouraging all labs to improve standards of quality control and assurance, and is encouraging all staff to attain a recognised qualification to secure their future. The commencement of a degree course in Clinical Measurement (2001) brings technicians to a level recognised by onlookers (!) and hopefully gets rid of the old idea that we are just 'button pushers'.

These major changes in our careers should be embraced positively and not looked upon as an imposition to annoy us. As in the 'breath of fresh air', a good spring clean of ideas would do us all good. Respiratory medicine has changed more in the past 5 to 10 years than in the previous 20, so we all need to stay alert to keep up with these changes. As recognised professionals we must constantly upgrade training and practices.

It will be interesting to see how things have progressed this time next year, but be assured, things will have changed. Will it be a case of 'Respiratory, Brendan, but not as we know it'?? We must wait and see. The conference certainly gave us all a lot to think about, and hopefully in a positive sense.

Finally, a word of thanks to all the companies who supported the conference. We were offered a vast array of equipment and stands, and had ample opportunity to ask questions (and collect the handouts).

Overall, a very positive conference. There was plenty of food for thought, and plenty of discussion to go with it! The evening entertainment finished it off nicely (as the photos proved) and hotel accommodation was of its usual high standard. I look forward to next year's event, and wonder what new changes we will have seen by then.

BURSARY ARTICLE BY PAUL KINGSTON
STUDENT RESPIRATORY PHYSIOLOGIST
ROTHERHAM GENERAL HOSPITAL

Introduction

Having applied for and successfully gained an ARTP bursary for the ARTP Annual Conference 2002, a bursary article has been written post-conference from the perspective of a Student Respiratory Physiologist at his first ARTP Conference.

This year's Annual Conference was held at the Hilton Hotel Blackpool on 17th – 19th January 2002.

Thursday 17th January 2002

After a busy morning in the Respiratory Department at Rotherham General Hospital we set off on our journey to Blackpool. It seemed to fly by due to the singing talents of Jane Walker (Chief Respiratory Physiologist) singing along to Robbie Williams for the majority of the journey from the back of the car!

We arrived at the hotel in plenty of time to book in and register before the MedicAid workshop where they were launching 'MOST' their new system of hiring out CPAP equipment (paid by the NHS) to patients, to lighten our (the Physiologists) work load. Our choice of where to sit, thanks to Jane Caldwell (Senior Chief Respiratory Physiologist), was on the front row in the seminar theatre and, in due course, I was kindly volunteered by the MedicAid representatives to be their guinea pig in demonstrating MOST's versatility over the Internet.

After my contribution to the conference it was Dr Brendan Madden's turn. He gave a talk on Lung Transplants, clearly stating when they are needed, why, and the complications of the transplant, whether both lungs are transplanted or only one and the effects of rejection and infection.

To conclude a good start to the first day of the conference it was time for the Manufacturers' Exhibition, which gave us the opportunity to see the latest respiratory equipment and consumables and pick up as many freebies as our new Beaver Medical ARTP bag would carry.

Friday 18th January 2002

Waking up to the second day of the conference feeling a little worse for wear (someone had to use up the free wine tokens), having to be ready for an early start. After breakfast the first session was on spirometry, an area that I am more familiar with than any other (due to being a student), therefore I found it all very relevant and informative. The second part of the morning lectures was on lung cancer, COPD and cystic fibrosis. This last subject I found of most interest due to having seen a patient for basic spirometry from our out-patients clinic only a couple of days before the conference. Her husband had recently died and two of her sons had died of cystic fibrosis. I didn't know much about the illness at the time so the talk by Dr Andy Jones was very helpful; it gave me an idea of what the woman had gone through and the sort of treatment that both her sons would have had.

At lunchtime I had no time to relax or recover from the night before thanks to Jayne Hall (Senior Respiratory Physiologist) who had booked us a place on the MedicAid workshop 'Assessing Obstructive Sleep Apnoea (OSA)'. The reason for attending the workshop was that our sleep study service is continually growing and the equipment being used constantly developing, therefore ever increasing my contribution to the service at Rotherham Hospital. I didn't realise the consequences of untreated OSA some of which are hypertension, coronary heart disease, heart attacks, strokes, death and cognitive and performance deficit. I only thought OSA affected the amount of sleep a person has, making them tired thus interfering with their normal day to day life.

The workshop was very informative but ran late due to questions/topics of discussion being raised throughout and this caused us to be late for the afternoon sessions regarding assessing reversibility. The following session was on Auto Titrating CPAP, links between driving and OSA and sleep services, all of which tied in nicely with the MedicAid lunchtime workshop.

After refreshments and poster viewing there was the Sue Hazard Memorial Lecture on the respiratory aspects of motor neurone disease by Dr William Kinnear, introduced by a very moving speech by Dr Brendan Cooper. For someone like myself who didn't have the chance to meet Sue Hazard it was evident that she is and will always be missed immensely by her family, colleagues and friends. I feel that it is very appropriate that her name will live on within the ARTP as an award received by the technician judged to be the most outstanding candidate each year to complete the ARTP National Assessment (exam and essays).

After a long day of lectures the party began with the drinks reception at 7pm before the Gala Dinner. The evening was fantastic with an after-dinner speech by Dr Dave Leather (a man who should give up his day job as a GP and become a comedian – his speech was brilliant). Then came the dancing and drinking which went on to the early hours of Saturday morning.

Saturday 19th January 2002

The final day of the conference commenced with the Annual General Meeting, reviewing 2001 and the proposed future developments for the Association in 2002.

The remainder of the lecture sessions were on exercise physiology, highlighting the pros and cons of exercise protocols and measurements. There were also plenary sessions on Lung Function Laboratory Accreditation, proposing the accreditation process and the key issues that affect lab accreditation. The meeting drew to a close with Dr Sue Hill talking about grading, Mr Keith Butterfield about equipment and testing, and Dr Adrian Kendrick about quality control, infection control and protocols.

Concluding Comments

The conference as a whole was excellent. It provided me with further information about the ARTP and the area of Respiratory, and provided me with further knowledge that will help me in the future.

A bit of advice – before going to next year's conference ensure that you get plenty of sleep – the days are long and the nights can be even longer.

I would like to thank the ARTP for giving me the opportunity to go to the Annual Conference and I would also like to thank everyone else who attended the conference and made it so enjoyable.

ROLE ON THE ARTP CONFERENCE 2003 !!!

ARTP CONFERENCE JANUARY 17th - 19th 2002.
HELD AT THE BLACKPOOL HILTON

Bursary Article by Jenny Iosson, Battle Hospital, Reading

The Conference was preceded on Thursday morning January 17th with the Heads of Department Meeting. Brendan Cooper (Chairman, ARTP) welcomed everybody and then reviewed the two ARTP Departmental Surveys - one carried out in 1999 and a second one conducted over the phone this year. One worrying statistic was that there were fewer younger staff coming into the profession and staying in it. Keith Butterfield (ARTP Representative, RCCP) then presented some of the ideas that the working group had come up with, which should form the basis for the proposed accreditation of Lung Function Laboratories. These ideas were very far ranging and gave us much food for thought as well as inducing rising panic! He then went on to outline the plans for a network of regional groups to include all laboratories. The groups would meet on a fairly regular basis and report back to the ARTP Executive. Hopefully the regional groups would be aligned to the new NHS groups. Sue Hill (Chair, RCCP) updated us on National Occupational Standards and Brendan returned and explained the setting up of a College structure for Education and Training hopefully to be in place very soon. The morning session finished with a progress report on State Registration and the very poor showing by ARTP Members. So far only 10% had acquired Voluntary Registered status. Throughout the Conference, Sue continued to stress how important it was that as many members as possible fill in and return the Registration forms. This session gave us much to think about and also made us realise how much time and effort members of the executive were committing on behalf of the ordinary ARTP members to raise the profile and professionalism of lung function technicians and to improve standards in the laboratory.

After a brisk buffet lunch we assembled again for the Manufacturers' Workshops. This was another first for an Annual Conference. Each manufacturer, Ferraris Medical, Beaver Medical and Vyasis briefly introduced themselves and their team and then gave a 30 minute presentation on their company and their latest products. This was followed by a talk entitled MOST – Management of Sleep Therapy – given by Medic-Aid. This sounded as though it would be the answer to all Sleep Technicians' prayers. A Company taking over all the non-clinical management of patients on CPAP. Wonderful! All we have to do is persuade the powers that be that it will be cost effective! A great idea!

Registration for the conference followed and proceedings began in earnest with a welcome and introduction by Brendan Cooper who then introduced the Keynote Speaker, Dr Brendan Madden (St. George's Hospital, London). He gave an excellent talk on the state of lung transplantation today; the assessment of patients for transplant both medically and psychologically; the problems encountered afterwards and the important role of lung function testing before and after the transplant. He concluded by looking at the future, of the shortage of donors and the possible use of transgenic pigs. The opening of the Manufacturers' Exhibition and Reception followed this. There was plenty to see – some 26 stands – and to eat and drink courtesy of Medic-Aid. Then to bed for some of the exhausted delegates while others set of to enjoy the best that Blackpool had to offer.

The first session on Friday was entitled Spirometry. Brendan Cooper talked about the equipment available and the differences between them; the types of flow heads; the rigorous testing by some manufacturers and the limitations of flow measurement - when does a blow end? He stressed the clinical importance of spirometry and that it is imperative that all nurses practising spirometry should undergo the 2 day spirometry course. Trefor Watts then spoke about the provision of a spirometry service by the hospital with patients having direct access, or should it be provided by GP's in their practices or be available in outreach clinics at specified locations? He then outlined the pros and cons for each option and spoke of a pilot project in Walsall, which had proved to be very efficient and cost effective. Speaking along similar lines, Adrian Kendrick (Bristol) spoke of a direct access scheme running very successfully at Bristol Royal Infirmary for the past 16 years.

After a coffee break the second session, on major lung diseases began with a talk by Mr Marzouk (Heartlands Hospital) on Lung Cancer and the options for treatment. With screening and early detection plus good lung function tests the success rate could be much higher. Dr Rob Angus (Liverpool) then spoke of the effects of COPD in all aspects of life. And that by 2020 it would be the 5th most common cause of death. Dr Andy Jones (Manchester) followed with a very encouraging and optimistic review of Cystic Fibrosis. The multidisciplinary care that patients now receive means many more have survived into adulthood and have a good quality of life. Gene therapy so far has failed to live up to expectations and it still seems as though a cure may be some years off. It was then time for lunch or, for those who had signed up, to attend one of the three lunchtime workshops. I attended the one on Smoking Cessation given by Dr David Leather who works for GlaxoSmithKline, the manufacturers of Zyban. He briefly outlined the problems associated with smoking, the health issues (approximately 120,000 deaths per year) and of the cost to the NHS (£1.7 billion per year) and that nicotine has a higher addiction index than heroin or cocaine. He emphasised our role in telling people to give up (apparently smokers are more likely to stop smoking if told to by a "medical person!"). He explained that Zyban works by restoring the natural biochemical balance of the brain. We ate our lunch during these talks and then it was straight back for the afternoon plenary session on Assessing Reversibility. Sue Hill spoke first on the Bronchodilator Response; something we are all familiar with but had we realised the pitfalls in the measurements we take and the way we express the results? Should we be looking at an improvement in exercise capacity; and should we be using body plethysmography? Next Joanne Shakespeare (Birmingham) talked on IOS. Are we any nearer global usage? My reaction was what is IOS? It stands for Impulse Oscillometry and is a technique used routinely in many countries to assess upper airway obstruction and airflow obstruction, small airway function and in bronchial challenge testing. I think it may be some time before I have a chance to use it. The session ended with a thoroughly amusing and informative talk on R INT by Pedr Bridge. R INT

is an interrupter technique for measuring airway resistance in pre-school children. But even Mr Bridge questioned what R INT was and doubted whether it would capture the minds and hearts of lung function technicians and be used routinely in laboratories. Then it was time for tea and a stretch of the legs before the next afternoon session. Dr Adrian Kendrick reviewed the use of the relatively new auto titrating CPAP machines. Could they eliminate the need for overnight trials in the sleep labs? After all most people sleep best in their own bed; and they supply the correct pressure by removing the highs and the lows, They are especially useful for measuring compliance of patients. However a double blind trial of fixed pressure and auto titrating machines found no difference in the total number of hours a patient spent using the CPAP machines and concluded that they were only really useful for a minority of patients. The single most important factor was the correct fitting of the mask and determination of the correct pressure during an overnight stay. Melissa Hack (Newport) followed with a fascinating talk on Driving and OSA; a very topical subject following several trials of drivers who had been involved in crashes caused by falling asleep at the wheel. OSA patients did poorly in 3 simulated driving tests. In a double blind trial OSA patients using CPAP (for more than 4 hours) improved dramatically on the same tests. Using similar tests it was shown with shift workers, that 24hours-sleep deprivation led to poor test results. Melissa deserved the award for "carrying on in the face of adversity". She had to contend with back to front slides (which the audio technician only corrected after 3 attempts); the testing of the fire alarms in the hotel, and a blank videotape. Nothing seemed to disconcert her! Congratulations. Finally Dr Martin Allen reviewed Sleep Services in the UK and concluded that the system was very underfunded and disorganised, with wide variations in the services supplied; that the referral rate was poor and overall knowledge of sleep disorders was lacking.

The afternoon ended with the Sue Hazard Memorial Lecture. Brendan Cooper was in the chair and began with a very moving tribute to Sue, a colleague and a very good friend of those who worked with her at Nottingham City Hospital, who sadly died from motor neurone disease in 2001. He then introduced Dr William Kinnear (Nottingham) who spoke of the devastating effects the disease has on the respiratory system. It had been a very intensive day with very little time to get that "breath of fresh air" on the Blackpool front but although the delegates were physically weary after all that sitting, they had been mentally inspired and enthused by the quality and content of the various sessions.

The Gala dinner in the evening was very well attended after which presentations were made to Dr J. E. Cotes and Kevin Hogben in recognition of their contribution to respiratory medicine. A special award (the Sue Hazard Award) was presented by Peter Hazard to Sylvia Yarde of Bath Hospital as the most outstanding ARTP Assessment candidate. The after dinner speech was given by Dr Dave Leather who could have a lucrative career as a stand-up comedian - he has missed his vocation in life! And then it was time to party and all the weariness of the day was forgotten as those who can, danced and those who can't talked and drank their way into the next day. ARTP members know how to enjoy themselves!

Saturday, 9.00am and the AGM started with quite a number of empty chairs which were filled slowly as members dragged themselves out of bed and propped their eyes open with matchsticks. The AGM was snappy and to the point and the successful candidates in the ARTP/BTS national assessment and the new Spirometry assessment were awarded their certificates.

The following session was split with a choice between Exercise Physiology or Poster presentations. I chose the latter mainly because I had been very impressed with the number of posters (a total of eleven) displayed in the foyer of the hotel and with the professionalism of their display and wanted to support those who had chosen to do spoken presentations. There were four of these and all the speakers deserve congratulations for the content of the talks and for their confident manner as they spoke.

The last session of the Conference was on Lung Function Laboratory Accreditation, which had been introduced at the Heads of Department Meeting but was now set out before all members. At the moment these were just proposals of the areas to be considered and the extent of the scheme in covering all aspects of running a successful, reliable and safe laboratory. What should be included and what should be left out? For example where do sleep studies fit in? Keith Butterfield followed on by discussing Equipment and Testing and the protocols required to ensure that all labs meet the same high standards. Finally Adrian Kendrick talked about infection control and suggested that we are all getting a bit neurotic about it. The reasonable approach is to take sensible precautions with the majority of patients and special precautions for the minority of special patients. Infection control must be practicable and evidence based and cost effective and be within COSHH and H&S guidelines.

And so an excellent conference came to an end. I am personally grateful to the ARTP for the Bursary that enabled me to attend. The sessions had been packed with information to educate and guide us; to show us where the ARTP is going and make us ready to take on the new challenges of State Registration and Laboratory Accreditation. It had made us aware of the new professionalism in our jobs and encouraged us to be proud to be Clinical Physiologists. Yes there were groans and yes, it would be easier to bury our heads in the sand and hope it all goes away but overall a renewed enthusiasm and optimism. A real breath of fresh air had inspired us. I can't recommend these conferences too highly. You need to be fit to keep up with the pace; there is never a wasted minute but the company is great and the time and effort put in by the committee on our behalf is outstanding. We are very lucky to have people of such high calibre prepared to give so much. So if you have never been to an annual conference, try it next year in Stratford-on-Avon. It will be fun and worthwhile.

ARTP National Conference – Blackpool 2002
ABSTRACTS

Poster 1

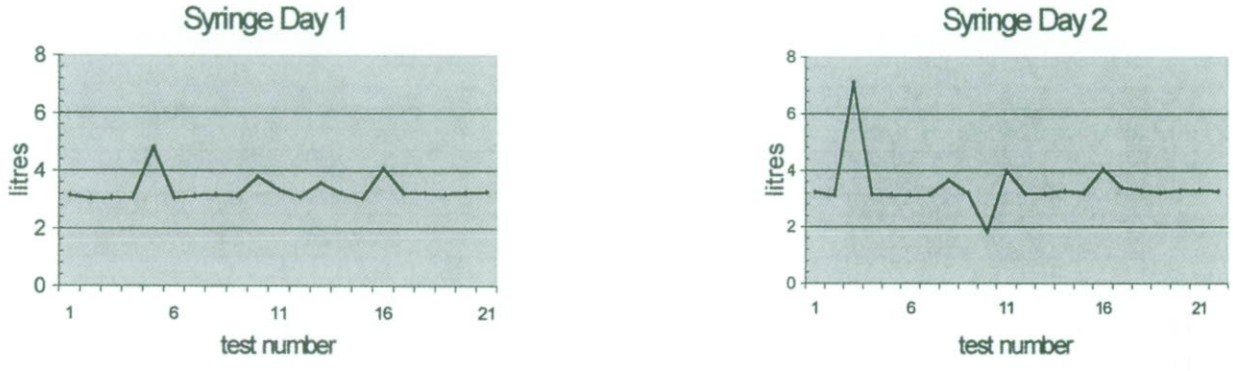
SPIROMETRY QUALITY CONTROL – DOCUMENTATION OF RANDOM VARIABILITY

CG Billings, L Bradshaw, D Fishwick.
Sheffield Occupational and Environmental Lung Injury Centre, Respiratory Function Unit, Royal Hallamshire Hospital, Glossop Road, Sheffield

One of two pneumotachograph spirometers, in repeated use during a single day's testing of subjects in the field, appeared to have some drift in readings during testing. No change in temperature had occurred. As the machines were new, the company was contacted. It was suggested that: a) The flow head may not have been at ambient temperature when calibrated, b) The head required drying after every 10 blows. A two day study was instigated to investigate the problem.

Day 1. Four subjects underwent spirometric testing more than 20 times each under constant conditions. On each occasion, the subject performed three blows. Testing was according to ARTP protocols, excepting the highest result was recorded whether or not it was within 100 mL of the nearest blow. A single operator used a 3L syringe as a regular verification.

Day 2. The procedure was repeated with the spirometer head being dried in between each subject/syringe.



Results demonstrated unacceptable variability for both syringe and subjects on both days. This variability appeared randomly and independently distributed throughout the course of testing. Drying had thus not solved the problem. The study demonstrates the importance of careful monitoring of quality control mechanisms for individual spirometers.

Poster 2

HOW ACCURATE ARE YOUR RESPIRATORY FUNCTION RESULTS? AN AUDIT OF 23 ADULT RESPIRATORY FUNCTION LABORATORIES IN THE WEST MIDLANDS.

AJ Moore, AK Butterfield*, TP Watts*, T Marshall†*
On behalf of the West Midlands Respiratory Managers Group & University of Birmingham†*

An audit of respiratory procedures (dynamic and static lung volumes and transfer factor) has been conducted every 5 years within the West Midlands since 1991. This study represents the third audit undertaken during 2001.

All 23 adult laboratories within the West Midlands volunteered to take part in the audit with 41 items of equipment being involved representing 5 manufacturers. Three physiological controls visited each laboratory and were tested by the hospital's own staff utilising their usual protocols. Deviations from ARTP/BTS guidelines were noted. The following measurements were recorded :-

FVC, FEV_1, PEF, FRC, TLC, TLCO, VA

To monitor the three subjects over the duration of the audit, measurements of dynamic lung volumes on each subject were made at each centre using a portable spirometer - these showed little variability.

Our study showed no significant differences between subjects or laboratories, but significant differences between manufacturers for the following parameters :-

Parameter	FEV_1	FVC	PEF	VA
p value	0.020	0.042	< 0.0005	0.001

Our study confirms continued improvement within laboratories since 1996 but highlights statistically significant manufacturer differences that were not identified in the previous audits. Further work is needed to identify reasons for these differences.

Poster 3

BRONCHIAL PROVOCATION TESTING WITH HISTAMINE AND METHACHOLINE - CURRENT UK PRACTICE

Butterfield AK, MJ Cushley
Lung Function Unit, Wordsley Hospital, Stourbridge, West Midlands DY8 5QX

Measurement of airway responsiveness is being carried out increasingly for the diagnosis and assessment of severity of asthma. The European Respiratory Society (Eur. Respir. .1, 1993, 6, Suppl. 16, 53 - 83) and American Thoracic Society (Am. J. Respir. Crit. Care 2000, 161, 309 - 329) have published guidelines for challenge testing.

We carried out a postal survey of 204 respiratory laboratories in the UK (BTS Directory of Laboratories) to assess current practice.

Of 139 (68%) responses 58 laboratories carry out this form of challenge testing (42 histamine, 13 methacholine, 3 both). The median number of tests per laboratory per year was 25 (range 1 - 480) though one laboratory reported that they had not done any challenge tests in the last year. A further 4 laboratories reported their intention to introduce challenge testing in the coming year.

Laboratories vary according to delivery method – tidal breathing 29, dosimeter 20 and bulb 9. Written consent was only obtained in 5 laboratories.

Medical supervision was available during testing in 46 laboratories.

Most departments failed to issue instructions to with-hold medications for the recommended time before testing.

Medication withheld pre-test

ß2 Agonists < 8 hrs	31 (53%)
Anticholinergics < 12 hrs	42 (72%)
Oral Bronchodilators < 12 hrs	30 (52%)
Antihistamines < 72 hrs	42 (72%)

In conclusion, there is considerable variation in bronchial challenge testing in UK laboratories. Testing could be standardized and quality control assessed by the development of BTS/ARTP guidelines, or more widespread adoption of existing ERS guidelines.

Poster 4

INTER-LABORATORY VARIABILITY IN FIFTEEN DUBLIN RESPIRATORY LABORATORIES

Geraldine Lawless, Michele Agnew
Association of Respiratory Technicians of Ireland (ARTI), St Vincent's University Hospital, Elm Park, Dublin 4

We compared results from two experienced healthy subjects studied in 15 Dublin respiratory laboratories under normal clinical conditions.

We also compared testing procedures and quality assurance programs to confirm if the recommended standardised protocols were in place. All laboratories surveyed adhere to the 1993 ERS guidelines except two laboratories reporting the best rather than the mean DLCO and incorrect predicted values affecting spirometry by reducing the % predicted by 7% and increasing the DLCO % predicted by 15%. Only 50% regularly test biological controls and none have established procedures for utilising known volume devices. Historically the co-efficient of variation (CV) has been used to determine inter-laboratory variability in pulmonary function testing. Most parameters should be ≤ 5%. We obtained CV values of between 4.5 – 5.7% for FEV_1 and FVC compared with 2.7 – 4.8%. Results for DLCO of 8.4 and 10.2% are consistent with the range of 8.2 – 12.7% found in the literature. But TLC values of 7.9 – 9.9% and FRC values of 17.8 – 19.7% compare poorly with previous study ranges of 5 – 5.7% and 5.8 – 8.8%. Large variability means that clinically important differences could exist between the laboratories.

In conclusion our study demonstrates the need to introduce a standardised QA program.

Poster 5

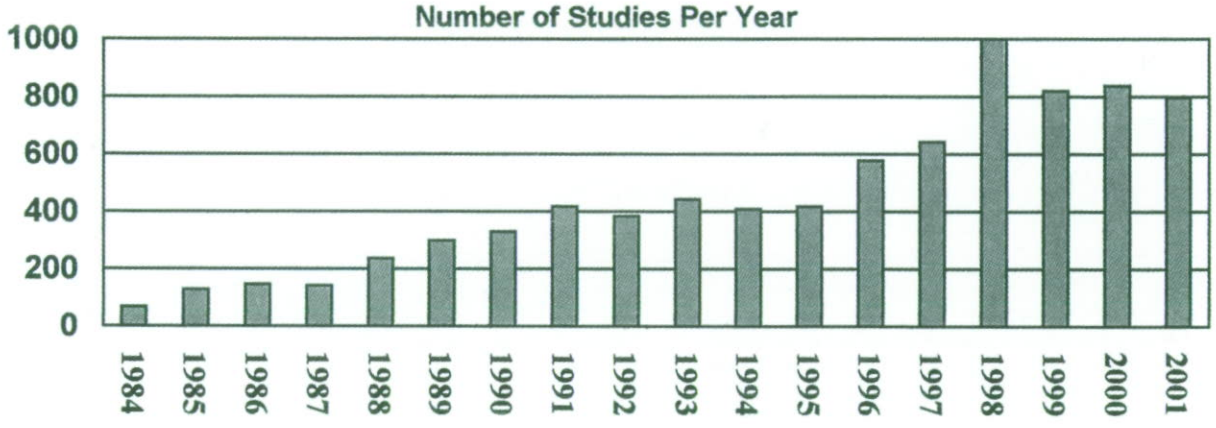
GP OPEN ACCESS SPIROMETRY SERVICE – 16 YEARS ON

D Smith, Crocker L, Laszlo G, Kendrick AH
Department of Respiratory Medicine, Bristol Royal Infirmary, Bristol, England

In 1984, after the closure of the Central Chest we started the GP Open Access Spirometry service to deal with the likely increased demand on medical outpatient services. This is open to all GP's in Avon. Patients attend from 09:30 to 11:30, Mon to Fri without an appointment. A senior ATO completes a history questionnaire and performs FEV_1, FVC and VC pre and post ß2-agonist via spacer device. A report is sent to the GP with advice on future management, if appropriate.

From mid-1984 to Sept 2001, 7875 studies were carried out, referred from about 150 GP's and covers the age range of 6 to 94 yrs. There was a significant increase in referrals in 1998 after publication of the COPD guidelines (Kendrick et al, Thorax 1998; 53 (Suppl 4), A85).

Of those assessed, about 15% are referred onto the hospital medical outpatient clinics for further investigation and advice on management.



This service continues to thrive despite many surgeries having their own spirometer. Few though have the skilled staff or the time to assess patients more locally. The costs of providing this service are low, but it does account for about 25% of our total service provision. This however must be balanced against the reduction in the potential number of referrals to medical outpatient clinics. Until skilled staff are employed within GP surgeries, this is the only dedicated spirometry service for GP's within Avon.

Poster 6

THE USE OF AN INCREMENTAL SHUTTLE WALKING TEST IN A PULMONARY HYPERTENSION CLINIC

JC Waterhouse, JL Phillips, N Jenkins and DG Kiely
Respiratory Function Unit, Royal Hallamshire Hospital, Sheffield

The incremental shuttle-walking test (mostly without supplemental oxygen) is used in this clinic as a primary outcome measure for the evaluation of treatment regimens, and is an important factor in promoting change in therapy. Distance walked breathing air is what medical staff tend to use in the decision making process, whereas there is more information available from concomitant pulse oximetry recorded continuously using the Minolta Pulsox 3i.

We retrospectively analysed 531 walking tests performed by 178 different patients. On 28/531 occasions there was not a good enough signal to analyse.

	Mean	SD
SaO2 at start	87.5	9.5
Lowest SaO2 (nadir)	82.8	13.2
Heart rate at start	83.6	18.1
Highest heart rate	119.4	25.3
Distance walked (m)	254.7	184.0

Our results demonstrate impaired exercise capacity in patients with pulmonary hypertension. In addition to heart rate increases ($p<0.0001$), we observed a significant ($p<0.0001$) fall in SaO2. More research is needed to see if the physiological changes can be used in addition to distance walked to refine the decision making process. Despite the very low starting and nadir saturations there were no adverse events.

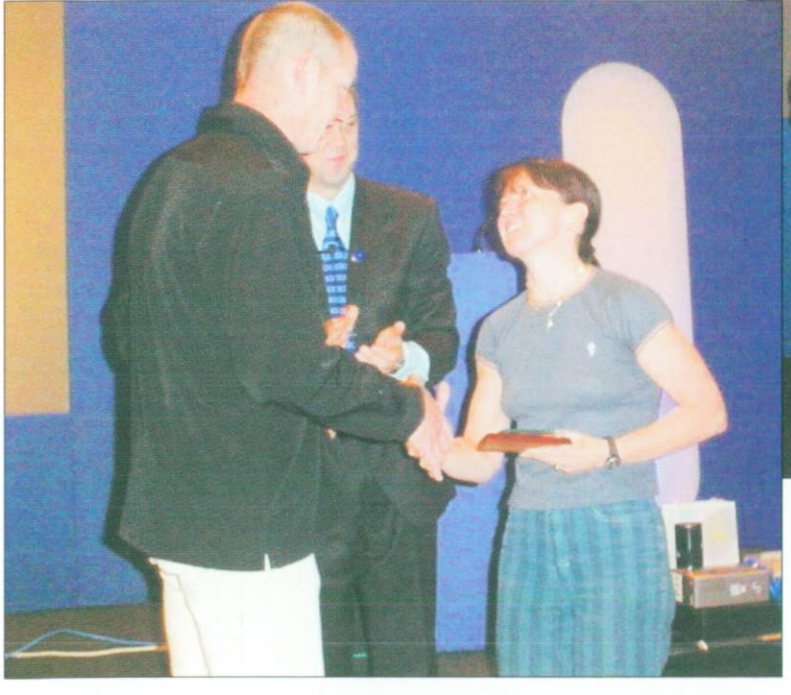
In conclusion: The shuttle-walking test can safely be performed in this group of hypoxaemic patients.

Old Hat and Cotes
Presentation to Dr J Cotes

Manufacturer's Exhibition

or ..... Chairman receives certificate for Services to Alcohol

Presentation of the Sue Hazard Award



Vapourised Executive members .....
Police suspect alien abduction.

Crowds gather on the seafront for "A breath of fresh air".

Treasurer demonstrates Patient Encouragement technique for obtaining maximal FVC.

Chris Baxter with Beaver .....colleague.

Saturday night Clayton.

No. It doesn't matter how many times I read it .....
It still makes no sense.

"And in reverse order!"

The naked Executive Committee Cabaret caught everyone's attention!

Watts yours?

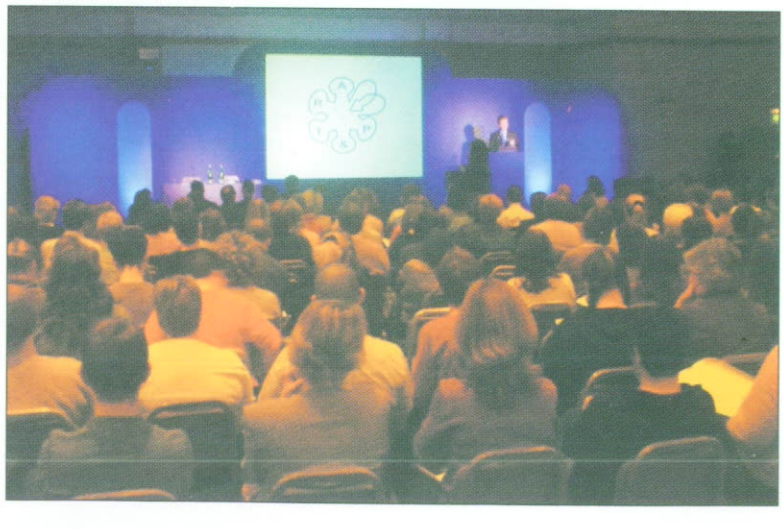
Sue Hill leads communal singing (from the same hymn sheet).

"Brendan, you still don't look young in it".

Live on camera: The Hogben Shuffle!

Dr Dave Leather entertains "Just like that".

The mass hypnotism of the membership was beginning to work.



Poster 7

DEVELOPMENT OF AN ELECTRONIC DATABASE FOR ANALYSIS OF HEALTH STATUS USING THE SHORT-FORM 36 HEALTH SURVEY (SF36)

*Proctor AR *Stevens VG and Waterhouse JC – Respiratory Function Unit and *Medical Physics, Royal Hallamshire Hospital, Sheffield.*

The SF36 is a widely used generic measure of subjective health status that assesses Quality of Life (QoL) in 9 dimensions. It is a self-fill questionnaire that is quick and easy to administer. Scoring the SF36 is more complex. Response scores are summed for their domain and transformed onto a scale from 0 to 100. Manual scoring is laborious and prone to error. We hypothesised that an electronic database where data from the manual forms could be entered and automatically scored would reduce errors and be time-efficient.

Time taken to input data onto the database and score it was a mean of 1m 56s. Manual scoring by an experienced SF36 user took 3m 36s and 7m 23s for an inexperienced user. The error rate was 4% for electronic entry and 8% for manual entry.

Domain scores may be generated by interpolation if there are some missing responses, making more use of the available data (Ref). Interpolation adds to the time burden of manual methods but is done automatically by the database.

Electronic scoring is time-efficient, accurate and allows easy verification of data entry.

(Ref) Ware JE, Snow KK, Kosinski M, Gandek B (1993) SF-36 Health Survey: Manual and Interpretation guide. Boston, Massachusetts: The Health Institute. New England Medical Centre.

Poster 8

RELATIONSHIP OF DYNAMIC LUNG VOLUMES TO EXHALED NITRIC OXIDE AND IMPULSE OSCILLOMETRY IN CYSTIC FIBROSIS

L Crocker, N Jarad, AH Kendrick – Adult Cystic Fibrosis Unit, Department of Respiratory Medicine, Bristol Royal Infirmary, Bristol

Impulse oscillometry (IOS: Jaeger) and exhaled nitric oxide (eNO) are simple, rapid, non-invasive methods of assessing airway function and airway inflammation respectively, and unlike conventional spirometry require little patient co-operation.

Aim: To identify the relationship between central resistance at 5Hz (R_5), peripheral reactance at 5Hz (X_5), eNO and the 1s forced expiratory volume (FEV_1) obtained from a forced vital capacity manoeuvre.

Methods: Measurements were made in the upright sitting position. R_5 and X_5 were obtained during resting tidal breathing over a 30s recording period. eNO was obtained using a relaxed maximal exhalation and analysed continuously over the vital capacity manoeuvre (chemoluminescence; Logan Research, UK). FEV_1 was obtained using a wedge-bellows spirometer. Data are presented as mean (range) and relationships between FEV_1, R_5, X_5 and eNO obtained using regression analysis. Ethics approval was obtained.

Results: 34 cystic fibrosis patients, aged 16 - 39 yr were studied and were each studied on one or more occasions. FEV_1 was 2.3 (0.73 - 3.85)*l*, R_5 was 0.48 (0.03 - 0.83) $kPa.l^{-1}.s$, X_5 was -0.21 (-0.69 - +0.16) $kPa.l^{-1}.s$ and eNO (n = 26) was 5.8 (1.0 - 22.7) ppb. There were significant ($p<0.001$) relationships between the FEV_1 and R_5: $FEV_1 = 3.30 - 2.03R_5$, $r^2 = 0.27$: X5: $FEV_1 = 3.11 + 3.66X_5$, $r^2 = 0.49$. For eNO, significant relationships were obtained ($p < 0.05$) between R_5: $eNO = 12.3 - 13.1R_5$, $r^2 = 0.18$ and X_5: $eNO = 9.05 + 13.9X_5$, $r^2 = 0.14$. There was no significant relationship between eNO and FEV_1.

Conclusion: In cystic fibrosis patients IOS indices and eNO are 1) simple to obtain regardless of disease severity; 2) sensitive to changes in lung function; and 3) provide useful additional information to the conventional index of FEV_1.

Poster 9

SINGLE BREATH DIFFUSION BY FAST GAS ANALYSIS DO WE UNDERSTAND IT?

Kevin M Hogben
Technical Manager – Rainham Kent.

Fast gas analysis allows the sample to be taken and analysed directly through the exhalation without need of bag collection.

The technique follows the same rules as with bag collection, a discard volume greater than the subject's anatomical deadspace and the instrument combined deadspace must be achieved for valid measurement. A sample volume sufficient for the analysers to respond and reach stability.

With systems that display gases throughout the exhalation cycle, it is important to note that the gas displayed is offset from "real-time" by the transit time of the gases to the analysers and response time of the system, therefore any adjustment to the sample point must be made on the volume axis not the gas traces.

In summary, system and subject deadspace can be calculated, if the gas trace is lagging this volume then the delay is due to a blocked sample line or similar problem, after this period the sample point should not exceed 1 litre to correlate with standard methodology.

Poster 10

SINGLE BREATH DIFFUSION IS 90% VC ACHIEVABLE

Kevin M Hogben
Technical Manager, Rainham Kent.

To qualify this limit an understanding of the instrument in use and the conditions of the volumes presented is essential.

Computerised systems present the measured VC (Forced or Relaxed) as corrected to BTPS conditions, typically this increases the volume from ATPD conditions 9 - 12%.

Traditional systems measuring the volume on a kymograph would be to achieve 90% VC measured ATPD or ATPS. A significant reason is that although the transducer (Spirometer) is calibrated to an ATPD or ATPS scale the subject inspiration is direct from a compressed gas cylinder.

The inspired gas will actually be 0% humidity and cold, this would suggest STPD conditions, if a demand valve is employed such would be an assumption. Inspiring the mixture measured on an ATPD or ATPS scale would only allow up to 90% of VC at ATPD or ATPS.

When checking the inspired volume against a VC at BTPS conditions the subject performance may not exceed 80%.

In summary the important criteria are to ensure the subject exhales to RV and thereafter a maximal effort is obtained before the apnoea (breath hold) point. Then volume inspired at BTPS conditions should be compared to be within 90% of the VC at BTPS conditions.

Poster 11

DO SINGLE-BREATH TRANSFER FACTOR MEASUREMENTS CHANGE IN RESPONSE TO NEBULISED BRONCHODILATOR THERAPY?

ME Bennett, DD Vara, MDL Morgan.
Respiratory Physiology Unit, Glenfield Hospital, Groby Road, Leicester. LE3 9QP.

Transfer factor measurements are widely used as part of clinical lung function testing, they are considered to be one of the most important measurements made. Despite this there are a limited number of studies which have investigated the changes that may occur in TLCO (transfer of the lung for carbon monoxide) measurements after bronchodilation.

In this study single-breath transfer factor measurements were performed before and after 2.5mg Salbutamol on 38 patient-volunteers. Of these, 12 had normal lung function, 7 mild COPD (chronic obstructive pulmonary disease) (FEV_1 (forced expiratory volume in 1 second) 60 - 80% predicted), 10 moderate COPD (FEV_1 40 - 60% predicted) and 10 severe COPD (FEV_1 < 40% predicted).

Of the above groups 10 subjects had a significant response to Salbutamol (either FEV_1 increased from mean 1.20 ± 0.45 to mean 1.42 ± 0.51 or FVC increased from mean 2.66 ± 0.72 to mean 3.23 ± 0.80). There was no significant differences in TLCO, VA (alveolar volume) or KCO (transfer coefficient) measurements ($p < 0.05$) in all groups. There was no change in oxygen saturations although there was an increase in the subjects' heart rate ($p = 0.021$).

The study suggests that TLCO measurements can be performed either before or after bronchodilation with no significant changes to the results.

Spoken Presentation 1

SPECIFIC AIRWAY RESISTANCE IN THREE YEAR-OLD CHILDREN AT HIGH, MEDIUM AND LOW RISK OF ATOPY WHO HAVE NOT WHEEZED

L Lowe, C Murray, A Custovic, BM Simpson, P Kissen, A Woodcock
NAC Manchester Asthma and Allergy Group, North West Lung Centre, Manchester, UK

Specific airway resistance (sRaw) can be measured in pre-school children who cannot perform standard lung function tests. The aim of this study was to compare sRaw in asymptomatic 3 year-old children with differing risk of atopy. The groups were defined as high risk (both parents atopic), medium risk (one parent atopic) and low risk (neither parent atopic). Parental atopy was determined by skin prick testing to mite, grass, cat, dog. Review of children at age 3 included skin prick testing, a standard respiratory questionnaire administered to parents and measurement of sRaw by plethysmography.

A total of 507 children were studied (mean age 3; range 2.9-3.1 years) of which 309 had never wheezed. sRaw was significantly higher in the high risk group (n=117; GM 1.11, 95% CI 1.06,1.15) compared to the medium risk (n=143; GM 1.01, 95% CI 0.98,1.05), or low risk group (n=49; GM 1.03, 95% CI 0.97,1.10, p=0.002, one way ANOVA). Atopic children had a significantly higher sRaw (n=69; GM 1.13, 95% CI 1.08,1.19) than non-atopic children (n=230; GM 1.03 95% CI 1.00,1.05, p=0.002). Non-atopic children from high-risk families had higher sRaw (GM 1.07 95% CI 1.03,1.12) than the medium risk (GM 0.99, 95% CI 0.96,1.03) or low risk group (GM 1.02, 95% CI 1.04,1.09, p=0.05, one way ANOVA). Multivariate regression analysis shows both risk group, and the child's own atopic status were significant and independent associates of lung function (p=0.027 and p=0.001 respectively) but maternal asthma was not significant (p=0.292).

In conclusion, 3-year-old asymptomatic children with a positive skin prick test have reduced pulmonary function compared with those with no atopy, suggesting that atopy is associated with impaired lung function in the absence of respiratory symptoms. Furthermore, non-atopic asymptomatic children from high-risk families have impaired lung function at age 3 compared to children at lower risk.

Spoken Presentation 2

KOKO THE CLOWN MEETS NELLIE THE ELEPHANT?: KOKO VERSUS VITALOGRAPH

RE Anthony, PM Dennis, J Christian, PR Smith, BG Cooper
Lung Function Department, Nottingham City Hospital, Nottingham NG5 1PB.

The aim of this study was to compare the KoKo spirometer with the Vitalograph wedge bellows spirometer in routine clinical testing.

Methods: We recorded routine spirometric measurements using (i) a wedge bellows [V] (Model R, Vitalograph, Bucks, UK) and using (ii) a pneumotachograph spirometer [KK] (PDS, Ferraris, UK) on 50 consecutive patients attending the lung function department at Nottingham City Hospital. Measurements of FEV1, FVC and VC were recorded, in accordance with the manufacturers' instructions, to ARTP/BTS standards in a randomised order by trained operators. Analysis used 2-tailed, paired Student's t-test.

Results: There were small differences in FEV1, FVC and VC measured between all the devices (see Table). However, most of these differences were between 0 & 200 mls and would be expected between spirometers. The difference in FVC between the KK and V is about 200 mls and is at the extreme limit of acceptance.

	KoKo	Vitalograph	p value	Diff KoKo - Vitalograph
FEV1	2.39 ± 0.95	2.35 ± 0.94	***	-0.004 ± 0.110
FVC	3.44 ± 1.06	3.26 ± 1.08	***	-0.199 ± 0.247
VC	3.56 ± 1.07	3.38 ± 1.18	NS	-0.139 ± 0.182
Expressed in litres as Mean ± s.d.; ***= p< 0.001; NS = Not significant.				

Conclusion: The KoKo spirometer measured FEV1, FVC and VC within 200mls of the Vitalograph on average and can be deemed to be acceptable for clinical use.

Spoken Presentation 3

THE MULTIDIMENSIONAL FATIGUE INVENTORY (MFI-20) IN OBSTRUCTIVE SLEEP APNOEA (OSA): RELATIONSHIP TO SF-36 AND EPWORTH SLEEPINESS SCORE (ESS)

F Buchanan, A Harper, N Wiltshire, JR Catterall, AH Kendrick
Sleep Unit, Department of Respiratory Medicine, Bristol Royal Infirmary, Bristol, England

The MFI-20 has been used to assess fatigue in patients with cancer and Chronic Fatigue Syndrome (Smets et al, J Psychosomatic Res 1995; 39: 315 - 325 & Br J Cancer 1996; 73: 241 - 245) and deals with 5 dimensions of fatigue: General Fatigue (GF), Physical Fatigue (PF), Reduced Activity (RA), Reduced Motivation (RM) and Mental Fatigue (MF). Scores for each dimension are from 4 to 20, the higher the score the more severe the subjective fatigue.

Aim: To determine the levels of subjective fatigue and to compare these with data from the ESS and the dimensions of the SF-36.

Methods: All patients attending the Sleep Unit were given and ESS, SF-36 and MFI-20 as part of our routine clinical assessment of patients with OSA. Data are presented as mean (range).

Results: 137 patients (15F), age 52.9 yr (26 - 83) and Body Mass Index 31.2 $kg.m^{-2}$ (18.8 - 49.3) were included. ESS was 8.3 (0 - 21). For MFI-20 GF was 11.4 (4 - 20), PF 11.1 (4 - 20), RA 9.3 (4 - 20), RM 8.3 (4 - 20) and MF 8.9 (4 - 20). For the SF-36, Physical Functioning was 70.9 (5 - 100), General Health 56.7 (0 - 100), Vitality 54.9 (0 - 100) and Social Functioning 79.9 (0 - 100). All dimensions of the MFI-20 were positively correlated with the ESS ($r > 0.28$, $p < 0.001$) and negatively correlated with the SF-36 dimensions ($r < -0.30$), in particular with the SF-36 Vitality score ($r < -0.61$).

MFI-20 GF = 7.14 + 0.517 Epworth Score r = 0.58
MFI-20 MF = 4.60 + 0.537 Epworth Score r = 0.59
MFI-20 GF = 19.5 - 0.147 SF-36 Vitality r = -0.81
MFI-20 PF = 17.7 - 0.119 SF-36 Vitality r = -0.66

Using a cut-off of 10 for each MFI-20 dimension and comparing these to and ESS of 0 – 10, 39/92 patients had a MFI-20 GH >10 and 42/99 had an MFI-20 PH > 10 indicating significant general and physical fatigue in the absence of significant daytime hypersomnolence.

Conclusion: The MFI-20 is a simple self-completion questionnaire that provides useful additional information to that obtained from the ESS and the SF-36 and separates out sleepiness and fatigue.

Spoken Presentation 4

CPAP RESULTS FROM A HOME AND OUTPATIENT BASED SLEEP SERVICE

MK Johnson[1], R Carter[1], J Mills[2], A Nicol[1], RB Paton[1], SW Banham[1]
Departments of Respiratory Medicine[1] and Clinical Audit[2], Glasgow Royal Infirmary

Recent studies have established CPAP as an effective treatment in obstructive sleep apnoea. The majority of subjects in these trials were diagnosed by hospital overnight sleep studies with CPAP prescription determined in a similar fashion. By contrast, resource limitations have meant that our sleep service has shifted to a policy of home sleep studies and day case CPAP initiation. The generalisability of the results of the CPAP trials to our population is assumed but not proven. To investigate this assumption, we have conducted a postal questionnaire and case note review of our CPAP users.

Between 1990 and 2000, 220 patients were commenced on CPAP of whom 169 were still using it (duration 25 months (12-43)*); 10 had died, 4 moved away, 18 defaulted, 15 had CPAP withdrawn and 4 switched to BiPAP. These 220 patients (age 51 years (42-58), BMI 35kg/m^2 (31-40), collar size 17.5" (17-18)) had an apnoea/hypopnoea index (AHI) of 31events/hr (16-51) and an Epworth Sleepiness Scale (ESS) score of 14 (10-18) at diagnosis. There was a mean reduction in ESS score of 5.0 (95% CI 3.5-6.5) after establishing CPAP therapy. Compliance (by hour meter) was 5.3hrs/night (3.1-6.6) with 67% of patients using >3.7hrs/night. The most common complication was nasal congestion (28%). Using Kaplan-Meier analysis and the log rank test, we assessed which of sex, age, BMI, ESS score, AHI and compliance, predicted continued use of CPAP. Of these variables, BMI<30kg/m^2, AHI<30events/hr and CPAP use<2hrs/night at first clinic visit were associated with a higher probability of discontinuing CPAP.

Compared to results from a hospital based sleep service (McArdle N et al. AJRCCM 1999; 159:1108-14), our CPAP population are more symptomatic at baseline, less compliant with CPAP therapy but are more likely to use it long-term. Although statistically significant, the differences seen are small in clinical terms. Also, the factors that we identified predicting continued CPAP usage would suggest that our service is delivering effective treatment.

*Figures indicated are median (inter-quartile range).

HEADS OF DEPARTMENT MEETING 17th JANUARY 2002, AT HILTON HOTEL, BLACKPOOL

Approximately 125 Heads of Department (H of D) attended the meeting, which preceded the ARTP Annual Conference. Brendan Cooper, ARTP Chairman, opened the meeting by thanking those present for their attendance stating that their feedback following the presentations would be welcomed, as it is vital that H of D are involved with the proposed national processes. Alternative suggestions should be voiced or debated in this important arena such that planning could be developed, which included the thoughts and support of the H of D in the future.

The presentation **The ARTP Departmental Surveys** followed. This data had been obtained from a questionnaire, which was sent to all Lung Function Laboratories in Autumn 2000, and from a telephone survey made by Jackie Hutchinson and her team over the last 2-3 months. In the 2000 survey 158 respondents returned the questionnaires, which was 58% of those surveyed.

In the recent survey 204 hospitals had responded positively (99%) from 206 initial telephone contacts.

The results obtained showed:

- The average size of the hospitals surveyed was approximately 600 beds
- Approximately half of the respondents were sole respiratory departments with approximately quarter being cardio-respiratory and the remainder being other types (e.g. Medical Physics,) or they did not specify type
- The workload had constantly increased in all departments
- The average number of staff per department was 3 to 4, but some had only 1 member of staff with others having very large numbers of staff
- The ratio of respiratory staff to consultants currently bears no relationship
- A marked difference from the previous survey done, showed a pronounced loss of young trained staff
- Over the last 5 years there has been an increased trend of the use of the Body Box, from 25- 45 % of departments using this method for Lung Volume measurements
- An increase in arterial blood gases testing
- An increase in full cardio-respiratory exercise testing, with a decrease in shuttle walk and the 6 min walk
- 57% of centres providing some type of sleep assessments, which was a slight decrease on previous surveys but more parameters were now being assessed during sleep
- A decrease in overnight specialist sleep centres
- The level of grades performing tests was more promising than previous surveys, with ATO's and MTO's performing basic testing and higher grade MTOs performing the more specialist tests and services such as sleep and exercise testing.

In conclusion the main points obtained included increase in workload of approximately 2% per annum; better grading of staff but there are still some departments were tests were being performed by inappropriate lower grades of staff; most departments are headed by grade MTO 4 or 5, which was previously held by MTO3 grades; 60% of departments have between 1 to 4 members of staff; respiratory departments tend to have less staff than similar sized cardiology departments; decrease in younger members of staff working in respiratory; helium dilution still remains the most popular test performed for TLC measurements.

From preliminary data obtained it would appear that the most appropriate numbers of staff to consultants is probably 1.5 or 2.0 to every consultant. Though further analysis needs to be completed. Thanks go to Jackie Hutchinson and her team for undertaking the telephone contact questionnaire survey on behalf of the ARTP Executive.

Questions were then taken from the audience:

1. Judith Russell, Conquest Hospital, St. Leonard's on Sea, asked for clarification regarding the ratio of staff to consultants and wanted to know if the ratio was part time or whole time equivalent (WTE). Brendan confirmed that the figures were based on WTE.
2. Janet Dunford, Middlesex asked for clarification regarding which type of consultants were involved as many referrals came from non-respiratory consultants. Brendan acknowledged this important point and confirmed that this estimate was based on the number of respiratory consultants only.
3. Melissa Hack, BTS Member, asked whether this survey had been related to any European data for comparison. Brendan confirmed that it had not and Melissa recommended that it might help when presenting the findings in the future.
4. Judith Waterhouse, Sheffield Central Hospitals commented that if 97% of departments performed basic Spirometry why didn't the other 3%? Brendan explained that some hospitals have dedicated nurses that perform all basic Spirometry.
5. Val Boswell, South Mead Hospital Bristol, asked whether limited space allocation of lung function departments would be a restricting factor, with respect to accommodation of ideal staff ratios. Brendan acknowledged that space could be a limiting factor.

Brendan thanked all those who had asked questions and reiterated that any further comments on this matter should be forwarded to him. He then handed over to Keith Butterfield, Wordsley Hospital, for his presentation on **Laboratory Accreditation**.

Keith opened his presentation by stating that the contents of the presentation were open to discussion and debate and had not been finalised. Comments during the meeting &/or at a later date would be most welcome.

Keith explained that it was probably best defined as services accreditation rather than laboratory accreditation as we would need to encompass all the work performed as a whole by each department. We would clearly need to measure key issues against approved, defined and standardised criteria of acceptability, which would include:

- Staffing. Head of department should ideally be state registered. Other staff members should be state registered practitioners or have recognised evidence of competence to practice with CPD.
- Training & CPD of staff should be in place
- Tests performed by the department should include written polices for core services and extended services
- Review of reporting of tests and verification of same
- Equipment used by the department and its maintenance/servicing arrangements
- Quality Control and Assurance polices and infection control procedures
- Review of overall patient experience in the department
- Health & Safety adherence

Keith explained that the accreditation validity duration, needed to be agreed, but 3 years seemed a practical time span. Discussions were needed to define levels of accreditation, provisional accreditation with recommendations, and the total cost charged to the department for the accreditation process. The H of D were asked for volunteers to help in producing criteria for assessment of laboratories and to help determine the costing of resources required by departments to meet accreditation, which would also need to be evaluated. Volunteers should contact Keith or Brendan.

Questions were then taken from the audience:

1. Simon Ward, Brompton Hospital London, asked about the appropriateness of the assessors who would visit the laboratories, which would probably include a BTS clinical representative. Keith clarified that it was important that we included the BTS from the start of the project and therefore a clinical assessor would be included, but that the technical assessor would probably be the lead assessor.

2. Trefor Watts asked whether the current Peer Review Process by the BTS would have any bearing on accreditation of laboratories and also where departments could obtain allocated funds for the assessment process. Keith confirmed that the accreditation costs would probably have to be found from the laboratory's budget, which is why charges will need to be kept to a minimal level. If the BTS were involved they hopefully would help and support the need for departments to obtain this required revenue. Brendan thanked Trefor for his comments and confirmed that it was important the ARTP became more involved with the BTS Peer Review Process.

3. Melissa Hack, (BTS member) stated that it was important that the process included a multi-disciplinary approach, with involvement and decision making from all areas.

4. Alan Moore, Birmingham City Hospital, queried why there was the need to assess some areas such as H&S and patient focused initiatives when there were already statutory provisions in place at most trusts to address this. Keith explained that it was felt that this varied amongst different trusts and an independent assessment on these areas was felt to be appropriate to ensure a uniform standard.

5. Janet Dunford, Middlesex, stated that with respect to this question, this had been her experience regarding infection control, as although there were guidelines in place at her trust they did not fit the criteria for a lung function department and separate guidelines had had to be drawn up.

Keith then moved onto the **ARTP Regional Networking Groups** presentation.

Keith stated that it was important that communication with all respiratory practitioners improved. The email forum has made a considerable impact on communication amongst practitioners, particularly lone practitioners, but it is important that all respiratory practitioners are included in the sharing of information, not just ARTP members. Many regions already have established networking groups, which have functioned successfully for a number of years. The aim of the ARTP regional networking group is to extend this out to all regions such that all departments have access to a group in their region. It is hoped that a "Regional Facilitator" for each group will report to a "Network Coordinator", whose role will be to oversee all these groups and feedback directly to the ARTP executive committee. This would create channels of communication both from ARTP Exec to individual labs and, equally importantly, *vice versa*.

Volunteers are needed from each region who should be H of D (or deputy); show commitment to attendance; take part in surveys; ensure Minutes are kept from the meetings and report quarterly or every six months to the ARTP network coordinator. All H of D willing to take part in this scheme were encouraged to complete a contact list provided or alternatively contact Keith directly. No questions were asked by the audience following this presentation.

After a coffee break, Brendan then introduced Sue Hill, Birmingham Queen Elizabeth Hospital, for her presentation **Update on National Occupational Standards (NOS)**

Sue confirmed that the NOS initiative was a key aspect of the "Making the Change" Strategy for Healthcare Scientists Document (launched in February 2001) and would be completed over the next four years. NOS would have a major impact on the role and function of Health Care Scientists (HCS) and their education strategy. The competence performance in over 40 disciplines would need to be defined such that the role and function would be related to discreet occupational activity. Key functions would need to be identified, defined and broken down into performance level and measurement criteria, assessment criteria with educational and training requirements specified to meet the expected performance. Training manuals and clearly defined syllabuses need to be produced which specify the learning requirements. These standards would need to be in draft form by the end of 2002. Once drafted the framework would need to be piloted, assessed and evaluated by 2004. It is hoped that NOS HCS project will be fully completed and introduced by the spring of 2005 and Volunteers from the audience were requested to take part in a number of developmental workshops and to be involved in piloting the standards within their own departments. The first of these workshops, which would involve all disciplines, would take place on 18th & 19th March 2002.

Sue continued by stating that the NOS initiative will result in clearly defined pathways for skills and knowledge for each discipline's role with standardised progression routes for each of the healthcare science professions. Sue confirmed that she would be meeting John Hutton, Junior Minster for Health in the near future to update him on the progress of NOS.

To conclude Sue stated that the NOS mission was to consolidate the heterogeneous workforce into an identifiable structure within the heath care workforce, which will help secure this important workforce, build and develop it and evaluate its important role, thus increasing the overall profile of health care professionals. NOS will have a positive effect in several ways which include: regulatory provisions, increased specialist training of staff; specified CPD requirements; job design and evaluation; clearly defined career and pay progression pathways; role expansion and integration of core skills into the education and training programmes. The audience were urged to support NOS by becoming active participants in its introduction and development. Volunteers from H of D and from departments wishing to take part in piloting NOS in their department should contact Sue directly or further information can be obtained from the project website: www.noshcs.co.uk. No questions were asked by the audience, following this presentation.

Brendan then presented **The College Structure for Education & Training**

Brendan confirmed that NOS and the advent of voluntary/state registration had highlighted the need to review the present education and training format. He explained that in 2001 an Educational Working Strategic group had been formed and had met to determine what the ARTP needed to do to meet these future requirements. The outcomes were:

- The formation of an **ARTP College**
- The College would consist of 4 Boards:
- 1. **Education and Training board,** (8 representatives). This board would develop the structure for education and training of all respiratory staff
- 2. **Examinations board,** (12 representatives, with 4 subgroups of 2 people working with the main board) All examinations would be formatted and formalised by this group
- 3. **Standards of Practice board** (20 people) this group would standardise competence to practice criteria and liase closely with other professional groups
- 4. **The CPD board** (8 Representatives) this group would be involved with accreditation of all courses and awarding the points scheme for courses.
- The Boards would liase directly with the RCCP and Educational providers

Volunteers are sought from the H of D to become involved with or become members of these boards. H of D should contact Brendan directly if they wish to participate in this development.

Questions were then taken from the audience.

1. Miriam Jackson, Grantham Hospital, Lincs. Asked whether full time employed member of staffs would be needed to work within the ARTP College. Sue Hill confirmed that although the term college was used, it would not be a typical educational college. The process of a college structure would be in used, such that the college would be controlled and run by members who would not be employed directly by the college, but would be employed within the respiratory field.

No further questions were received and so Sue Hill presented the final presentation on **The Path to State Registration**

Sue introduced her presentation by giving the audience a brief background (for further background details refer to www.artp.org.uk news - national issues) on the voluntary/state registration process and the changes of the Council for Professions Supplementary to Medicine, (CPSM) which would become the Health Professionals Council (HPC) from April 2002. Sue explained that the HPC would have greater flexibility for inclusion of new groups for state registration, which hopefully would include all clinical physiologists under the auspices of the Registration Council for Clinical Physiology, i.e. RCCP. Further legislation was required to allow this process to become complete.

The HPC was still in fruition and therefore would still refer to the CPSM rules and regulations over the next year. As it developed 4 statutory boards would emerge, with key roles: registration, education, professional code of conduct and disciplinary procedures/investigations. The key objectives of the HPC would be to reform the ways of our working practice and the structure and function of our roles. A direct link with education was therefore paramount and hence the importance of the ARTP College formation was emphasised.

The RCCP has made important steps in addressing the requirements needed to lobby the HPC for application for registration:

- A voluntary registration structure is in place such that members will, once accepted, simply transfer over to the state registration board;
- A generic code of conduct and disciplinary procedures structure has been formulated for all RCCP members
- The criteria for acceptance including grandfather clauses has been formulated for all professionals under the auspices of RCCP
- The education and training remit is being reviewed such that a generic umbrella of approved education courses with training outcomes and objectives will be produced
- Standards of practice are being reviewed such that clearly defined competences to practice with CPD requirements will be specified for practitioners

Sue stressed the importance of the H of D becoming involved with these initiates and the need to register with the voluntary registration ASAP. Current figures of RCCP members were displayed which highlighted the poor response from respiratory practitioners, which currently stands at 60 active and 18 pending. Total RCCP members currently stand at 612 and therefore only 10% are respiratory practitioners. Sue urged practitioners, to register and stressed that in the near future it may become more difficult for practitioners to register. Additional evidence with a possible viva, particularly from practitioners seeking registration under grandfather clauses may be introduced and the cost for applications may increase considerably. Sue confirmed that it was not mandatory to be a member of a professional body for acceptance onto the voluntary registration board. She also confirmed that an electronic form for applications would be available in the future, but urged members to proceed without delay with their applications. Only 4 practitioners had registered for the Cardio-Respiratory option and views were requested from H of D regarding this issue. Practitioners applying for this modality should be practitioners currently working in both areas and meeting the criteria for both cardio and respiratory. At present a degree course was not available nor had one been formulated for this joint modality and again views were requested from H of D regarding whether this option should be pursued or not.

Sue concluded her presentation by discussing specific points to remember when sending in applications. (See frequently asked questions on the ARTP website: artp.org.uk for a comprehensive list of relevant questions).

Questions were then taken from the audience. These included:

- Gillian Crowe, York, asked for clarification regarding the academic requirements and stated that she had registered as a cardiac practitioner but worked in a joint department. Sue confirmed that she was only registered to practice in cardiology but could still practice in respiratory if she could show evidence of competence to practice in respiratory. Sue confirmed that the criterion for acceptability for registration for all the modalities available, were included in the application forms. Additional information on national issues is currently available and regularly updated on the ARTP website.
- Lesley Lowe, Manchester, asked why graduates had to wait 6 years before applying for registration instead of 4 years? Sue stated that this point would be taken back to the RCCP committee for discussion.

Brendan thanked the audience for their participation and urged H of D to forward any further comments or suggestions to the ARTP Executive Committee. The meeting closed at approximately 1.30pm.

Minutes taken by Jane Caldwell, Honorary Secretary for the ARTP Executive Committee, (without typing or shorthand skills and not being able to hear everything, particularly questions from the audience, (especially with all the coughing) and not being able to see the screen and without any notes from the presenters, Amen!)

MINUTES OF THE ARTP ANNUAL GENERAL MEETING HELD AT THE HILTON HOTEL, BLACKPOOL, 19th JANUARY 2002

Executive members present

Dr Brendan Cooper (BC) Honorary Chairperson
Miss Julie Lloyd, (JL) Honorary Treasurer
Mrs Jane Caldwell, (JC) Honorary Secretary
Dr Sue Hill (SH)
Mr Nigel Clayton (NC)
Mr Keith Butterfield (KB)
Mrs Pat Mitchell (PM)
Mrs Angela Evans (AE)
Dr Adrian Kendrick (AK)
Dr Sue Revill (SR)
Ms Melanie Marshall (MM)
Mr Steve Scholey (SS)
Mrs Jackie Hutchinson (JH) ARTP Administrator

Executive members Apologies for Absence
Mrs Jill Fallen (JF)
Ms Gill Butcher (GB)

Dr Brendan Cooper opened the AGM meeting by welcoming the audience, of approximately 200 delegates, once again to Blackpool. This venue last year had inspired the theme of "Turning the Tide", and the theme a "Breath of Fresh Air" had been chosen this year to reflect the profession's added task of facing the new future of the NHS, making changes, creating a new way forward, whilst shaking off the old ways, but carrying the best traditions and best practice forward.

Brendan continued, stating that 2001 has been a difficult year for many. In March the "Sue Hazard Appeal" achieved its target and the Hazard family were able to fly off to Disneyland Paris for a final holiday together. Unfortunately Sue Hazard (MTO3, Nottingham City Hospital) lost her fight for life in May 2002, but Brendan confirmed that she would not be forgotten in the history of ARTP. Acknowledgement and thanks were expressed to all those who had supported this appeal.

Following the September 11th tragedies it was poignantly acknowledged that this had changed our world in many ways and that we should reflect and remember that our roles are about working with people, internationally, nationally, within our profession and within our hospitals.

From appraisal of last year's Annual Conference at Blackpool, Brendan reported that findings showed: increased delegate attendance; increasing interest from manufacturers; excellent programme content; good organisation and that the participation and social events had been very well received. Thanks were conveyed to those delegates who had returned their appraisal forms, ensuring that the ARTP Executive continued to provide a conference, of quality, which was appropriate to demand.

Executive Committee Report
Confirmation was given that the last year had been a busy and demanding year for the ARTP Executive Committee.

Introductions and acknowledgment was given at this point to all the Executive Committee members: Sue Hill, Julie Lloyd, Jane Caldwell, Pat Mitchell, Adrian Kendrick, Nigel Clayton, Keith Butterfield, Gill Butcher, Angela Evans, Clare Newall, Jill Fallen & Jackie Hutchinson. Specific acknowledgement was expressed to Angela and Jill whom had both overcome serious illness and personal struggles during the last year. Brendan stated that the team would continue to work very hard on behalf of the ARTP, requiring and relying on further support from the membership to help make the changes ahead. Acknowledgement to all the "offers of help" received; in response to our plea last year was given. These people and additional volunteers from this conference would be included in future plans of the Committee's objectives.

Resignations of Executive members since the last AGM meeting, due to increased work pressures and commitments included: Steve Scholey, Melanie Marshall and Sue Revill. Grateful thanks and appreciation on behalf of the ARTP membership to all three executive members were sincerely expressed.

It was noted that the ARTP Committee is becoming a more democratic Executive, reflecting the need to build a network of leading professionals within the ARTP so that communication is open with all the membership.

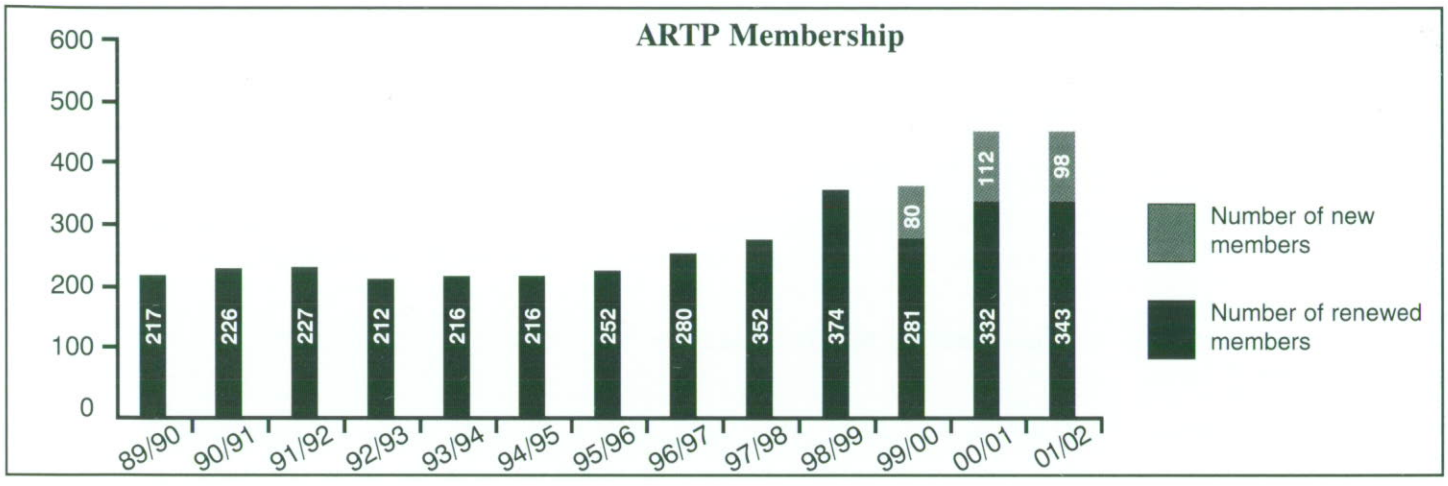
Key areas of ARTP Executive Committee work has been:
Establishment of the Voluntary Register
Organisation of Annual Conferences
Improvement in Financial Position
BTS/ARTP National Assessment Parts 1&2
Objectives for 2002
Reviewing the Structure of ARTP

Brendan then presented specific ARTP reports:

Website Report
It was confirmed that communication with ARTP membership is vital to the success of the association and the ARTP Website has made phenomenal improvements with this aim. The second year of the Website has shown it to become an ever-expanding source of reference material, echoing important news from the ARTP Forum. Membership of the Forum has stabilized at 180 (30% of membership) with about 75 messages per month, with over 1000 messages in a year, (950 of them from Alan Moore!)

Website hits continue to show a wide interest in ARTP information and current topics; Job adverts and ARTP course information are updated regularly and a new "members only" section is intended for later this year. Specific thanks were expressed to Keith Butterfield, ARTP Webmaster, for his sterling efforts in developing and maintaining the Website.

Membership Report



The website has played a big part in the increased membership of the Association. The membership is now 500+, which has more than doubled in the last 8 years. The core membership of renewed members continues to grow year on year. Special thanks go to Steve Scholey for his contribution to increasing the membership, and to Jackie Hutchinson for spearheading the drive to increase the membership.

Financial Report
In line with the constitution of the ARTP all ARTP members had received the Financial Report for 2001 recently. The ARTP's financial position continues to be very healthy. The ARTP have capitalised their assets by offering realistic prices for advertising, costing out all functions of the ARTP carefully and controlling expenses rigidly. New membership drive; preparation for state registration and delivering teaching and training to the membership, has required and will continue to require a wealth of assets to realise key objectives and therefore it is important that the financial position continues to be viable. However, as membership and activity grows, so will expenses, meetings and conferences.

The ARTP Executive acknowledges the careful bookkeeping and financial control of Julie Lloyd, ARTP Treasurer, who works in close contact with Jackie and Diane at ARTP Head Quarters in Sutton Coldfield.

As a direct result of the ARTP's healthy assets, in addition to the usual bursaries to attend national meetings, it was announced that the ARTP are now offering three E.R.S. bursaries to Stockholm in September. Further information regarding these bursaries can be obtained from Gill Butcher, Bursary Secretary/*Inspire* Editor, Burton Hospital.

Education Report
The biggest issue, which the ARTP Executive Committee has had to face over the last year, is undoubtedly Education. Education & training is regarded as the lifeblood and major purpose of the ARTP and the forthcoming onus is to step up the ARTP's education and training function. Major work has begun, and this opportunity was taken to thank the following for their efforts throughout the year:

- Angela Evans
- Melanie Marshall
- Cath Billings
- Sue Hill
- Clare Newall
- Adrian Kendrick
- Jane Caldwell
- Georgina Martin
- Julie Lloyd
- Nigel Clayton
- Roger Carter
- Trefor Watts
- All the ARTP/BTS National Assessment Assessors

Major achievements so far in education include: the writing and development of the B.Sc. syllabus for Clinical Physiology in conjunction with the Registration Council for Clinical Physiology; the specialist options in respiratory physiology have been formulated; a team is in place to write the Occupational Standards; the ARTP has outlined the proposals for the College of Respiratory Physiology.

Further work is needed in: writing the competences for practice, training manuals, outcome objectives, the examinations and information required for the parts 1& 2 National Assessment and the introduction of the ARTP College.

Educational Courses run this year include:
National Assessment Short Courses (Birmingham & Edinburgh)
Basic Sleep Courses 1 & 2 (Bristol)
Spirometry Courses (Local Centres)

The **National Assessment** has been successful:
21 Students passed
New format developed for future part 1
New Sue Hazard Award, replacing Sally Gough Award

A new format has been developed in the National Assessment part one for the forthcoming year in line with the changes in the profession.

Once again the ARTP needs help and input to complete all the education & training tasks ahead. Approximately 45% of what is required has been started and therefore further assistance will be required in order to achieve all the educational objectives.

***Inspire* Report**
The ARTP journal has had several achievements over the last year, including:
3 Editions published
New Editorial Board
New Front sheet Format
New Regular Articles
New Content

Thanks were expressed to Gill Butcher and the Editorial Board for their efforts in continuing to produce the quality journal.

Brendan then reviewed the ARTP's objectives and Key Achievements in 2001

1. To take forward **State Registration** as a member of the Clinical Physiology Group and to continue the Heads of Department forum as a working consultative group. **On-going - Voluntary Register established**

2. To develop **education and training** in collaboration with the Clinical Physiology Group for both Clinical Scientists and Clinical Physiologists (MTOs) within the ARTP.
   Achieved & on-going - New "college" structure developed

3. To maintain a **solid financial basis** before the next AGM.
   Achieved - increased income, turnover and reserves
4. **Develop the Web-site** on the Internet to include technical reports on equipment, etc and on line *Inspire*.
   On-going - website success continues

5. Strengthen strong **links with manufacturers** in developing training courses and development of new equipment.
   Achieved - 26 stands at conference plus workshops.

6. To develop the syllabus, course content, examinations and examination board structure for the **National Assessment** in Respiratory **Physiology Parts 1 and 2 before the next AGM 2002.**
   On going - new examination

Brendan handed over to Dr Sue Hill at this point for the National Issues report.

National Issues.....Sue Hill
(See separate report in Heads of Department Meeting - "Update on National Occupational Standards" and "The path to State Registration")

Brendan confirmed that the year ahead will demand a large input of Executive Committee time, but will also require the help of the whole membership. A moderate response of offers to help from the membership has been received, but more help and practical support is required. The membership was urged to volunteer their time and service no matter how small their contributions.

The National Assessment Certificates for 2001 were then presented by Dr Martin Allen, Dr Brendan Cooper and Ms Melanie Marshall.

The Sue Hazard Award for most outstanding Candidate was awarded to Shirley Yarle, Bath Hospital. (See list of all successful candidates for 2001 in previous edition of *Inspire* – January 2002)

To summarise and conclude the meeting Brendan asked delegates to reflect on the words and meaning of "A Breath of Fresh Air". He urged members to consider what any patients with Asthma, Emphysema, Fibrosing Alveolitis, etc. feel about being relieved and refreshed by a

breath of fresh air. He continued by stating that this is the time to take a deep breath and look to the future with a new confidence, a belief in our worth and desire to make the services we offer better for our patients and colleagues. There is the need to expand and widen our expertise to the other health professionals that now look to our expertise particularly in the field of spirometry and blood gases.

Gradually in the last 5 years, the old image of being small time players in the respiratory medicine arena has diminished and the profile is slowly growing year on year. This has been achieved by:

- Setting Standards in Spirometry and lung function,
- Writing new guidelines,
- Establishing training courses,
- Strengthening our national structure by liasing with Regional Groups.
- Striving for State registration for the protection of the patient and our profession

It is proposed that breathing fresh air into our departments and Trusts can be achieved easily by three simple things;

1. Poster advertising our profession in every lab in the UK – stating who we are and what we do.

2. Actively seeking out Careers Fairs and representing Clinical Respiratory Physiology locally.

3. Getting in contact with Trusts Public Relations, Trust Board and any patient groups and making them aware of our role and skills.

In 2002-3 the ARTP are planning to introduce a Breath of Fresh Air by proposing an achievable programme of objectives, which Dr Cooper then presented to the delegates present.

Objectives of the ARTP Executive Committee for 2002.

1. To take forward **State Registration** as a member of RCCP and to continue the Heads of Department forum as a working consultative group.

2. To further develop **education and training** in collaboration with the RCCP for both Clinical Scientists and Clinical Physiologists (MTOs) within the ARTP.

3. To maintain a **solid financial basis** throughout the year, and to have a long term financial plan for the next 3-5 years.

4. To further **develop the Web site** on the Internet to include technical reports on equipment, on line Inspire, and splitting the website in to public and members areas.

5. To further strengthen strong **links with manufacturers** in developing training courses and development of new equipment and to develop **accreditation of non-ARTP courses** with regards to CPD

6. To develop the syllabus, course content, examinations and examination board structure for the **National Assessment in Respiratory**.

7. To promote further the **National Assessment in Spirometry** and to increase the register to over 100 before the next AGM 2003.

8. To **improve the organisation** of the Executive Committee and to develop links with Regional Groups from around the UK.

9. To **increase the membership** of the ARTP to over 700 practitioners of lung function measurement in the UK before the next AGM 2003; and to raise the profile of **Careers Development** in Respiratory Physiology to schools and colleges in the UK.

10. To **develop closer links with other professional groups** with joint interests in respiratory physiology/measurement over the next 2 years (e.g. physiotherapists, respiratory nurses, etc.) and to strengthen links with the BTS.

11. To establish and pilot the criteria and structure for **Accredited Lung Function Laboratories** within the next year.

12. To develop an **advanced plan of future national training courses** for ARTP members over the next two years

Dr Cooper thanked the delegates for their attention. No further business was discussed and the meeting closed at approximately 10.10am.

Minutes written and adapted for the *Inspire* Journal, by Jane Caldwell Honorary ARTP Secretary.

"ON THE BLOWER"
MANUFACTURERS' REPORT FROM THE BLACKPOOL CONFERENCE
by Nigel Clayton

The Blackpool conference was, without doubt, the most successful to date (although the food might have been better). With record numbers of delegates, we also attracted more manufacturers to the exhibition. For those of you who were unable to make the conference, or missed some of the exhibitors, here is a recap of what was on offer from more than twenty of the manufacturers.

Thursday afternoon started the ball rolling with the manufacturers "work shop". **Ferraris Medical, Beaver Medical** and **Vyasis** promoted various aspects of their latest equipment, although it turned out to be more of a sales campaign than a technical workshop! SensorMedics did however offer us an insight into the Intrabreath technique for measuring gas diffusion and cardiac output.

Medic-Aid then went on to launch a new concept in the Management of Sleep Therapy (MOST). This is a non-clinical management service for patients on CPAP therapy. Once a patient is established on CPAP, Medicaid will rent one of the Remstar range of machines to the patient. This includes a direct mask supply (one per year) and compliance assessment for the first year. Any problems encountered are immediately relayed to the clinician in charge of the patient via an Internet connection known as MOST net.

Typical costs of the service, per patient, including internet connection are:

Merit machine (basic CPAP)	5 yrs	£19.00 / month
Auto titration machine	5yrs	£34.00 / month
Heated humidifier	5 yrs	£6.50 / month

This is a great idea in theory, but has anyone put it to the test yet? Is it a value for money service? Let me know, as I am sure it will be of great interest to those of us who spend hours each week sorting out problems with machines, masks, humidifiers etc.

The manufacturers exhibition opened on Thursday evening. As we entered the exhibition we were entertained by the **Micro Medical** one-man band (surely not the way the company is heading?) They were demonstrating a new hand held device for measuring Negative Expiratory Airway Pressure (NEP). This must be used in conjunction with the airway resistance transducer and Super Spiro spirometer. This enables the measurement of expiratory airways flow limitation to be made and is particularly useful in patients with COPD who find spirometry measurements difficult to perform.

Good marketing from **Vitalograph** attracted us to their stand by tempting us with mugs and soft toys which were not up for grabs until Friday morning. Guess where all the delegates headed at the first break on Friday! Yes I got one too. Vitalograph have launched a new bacterial viral filter, which claims to be 99.4% efficient at 750 litres/min. Not a bad price either, at just 70 pence each if purchased in large quantities.

Breas were demonstrating the SC20, which is their latest sleep apnoea screening system. Data storage is direct to a PC via an infrared link for laboratory use or stored on a 64MB flash card if used in the patients home. It even features a rechargeable battery should you wish to use it outside the home. Great for those patients who have to sleep in a tent in the garden due to antisocial snoring. Complete with analysis software, this package retails at just £2,750 exc. VAT.

Raised levels of exhaled Nitric Oxide may detect airway inflammation. **NIOX** were demonstrating a device capable of making quick, simple and reliable measurements of exhaled NO which includes software specifically designed for use in children as young as four years.

The conference would not be complete without **Morgan Medical**. Later this year they will be celebrating the 40th anniversary of the founding of Morgan Medical. Started as a family business by Philip Morgan back in 1962, it now forms part of **Ferraris Cardiorespiratory**. During this year they plan to run a road show throughout the UK to which we are all invited. (Watch out for a large Winnebago MPV entering your car park at 50 MPH. The chances are that it will be Kevin Hogben at the wheel.) Look out for the end of year promotions being offered as part of the anniversary celebration. Get your orders in whilst stocks last.

Need a cheap device to make serial measurements of PEF, FEV1 AND FEV6? For just £49.00 **KoKo** offer a pocket-sized meter that will record and store these measurements. Optional software can be purchased which will allow the data to be downloaded and displayed graphically. Incidentally it is still possible to buy the original clock style Wrights peak flow meter from Ferraris Cardiorespiratory.

Pulmolink presented the latest software offerings from the **Medisoft** range of lung function equipment. They offer a full range of lung function testing equipment, which also includes the intrabreath technique for measuring cardiac output.

Nuwyn were promoting the Weinman SOMNO mask. The design of this CPAP mask is such that it features a ball and socket swivel joint that allows greater freedom of movement. Also on demonstration was the Weinman Somnocheck sleep apnoea screening system featuring the usual recording parameters. This is ideal for home use as it is quick and simple to attach by the patient and does not require connection to an external device by the bedside. Down loading and analysis of the study is complete within four minutes.

DeVilbiss were promoting the latest range of sleep equipment including the VEGA 9000 CPAP machine and their range of Serenity masks. DeVilbiss also distribute the Minolta Pulsox 3i wristwatch style pulse oximeter. A great little device for simple overnight oximetry recordings. Using an optional interface and software it will analyse the results within minutes the following day.

More and more patients on CPAP and NIPPV seem to benefit from heated humidification. **Fisher and Paykel** now sell the HC221, which combines a CPAP machine with heated humidification in one unit.

New to the ARTP conference this year was **Trainair**. They manufacture an inspiratory muscle-training device that is designed to improve the respiratory muscles in athletes and patients with diseases such as COPD and Cystic Fibrosis. I have experienced

this device and believe me the TIRE (Test of Incremental Respiratory Endurance) protocol does just that!

Another new company was **Artemis**. They were demonstrating a new concept in pulse oximetery, which uses "signal extraction technology". If you require a reliable artefact free signal during exercise or when assessing poorly perfused patients then the Masimo pulse oximeter will do just that.

Beaver demonstrated that Medgraphics have been beavering away with their software that now offers improved functionality. Also on display was the Medgraphics VO 2000 telemetry exercise system. If you wish to perform exercise field studies, it has a 5 km range, which should be suitable for most exercise applications providing your patient does not run off with the equipment.

ResMed supply everything you need to diagnose and treat sleep related breathing disorders. The Embletta diagnostic system is a fully portable sleep recording system with up to 16 channels available for recording. Titration of CPAP and VPAP is also possible through the software supplied with this system.

New to the blood gas market was the **Radiometer** ABL77. This analyser is ideal for those departments performing up to 10 samples per day. It employs easy to change sensor packs and reagent packs. It will also operate off a battery, which makes it ideal for use on the ward or out in the community.

Instrumentation Laboratory were also demonstrating their GEM blood gas analyser. Again this is a compact analyser that offers all the reagents and sensors in a disposable pack. Ideal as a ward based analyser as it requires no maintenance.

Recording and analysis of sleep is **Stowood Scientific Instruments** speciality. With loads of goodies on display it was difficult to decide what to write about. They are now marketing the latest version of the Oxford Sleep Resistance Test (OSLER 2). This is a non-computerised version of the original OSLER that can be used in any test environment.

Intermedical specialises in oxygen concentrators and nebuliser systems. If your patient requires a portable nebuliser then how about the Chiesi Clenny Aerosol pocket size nebuliser? They also sell the Cosmed range of Pony spirometers and electronic diary peak flow meters.

Oxygen concentrators and portable liquid oxygen were two of the **Air Products** range on display. Patients who require oxygen outside the home can benefit from a lightweight portable flask which holds up to 8.5 hours of continuous oxygen.

It was good to see **Medic-Aid** taking two stands in the exhibition. Renowned for their sleep products, they have now become distributors for a new product made by ndd Medizintechnik called the EasyOne (I'm sure there's a joke there somewhere). It is a pocket-sized spirometer that uses ultrasonic flow measurement technology. By blowing through what appears to be a plain tube, it is possible to record and display all the usual spirometry parameters. There are no turbines, flaps, meshes or pneumotachographs to clog up. Wonderful! (If you place an order for one of these before July 1st 2002 you could win a place on the ARTP spirometry course.)

Anthony Phillips from **Air Safety** informed me at the meeting that he would be leaving the company in March to pursue a new career. I feel sure that we will see him filtering through to another respiratory company sometime in the future.

GlaxoSmithKline were the only drug company exhibiting at the conference. If your patients have no success using nicotine patches then Zyban tablets may be the answer. Reported in the New England Journal of Medicine, Zyban has been shown to be almost twice as effective as a nicotine patch over a one-year period.

We are all familiar with the Mini-Wright peak flow meter manufactured by **Clement Clarke**. Their latest product, made by Medikro Oy in Finland, is the Spirostar DX Spirometer (quoted as being "the smallest spirometer in the world.") This features a lightweight disposable screen type pneumotach and is supplied with Windows based software that complies with ATS and ERS spirometry standards.

The names of **Jaeger** and **SensorMedics** are synonymous throughout the world when it comes to making respiratory measurements. Having combined forces under the heading of **Viasys Healthcare** they have now moved to a new location in Warwick. It's good to see more manufacturers providing training and education and Viasys are no exception. Their new premises include purpose built training and education facilities for all their users. Lets hope that it is included in the price of all new equipment and at a price we can afford.

EQUIPMENT AND MANUFACTURER UPDATE

By Alan Moore

The Big 4 – or is it 5?

Difficult to know whether there are 4 or 5 big boys around now given the SensorMedics/Jaeger evolution into Viasys. Also do Pulmolink qualify yet as one of the big boys? – we know Derek thinks he does. As regards systems, not a great deal to report apart from an anticipated announcement of a new range of systems from Viasys in the not too distant future. As for servicing, then reports of discontent continue to surface. We have been made aware of some discontent from users who are locked into lengthy service agreements with EME as a result of purchasing the service agreement up-front with the equipment purchase. Could anyone who has not made us aware of discontent or problems experienced please let us know so that we can take this up on your behalf.

Spirometer Round-Up

Relatively new to the market place is the innovative EasyOne Model 2001 being supplied by Medic-Aid. The device uses ultrasonics to measure flow. It has one of the best customizable A4 printouts of results around. One major drawback though. The device literature indicates that it uses a "single patient use" Spirette breathing tube, which means cost per patient, is significant. However, Medic-Aid reps are advising that this device can be re-used a limited number of times and washed in warm, soapy water between uses. Also, a disposable mouthpiece version of the Spirette breathing tube will be available soon which they claim will eliminate the need to change the tube between patients. As you cannot fit any of the current breathing filters onto the device (the mouthpiece is oval), then herein lies a cross infection problem that Medic-Aid haven't twigged on to. Mind you, as their reps reckon that washing the original Spirette in warm, soapy water is sufficient to kill all known bugs, then that is not surprising.

The MIR range of Spirometers is no longer available from Beaver Medical. They are now available from Albert Waeschle in Bournemouth, Tel No. 01202 204803. It is unreliably rumoured

that this move has less than impressed the boys at Micro-Medical who also distribute through Albert Waeschle. Apparently the two ranges of products appear on following pages in the catalogue and difference in prices between the two ranges is alleged to stick out like a sore thumb. Apparently Messrs. Sue, Grabbit and Runn – Solicitors at Law have been consulted but the outcome of this is not known when going to press.

Sleep System News

The SensorMedics/Jaeger Alphascreen multi-channel system is now available with the Somnostar Alpha software previously only available with the SensorMedics full polysomnography system. The full range of editing, reporting and data management facilities are available within this software – the only part not present obviously being the polysomnography data acquisition component.

Also flying high at present is the cracking Breas SC20 multi-channel system. Now with significantly improved software performance, this system is a little gem and is available at a price that will make the other manufacturers/agents weep. Most impressive is the way that Breas have listened to customer feedback and amended the software in a very timely manner.

CPAP machines – can you hear them ?

Recent ranges reviewed include the Devilbiss 9000 series and the Breas PV10 series. Both ranges are described by patients as being significantly quieter than anything previously experienced. The ranges from both companies have a number of different options including compliance calendars. The Breas 10i is something of a revelation working on a neural network approach to anticipate and respond to apnoeas and hypopnoeas again at a price that will have some of the auto device vendors crying in their beer.

Masks - Resmed

In the last issue, we reported on problems experienced with the Mirage full face mask in relation to its use in Critical Care. Resmed respond that this appears to be an "isolated" problem – where have we heard that before. It is true to say that the retaining circlip in the mask has been modified substantially. One further problem though. The masks are packaged as "single patient use". In the package with supplied masks is advice and instruction for re-cycling the mask up to 15 times providing that you can disassemble it, replace the one way valve and then reassemble it correctly. The snag is that there is a step in the disassembly instructions missing and you need to be a mechanical engineering graduate to carry the process out – something sadly lacking in hospital sterile supplies units who would normally deal with such processes. Also, as you remove the revised circlip (which is transparent) you can see white stress fractures occurring in the plastic.

So, the mask is "single patient use" – except in this country. Couldn't have anything to do with the high price could it? Perish the thought!

Masks – Weinmann/NuWyn

Some of you may have seen these masks at the Blackpool meeting. Beware that the masks themselves have no "bleed" holes in them. You have to purchase the "silencing" attachment that performs the leak task whilst at the same time making the process quieter – something to be encouraged. However, when you add the cost of the two components together, the price becomes less attractive. The purpose of this warning is that, as usual, all that at first glitters, is not necessarily golden.

Innovation in Advertising

Fresh from his thoroughly deserved ARTP Special Award, we now present yet another award to Kevin Hogben of Morgan/Ferraris. Such is Kevin's subtlety, he has perfected the art of turning a helpful response to a request for assistance on the ARTP forum into a plug for the company without falling foul of the Webmaster's ever careful lookout for blatant advertising. Note the recent helpful response in the debate of reference values for KCO where he succeeded in proving the same along with several more pages of reference values – each page faithfully displaying the Morgan and Ferraris trademarks. Seems a pity that Kevin's sales colleagues don't appear to take note of his undoubted skills.

BURSARY ARTICLE

Feasibility and interpretation of Forced Expiratory Manoeuvres in Pre-school Children

Oliver C, Aurora, P, Stocks, J.
Portex Respiratory Unit, Institute of Child Health, London

Introduction

The pre-school years could be considered to be the "missing years" with regard to respiratory function testing and the monitoring of disease progression. Lung function testing in young children is difficult and generally not attempted as there are very few suitable tests for this specific age group. Young children (2-5 year olds) are difficult to assess as they are not the most co-operative and find it difficult to concentrate and follow instructions. In addition, respiratory function testing requires time and patience, which unfortunately is not always available in the clinical setting.

Forced Expiratory Manoeuvres are currently considered to be the "gold-standard" in the assessment, diagnosis and monitoring of lung function in adults and older children. Although with minimal training this test can be performed by the vast majority of adults and children over six years of age, there remains much debate on its use and accuracy in young children.

For the last two years I have been working on a research project entitled *Respiratory function and clinical status in pre-school children.* Among other things, this project is looking at the feasibility of spirometry in young children and the limitations of this test.

In this article I am going to describe my experiences of working with young children and give examples of the problems that can occur when testing this age group and my ideas on how to interpret the results obtained.

Methods

Before attempting to measure a pre-school child it is essential to gain their trust and to be willing to sit on the floor (so to speak) and get down to their level. Testing children of this age group requires much patience and an ability to explain and teach at a level which they can comprehend. To help teach the children what "blowing" is, I have found it very useful to play bubble-blowing games. This can help to encourage a full inspiration and a sustained expiration, both of which a child of this age finds difficult to grasp.

Using descriptions to which they may be able to relate can also help. For example, an inspiration can be described as when they

take a big suck of a drink through a straw; and an expiration can be associated with the story of the three little pigs and the big bad wolf, by saying to them that want them to pretend to be the big bad wolf and huff and puff and pretend "to blow a house down".

Using incentive spirometry (Masterscope, Jaeger), I then ask the child if they would like to play some blowing games on the computer.

If possible (and in the majority of cases it is) the child is asked to wear a nose-clip, to help ensure that air is not expelled through the nose during the measurement. I then ask the child to sit comfortably and upright in front of the computer and show them the different games which are available to play. The different games available on the incentive spirometry software are designed to encourage the child to perform different parts of the flow volume loop accurately e.g. the candle blowing game encourages a good peak-flow and the bowling game is designed to encourage a full expiration (FVC) manoeuvre.

By playing several different games you hope to achieve a good accurate measurement.

I usually try to give the child the choice as to which game they would like to play although sometimes encouragement is needed to play a certain game if I feel the results are inaccurate in a particular way e.g. not achieving a FVC.

The child is asked and encouraged to perform the test in the same way as adults and older children, following as closely as possible to ATS guidelines (1).

Arets et al identified that children are unable to reach ATS criteria of acceptability (2); therefore we have amended our acceptability criteria to allow for the differences between children and adults.

The differences are: -

1. Children require a learning period so that they can perform the test correctly and therefore we allow up to 15 manoeuvres with a rest in between attempts.

2. Young children do not always achieve an FEV1 and therefore we have used a forced expiratory volume in 0.5 seconds ($FEV_{0.5}$) to calculate the reproducibility of measurements. $FEV_{0.5}$ is not routinely available on all lung function equipment at present, but due to the increased interest in the measuring of pre-school children it is a parameter that may be required routinely for this age group. We also record $FEV_{0.75}$ which can be reported if an FEV_1 is not achieved.

Test procedure

- Measurements should be made with the child sitting, with the feet resting flat on the floor or footrest. They should wear a nose-clip and breathe through a circuit comprising of a pneumotachograph, elbow, filter and rigid mouthpiece. Begin recording and ask the child to put the mouthpiece in their mouth, encouraging them to make a good seal around the mouthpiece.

- Ask them to breathe normally for a few breaths, then to take a big breath in (as big as they can) and then to blow out as hard and as fast as they can, for as long as they can.

- Re-zero the pneumotachograph between each attempted manoeuvre.

- A maximum of 15 manoeuvres can be performed. ATS recommend 8 manoeuvres but due to the practice and teaching needed by pre-school children a maximum of 15 can be attempted providing that both the child and parents are happy to do so. All measurements/attempts must be saved for later inspection.

- Aim to obtain a minimum of 3 technically acceptable manoeuvres, of which at least 2 must be reproducible (the sum of $FEV_{0.5}$ + FVC must be within 10%). They should be as technically satisfactory as possible in terms of rapid rise to peak flow. In children it is not possible to sustain expiration for 6 seconds as recommended by ATS guidelines, therefore in this case the end of expiration should be judged from the shape of the volume/time curve. It must be ensured that the line achieves a plateau for the loop to be considered acceptable in terms of providing the most accurate available FVC.

Results

It could be argued that the use of spirometry in this age group is time-consuming and the results are difficult to interpret, as there are currently no standardised guidelines and very little reference values. ATS guidelines, whilst providing a basis to work from the criteria, are too harsh and in some ways unrealistic for a young child to achieve e.g. they are unable to sustain expiration for 6 seconds. Keeping as close as possible to ATS criteria, individuals involved in pre-school testing in our laboratory have devised an acceptability criteria for spirometry for this age group, which are detailed below. We have found these criteria to be useful when examining our measurements.

Acceptability criteria for analysis

Initially all the loops should be inspected for acceptability based on their shape. Loops should be excluded if there is a very hesitant start or if they are not a suitable shape (i.e. zig zag shape indicating an uneven flow and sub-maximal effort). If a plateau is not reached on the volume versus time graph the FVC will be underestimated, therefore caution must be taken when reporting an FVC from such a loop and this should be noted on the results form. It may be useful to know that the FVC is "no less" than (or "at least") the result gained for use as a baseline in future comparisons although it should always be noted that this is an underestimate of the true values. Flows will be overestimated in a loop of this shape, therefore extreme caution should be taken when looking at these results and it would be advisable not to report flow results if the FVC is considered unacceptable.

Peak Expiratory Flow (PEF): PEF will be part of the flow-volume manoeuvre and therefore taken from the spirometer. The highest PEF should be reported. It is permitted to accept the PEF from a loop which is regarded as technically unacceptable as far as FVC and $FEV_{0.5}$ are concerned (e.g. a blow that was terminated prematurely), provided that there is another value within 10% of it. The operator must be satisfied that it was not obtained by 'cheating', e.g. by using the cheeks to generate a false PEF or coughing.

Forced Vital Capacity (FVC) and Forced Expiratory Volume in 0.5 second ($FEV_{0.5}$): ATS criteria state a minimum of 3 acceptable manoeuvres, from which the two largest FVC should be within 0.2 L and the two largest FEV_1 should also be within 0.2 L. These criteria are for adults; therefore allowances should be made for children. For the present study it was agreed that we would accept a minimum of two 'reproducible' manoeuvres, where the sum of $FEV_{0.5}$ + FVC is within 10%. Furthermore, the 'second best' FVC and $FEV_{0.5}$ must each be at least 90% of the highest values. Report the largest FVC and the $FEV_{0.5}$ from the same 'best' attempt although this is not in accordance with ATS guidelines.

MMEF and instantaneous flows (MEF_{50}, MEF_{25}): These should all come from the single best manoeuvre, i.e. the one with the largest FVC.

Using current published reference data from Eigen et al (3) the result is then reported.

It is sometimes difficult for pre-school children to perform the test accurately. A common problem is that they are unable to adequately sustain expiration until their lungs are totally empty. This can be identified by an abrupt end to the tests (See fig. 2 and 4). Caution must be taken when analysing the results as this will not only underestimate the FVC and related volumes but also overestimate their flows. However, under these circumstances an $FEV_{0.5}$ and/or $FEV_{0.75}$ may still be reportable.

Examples of acceptable and unacceptable loops

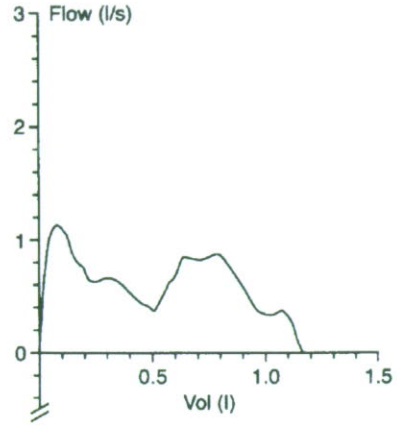


Fig.1: An unacceptable loop, it appears as if the child has taken two breaths

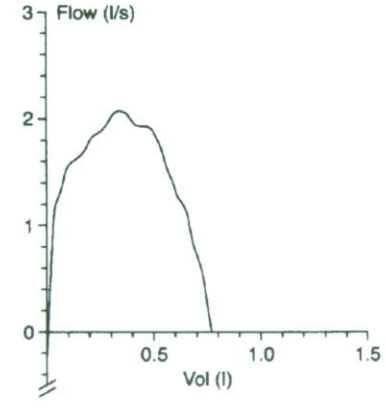


Fig.2: An unacceptable loop, a hesitant start, with late peak flow and early termination during expiration

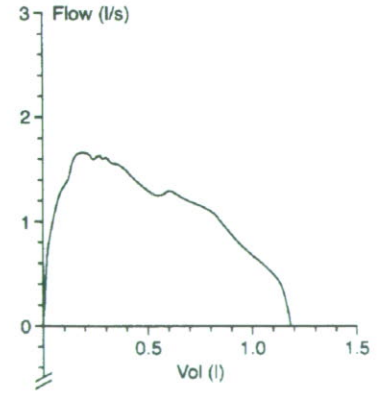


Fig.3: An acceptable loop although caution should be taken if reporting FVC and flows as there appears to be a slightly early termination during expiration

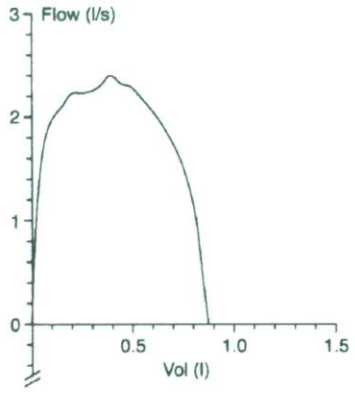


Fig.4: Although this loop is technically unacceptable due to an early termination in expiration, $FEV_{0.5}$ or $FEV_{0.75}$ may be reportable if the forced expiration time is greater than 0.5 or 0.75 seconds

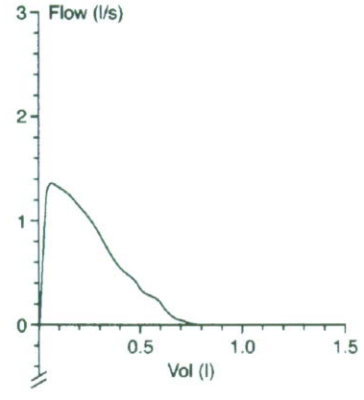


Fig.5: A technically acceptable loop

Conclusions

Using our criteria, acceptable spirometry results were obtained from 28/43 (65%) of pre-school children. The time required to teach the child to perform an adequate and reproducible result is similar to that needed for older children. Vilozni et al (4) and Skinner et al (5) have shown that incentive spirometry is very useful in achieving accurate measurements in this age group. I feel that incentive spirometry is useful in gaining the co-operation of pre-school children. ATS guidelines for spirometry are inappropriate for testing this age group and therefore specific guidelines and reference values need to be established.

References

1. Standardization of Spirometry, 1994 Update. American Thoracic Society. Am J Respir Crit Care Med 1995; 152(3):1107-36.
2. Arets HG, Brackel HJ, van der Ent CK. Forced expiratory manoeuvres in children: do they meet ATS and ERS criteria for spirometry? Eur Respir J 2001;18(4):655-60.
3. Eigen H, Bieler H, Grant D, Christoph K, Terrill D, Heilman DK, Ambrosius WT, Tepper RS. Spirometric pulmonary function in healthy preschool children. Am J Respir Crit Care Med 2001;163(3 Pt 1):619-23.
4. Vilozni D, Barker M, Jellouschek H, Heimann G, Blau H. An interactive computer-animated system (SpiroGame) facilitates spirometry in preschool children. Am J Respir Crit Care Med 2001;164(12):2200-5.
5. Skinner K, Connett GJ. The effects of animated incentive devices on measurements on forced lung volumes during childhood. [Abstract] Arch Dis Child 2000;82:(Suppl. 1)A42-A42

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