Inspire

The Official Journal of The Association of Respiratory Technology and Physiology

Vol 2 No. 7 Dec 2000

Reg. Charity No. 2900907

FIRST WORD

Wishing a Merry Christmas to all ARTP members.

Let's hope everyone gets some time, in between the usual 'Winter Pressures' and acute respiratory admissions, to grab a sherry (or even a few!), a mince pie and an application form for the ARTP's Winter Meeting in Blackpool. Preparations are well under way and it looks like being a great meeting at a great venue so dig out your old "KISS ME QUICK" hat - what do you mean you haven't got one ? !! – and head on over to Blackpool. Just bear in mind that most Trusts will probably not be very tolerant of Pleasure Beach receipts attached to your travel claim forms.

The ARTP's website **www.artp.org.uk** is now up and running successfully and being updated regularly so if you haven't already visited the site, log on and let us know what you think. The web Forum is also proving to be a valuable focus point for all kinds of respiratory related issues (as well as some witty, light-hearted regional rivalry), and has the advantage of gathering together knowledge and opinions very quickly on issues that are being raised. Inside this edition of *Inspire* is a report summarising the input into the Forum. For those who do not have access to the Internet I would like to start up a *Readers Letters/Correspondence* page in Inspire for members to raise enquiries, make comments, answer previous correspondence etc. So if you have any issues you would like advice or feedback on from other ARTP members please let me know.

Many of you will have attended the Clinical Physiology Workshops that have been running across the country to bring us up to date with the latest developments in the process of petitioning for State Registration and the establishment of the Registration Council for Clinical Physiology (RCCP) as a pre-registration requirement. With State Registration just around the corner we all need to get working on preparing an application to the RCCP and gathering the information and evidence required. Registration forms will be circulated to ARTP members. This issue contains all of the information presented at the workshops however if you need more information about the Voluntary Registration process please contact **Dr Sue Hill on 0121 697 8339.**

Finally, just to say that the next edition of *Inspire* will be out in the springtime so please send any contributions to me:

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

CONTENTS

DATES FOR YOUR DIARY

THE BRITISH THORACIC SOCIETY WINTER MEETING
13th to 15th December 2000
Queen Elizabeth II Conference Centre, London
Full details available from The British Thoracic Society
Tel: 0207 831 8778

ARTP WINTER MEETING
22nd to 24th February 2001
Blackpool Hilton Hotel
ARTP Member £125 Non-Member £155 ARTP Student Member £96
Student Non-Member (including 1 years membership) £105
Accommodation £50 twin/double £70 single (per person per night)
Late registration (after 31st December) £40 supplement
Full details and application forms available from:
ARTP 2001, Universal Conference Consultants,
China Court Business Centre, Ladywell Walk,
Birmingham B5 4RX Tel: 0121 622 3644

ASSOCIATION NEWS

RE-ELECTION OF ARTP CHAIRPERSON

Notice is hereby given that, in accordance with the Constitution of the ARTP, the position of ARTP Chairperson is due for re-election at the next AGM. The Executive Committee have nominated the current Chairman, Dr Brendan Cooper for re-election by the Membership. The next AGM will be held at the ARTP Winter Meeting at Blackpool in February 2001.

ARTP BURSARIES

Just a reminder to anyone struggling to finance a trip to the ARTP Winter Meeting at Blackpool that help with funding is available. For further information and application forms please contact me:
Gill Butcher, ARTP Bursary Secretary, Cardiorespiratory Unit, Queen's Hospital Burton, Belvedere Road, Burton on Trent DE13 0RB
e mail : bursary@artp.org.uk

MANUFACTURERS LIAISON GROUP

The ARTP Executive has set up a Manufacturers Liaison Group. The aims of the group are to meet up with manufacturers of various types of respiratory equipment and discuss and resolve issues common to us all.

The group (at present Brendan Cooper, Nigel Clayton and Alan Moore) is planning to have a meeting with the major full lung function kit suppliers (Jaeger, Sensormedics, Pulmolink and Ferraris/PK Morgan) soon. The first issues for discussion will be reference values, quality assurance and service agreements. ARTP members will be given feedback on this meeting via Inspire and the ARTP Forum.

Plans are also being made to meet with spirometer manufacturers next year on a similar theme.
Anybody interested in contributing to this liaison group or wishing to raise any issues regarding equipment should contact the ARTP Forum
e mail : forum@artp.org.uk

JOB ADVERTISEMENTS – NEW RATES

At a meeting of the Executive Committee on 23rd October 2000, it was agreed that the rates for job advertisements circulated to members should be increased to cover increasing mailing costs and to make them more comparable with those charged by other publications.

Standard Rate = £600 **Urgent = £750**

These new costs include an appearance on the ARTP Website for a limited period.

NEWS FROM THE SCOTTISH FORUM

SCOTTISH FORUM MEETING – GLASGOW ROYAL INFIRMARY 20TH OCTOBER 2000

A report by Jill Fallen, Secretary of the Scottish Forum

Another successful Scottish Forum meeting took place in Glasgow in October with the highest number of delegates so far - a total of 42.

Jill Fallen opened the meeting and welcomed everyone, especially those who had travelled a distance to attend. After giving out some housekeeping details, she handed over to Melanie Marshall who chaired the morning session on Measurement of Lung Volumes.

Melanie introduced:
Dr Andrew Robson, Western General Edinburgh who gave the first talk on Helium Dilution. This was followed by a few questions and discussion.
Jo Montgomery, Northampton General Hospital who spoke on the Nitrogen Washout method.
Dr Roger Carter, Glasgow Royal Infirmary who spoke about Body Plethysmography.
Dr Martin Johnston, Glasgow Royal Infirmary who spoke on Oscillometry.

After lunch Dr Andrew Robson chaired the afternoon session consisting of a debate on 'The Pros and Cons of Filters'.
The Pro speaker was Mr Anthony Phillips, Air Safety
The Cons speaker was Dr Adrian Kendrick, Bristol Royal Infirmary
A lively debate followed.

Following the afternoon tea break Dr Adrian Kendrick chaired the Annual General Meeting of the Scottish Forum.

A report of the first year's activity was given by Dr Andrew Robson.
The secretaries and financial report was given by Jill Fallen.
The existing Committee members were elected for the next year as no other interest was shown.
The next meeting was approved with members in Aberdeen being asked to help with the organisation.

The meeting was closed with a vote of thanks given to Air Safety and Erich Jaeger(UK) for kindly sponsoring the meeting, and a thank you to all the speakers.

The next meeting of the Scottish Forum will be in Aberdeen in April.
Further details of this can be obtained from either Jill Fallen, Secretary or Andy Robson, Chairman – both at the Respiratory Function Lab, Western General Hospital, Crewe Road, Edinburgh. TEL: 0131 537 1984 e mail: artpsf@aol.com

PRESS RELEASE

THERMO RESPIRATORY GROUP

Date: November 8, 2000

Coventry, November 8, 2000: SensorMedics and Jaeger have developed a strategic collaboration program to generate maximum customer value. According to Paul ter Grote, Vice President Sales, Thermo Respiratory Group Diagnostics: "Our vision is crystal clear: merge our expertise in research & development, and customer support. In this way the customers are better served".

Through this collaboration, we are confident that we will be able to meet the ever-changing demands of the medical diagnostic market. We look forward to working with our customers to develop new and innovative products and methods of customer support utilizing the latest technologies whilst remaining aware of the financial pressures confronting Healthcare Providers. One of the first projects will be to ensure that the Jaeger and SensorMedics Databases become compatible, resulting in uniform data reporting and handling so that you can select the best product for your needs – from either company.

SensorMedics and Jaeger are each part of the Thermo Respiratory Group, consisting of 8 well-known medical companies. As of November 01, 2000, Jaeger and SensorMedics will share a common facility for their direct operation in the United Kingdom. By combining the resources of SensorMedics and Jaeger, you will clearly have stronger customer support.

Jaeger and SensorMedics will continue to exist as two individual product lines allowing you to choose a product based on the features and benefits important to your individual needs while still allowing you to combine systems into a common network.

The SensorMedics critical care product line, the High frequency Oscillatory Ventilator products (3100A/B), will continue to be represented by E.M.E. Ltd. who have a proven track record in ventilator sales and after sales support. To broaden the SensorMedics direct service organization, E.M.E. will continue to be an Authorized Service Provider for the SensorMedics diagnostic product line in the United Kingdom and Northern Ireland.

The new combined Jaeger and SensorMedics Company in the United Kingdom will strive to provide you with service and support of the highest calibre. We continue to expand our Customer Training Courses to support your Continuing Medical Education programs. Our Service Hotline and Remote Diagnostic Support via modem is proving to be most successful and we will be expanding this service throughout next year.

Jaeger UK Ltd
Jaeger House
Orchard Court
Binley Business Park
Coventry
CV3 2TQ
Tel: 02476 438 300
Fax: 02476 438 322

SensorMedics

Orchard Court
Binley Business Park
Coventry
CV3 2TQ
Tel: 02476 438 300
Fax: 02476 438 322

E.M.E.
(Electro Medical Equipment)

60 Gladstone Place
Brighton
Sussex
BN2 3QD
Tel: 01273 645 100
Fax: 01273 645 101

EMAIL FORUM DIGEST

For the benefit of those members who do not yet have access to the E-mail Forum here is a synopsis of the messages and discussions that have been 'posted' during the first three months...

We had a discussion about **Clinical Risk** about who would be responsible, should a test make a patients condition worse. There was no absolute conclusion but it would appear that at the moment, if it came to a liability issue, the Trust should cover you providing that you were acting within recognised guidelines. This also raised the (as yet unanswered) question of whether State Registration would incorporate any form of requirement for professional liability insurance.

I reported a design fault with twelve of a batch of nineteen **AC3000 nebuliser** compressors purchased in February 2000. A modification has been made to newer machines to prevent the cooling fan from falling off the motor spindle. Clement Clarke issued a statement which was circulated via the Forum (which can be found on the website). Incidentally, I recently saw a faulty AC3000 with a serial number in the 2600's which implies to me there are still quite a few out there somewhere!

An anaesthetist sent a letter to the ARTP with a technical query about prediction of the pre-operative **FRC in a paralysed patient** for the purpose of calculating specific compliance intra-operatively. Warren Mitchell was able to provide a useful reference and suggest a contact with specific knowledge of the field.

Having changed from a Morgan Model C to a Jaeger Masterscreen Geraldine Lawless noticed differences in the equilibration time on **FRC helium measurement**. Her question prompted a spat of exchanges between the two companies on the relative merits of their systems.

Adrian Kendrick raised the (apparently) unnoticed implications of **Health Service Circular 2000/026** (Patient Group Directions) which effectively excludes MTO's from administering medications in certain circumstances. Having been raised and discussed on the Forum the problems raised prompted action in the form of an ARTP recommendation pending further clarification of the issues. The use of the Forum prompted an unprecedented speedy response to this problem.

Melanie Marshall would like to know if there are any schemes set up nationally to provide **spirometry in primary care** by secondary care providers (ie. employers sending out technicians into primary care for the sole purpose of providing a spirometry service). The Forum only provided one proposed scheme in Gloucester – if you know of any other please contact her direct.

Laura Watson asked for a **CPAP prediction equation** and was given the choice of Adrian Kendrick's 4.44 + 0.0075Desats + 0.085 BMI or Brendan Cooper's which is based on licking your finger and sticking it in the air. Kevin Hogben pointed out that another element of Brendan's equation (Kevin's IQ) would force a 'division by zero' error!

That perennial brain twister **BTPS** compensation factors came up when Jane Graham reported a discrepancy between her old and new machines (she's not letting on who the manufacturer is though!)

How to dispose of **Sensormedics gas cylinders** was discussed at length (for those who don't know they sell you the gas but do not take their empties back – does anyone else remember, as a kid, taking your pop bottles back to the shop to retrieve the deposit... am I getting old!!).

And just when we thought there wasn't anyone from Sensormedics watching the Forum to take this on board I was given a press release to circulate from the **Thermo Respiratory Group** announcing the 'strategic collaboration program' between Sensormedics and Jaeger. (If you haven't seen it the press release can be viewed on the website.)

Justin Adams asked for recommendations for **Paediatric Predicted Equations** and Derek Cramer suggested their published reference equations (Thorax 1993;48:794-802 & 803-808) which are apparently the only reference set that take into account the growth spurt of puberty.

Among several other queries and discussions - Angela Hutton was able to make an enquiry about **State Registration** from Saudi Arabia. There was some good-humoured banter about the north/south divide and the **Scottish Forum**. Nigel Clayton (Manufacturer's Liaison Officer) was able to answer a query about **Dosimeters**.

Our esteemed chairman's debut on the Forum was delayed somewhat by a major failure of IT support (in the NHS - never!) but he was eventually able to canvas opinions on **special gas suppliers** for a report he is compiling.

We have had some excellent feedback on this innovation which has, and no doubt will continue to, provide thought-provoking discussions, give fast access to shared information and allows each member to access the combined knowledge and experience of (currently) over 100 members on any topic. If you want to join in the fun and games visit the Forum page on the ARTP Website to find out how to subscribe.

Forum Tips...

If you would like to separate the Forum messages from your other email you can use 'Message Rules' (Outlook Express) or 'Inbox Assistant' (Outlook) to sort your mail into separate folders. You can find instructions on how to do this on the Forum page of the Website.

Sometimes if there is an interesting topic being discussed there might be a lot of 'traffic' on the Forum. If you would prefer not to receive several messages a day you can visit the eGroups website and alter your personal settings to receive a 'digest' which is one email containing all the messages sent each day.

The website is regularly updated with the latest information on news, courses and meetings. If you aren't able to monitor the Forum don't forget to keep an eye on the website.

Keith Butterfield (Email: webmaster@artp.org.uk)

ARTP Website – http://www.artp.org.uk

Forum Email Address – forum@artp.org.uk *(subscribers only)*

NATIONAL ISSUES
SUMMARY OF CLINICAL PHYSIOLOGY WORKSHOPS ON STATUTORY REGULATION OF PRACTICE

Dr Sue Hill, Consultant Clinical Scientist, Lung Investigation Unit, 1st Floor Nuffield House, Queen Elizabeth Hospital, Birmingham, B15 2TH

State Registration (SR) is the criterion for employment in the professions in the NHS and Local Authority Social Services Departments. It is the definition of what is deemed proper medical activity in a number of statutes. It implies high ethical standards, educational and professional excellence, and a higher expectation of duties of care than from unregistered practitioners. It regulates interaction with other medical professions and with patients, and is the instrument of self-governance independent of educational, employment, governmental or professional (in the sense of membership of a professional body) interests.

The reasons for State Registration are :
- closure of professional title
- achievement of a European consistency
- recognised professional code of conduct
- maintenance of professional standards and competencies.

There have been 2 routes available to achieve statutory regulation of practice:

i.) Council for Professions Supplementary to Medicine (CPSM) – this requires the Order of the Privy Council. The 1960 Professions Supplementary to Medicine (PSM) Act provides for CPSM to co-ordinate and supervise up to 12 Statutory Boards, the remit of Boards being to regulate activities of specified professional groups. Each Statutory Board is directly accountable to the Privy Council.

ii.) Private Members Bill – this is consistent with the "group by group" approach and requires primary legislation. It is the route taken by Osteopaths and Chiropractors.

In the CPSM Route the applicant must be a profession which appears to the CPSM to demonstrate adherence to the following administrative guidelines:
- a mature profession with an established recognised governing body
- based on a systematic body of knowledge
- have mutually accepted relationships with organisations who represent practitioners of contemporary medical practice
- have recognised courses of training over a substantial period
- examinations must be adequate and properly conducted
- a minimum educational standard must be enforced for all entrants (with special provision for the acceptance of mature students with relevant experience)
- have an appropriate and acceptable code of conduct with patients and members of other professions.

The "Group by Group" or Private Members Bill route is based on five principles:
- founded on systematic body of knowledge
- requires a voluntary registration system in place with an enforceable code of conduct
- move to statutory regulation is supported by members of the profession
- support and acceptance of the medical profession is secured
- the will of Parliament is tested by primary legislation.

The usual route taken by groups who are now state registered has been the CPSM route. The Private Members Bill route took Osteopaths and Chiropractors a considerable time to achieve and they did not succeed until they had convinced the medical establishment that they had a professional role to play in the management of patients.

CPSM is an independent, self-regulating statutory body with 12 Boards within its framework having the duty to offer State Registration to members of those health professions approved by Parliament as falling within the 1960 PSM Act. The professions covered in the 12 Boards are:
- Arts therapies
- Chiropody
- Dietetics
- Medical Laboratory Science
- Occupational therapy
- Orthoptics
- Physiotherapy
- Prosthetists and orthotists
- Radiotherapy
- Clinical scientists*
- Ambulance Paramedics*
- Speech Language Therapists*

* approved by Privy Council June 1999, State Register officially opened 1st October 2000.

The Boards of CPSM have a general function to promote high standards of professional education and professional conduct among members of the relevant profession (education and training both key elements). In the discharge of these duties SR Boards have a number of responsibilities:
- to prepare and publish registers
- to approve institutions where education and training take place
- to make recommendations to the Privy Council for approval of courses, examinations and qualifications
- to carry out disciplinary functions.

Each Board has a disciplinary committee charged with producing a statement of conduct.

Other professions regulated by Statute are Doctors, Dentists, Nurses, Midwives and Health Visitors, Opticians, Pharmacists, Osteopaths and Chiropractors.

A number of professions have been recognised as candidate groups for statutory regulation of practice and have included physiological measurement technicians and the various constituent disciplines. However, approaches to CPSM by various professional bodies in Clinical Physiology disciplines have been rejected on the basis of the "size of the professional group" and the evidence not being clear on why the practice of the individual group needed to be regulated by Statute. In general CPSM has encouraged similar professional groups to come together for State Registration purposes. Indeed, the Clinical Scientists were persuaded to come together to petition for State Registration and now the State Registration Board covers some 14 different disciplines (including large professional groups such as Clinical Biochemists and Medical Physicists) and approximately 5,000 practitioners.

It has been suggested that Clinical Physiology closely follow the route pursued by the Clinical Scientists since we are also composed of a number of different disciplines (Audiology, Hearing Therapy, Cardiology, Gastrointestinal Physiology, Neurophysiology and Respiratory Physiology). The CPSM route to achieve State Registration is no longer available as all 12 Boards provided for under the 1960 PSM Act are full. However CPSM will be replaced during 2001 with the Health Professions Council (HPC) with greater flexibility for inclusion of new groups.

The Health Professions Council established under the 1960 PSM Act was perceived to have a number of deficiencies including;
i. weak protection of professional title
ii. excessive medical orientation
iii. no locus in relation to post basic training
iv. no locus in continuing competence to practice including resumption of practice after a break
v. no locus in relation to unfitness to practice on health grounds
vi. archaic disciplinary procedures
vii. inability to reflect changes in educational practice

viii. weak employer and consumer input, notably into educational developments
ix. excessive and cumbersome supervision by Privy Council and an intermediate role of Council (which is composed primarily of representatives of the Medical Royal Colleges).

A consultation process on the role and structure of the new Health Professions Council is currently taking place as part of modernising statutory regulation of practice. The necessary changes will be made by an Order under section 60 of the Health Act 1999. The focus of the new HPC will be a multidisciplinary Council comprising of at least one representative from each professional group being regulated as well as a significant number of lay members. In addition there are 4 proposed multidisciplinary Statutory Committees:

- Investigation committee dealing with all initial complaints about individuals
- Professional conduct committee (PCC) dealing with standards of conduct and disciplinary hearings
- Health committee dealing with practitioners with health problems.
- Education committee dealing with pre-registration qualifications, CPD and registration procedures for applicants.

The key objectives of the new HPC are:
a) To reform ways of working by requiring Council to treat the health and welfare patients as paramount, to collaborate and consult with key stakeholders and to be open and proactive in accounting to the public and the professions for its work.

b) To reform structure and function by wider powers to deal effectively with individuals who present unacceptable risks to patients. To create a smaller Council comprising of directly elected practitioners with strong lay input with responsibility for setting and monitoring standards of professional training, performance and conduct. Evidence of CPD will be linked with Re-Registration. Stronger protection of professional title. Extension of regulation to new groups.

The new HPC in a reformed structure will enable the Clinical Physiology to apply for statutory regulation of practice. During the interim period a voluntary registration system is being established which is a necessary pre-requisite to petitioning for State Registration under the new HPC.

The criteria for petitioning by Clinical Physiology to come under the aegis of CPSM or its successor the HPC includes approaching the Registrar to investigate, in broad terms, if the group meets the following criteria:

- Need for public to be protected from activities of the group
- Group naturally falls within family of health professionals and conventional medicine
- Group is considered to be a mature profession and is a single defined professional voice working to a common threshold competency
- Common education system at an appropriate level allowing unified approach to approval of course programmes and establishments
- Large enough group to provide additional body of unpaid volunteers to undertake statutory regulation
- Does the group naturally fall within the PSM Act or its successor?

There are also criteria that need to be met to enable Clinical Physiology to be considered as a profession (adopted from Lord Benson, House of Lords Debate 1993) which is summarised as controlled by governing body which directs behavior of members, sets standards of education as a condition of entry and ensures an acceptable standard of professional competence is obtained. Sets ethical rules and professional standards, and has rules and standards, which are enforced designed for protection of public and not for members. Can take disciplinary action including expulsion and ensure that the work is reserved to the profession by statute. To have fair and open competition in the practice of the profession and members of the profession must be independent in thought and outlook and give leadership to the public that it serves.

An informal grouping of Clinical Physiology specialties (representatives of the constitutive professional bodies BAAT, BSHT, EPTA, SCST, ARTP, AGIP) have met since 1998, since there was a recognised need for a common approach on a variety of issues particularly in achieving State Registration. The grouping represents approximately 6-7000 practitioners and each professional body has recognised that the job role, function and responsibility of individuals within the disciplines has changed dramatically over the years with advances in technology, changes in the patient population being investigated to the more severely functionally impaired and changes in the role of clinicians. This means that the competent independent practitioner working with autonomy without supervision undertakes a wide range of responsibilities with a potential to do harm to patients. Furthermore, the academic attainment of the independent practitioner has changed over years (from BTEC National Certificate to Higher National Certificate or Diploma to BSc in some instances).

In addition, the content of Academic courses has been reasonably well standardised as a result of professional body input over the year and training and assessment strategies have been similar between the professional groups – having been the subject of several national projects.

It was felt, therefore, that an umbrella group of Clinical Physiology disciplines would be in a good position to apply for State Registration and satisfy the criteria outlines earlier which includes

- requirement for generic "umbrella" grouping
- approved educational courses
- training outcomes/objectives
- works to codes of professional conduct and disciplines

On this basis the Registrar of CPSM was approached who confirmed a strong case for petitioning under the new legislation (ie HPC) and stated: "a voluntary registration system is pre-requisite for coming under the aegis of HPC and groups petitioning must demonstrate suitable level of maturity and organisation)". To achieve these requirements the Clinical Physiology group has established a Registration Council for Clinical Physiologists (RCCP) with limited company status which will provide for voluntary registration system, with a common code of conduct and discipline, and with grandparenting arrangements for those individuals who are bona fide practitioners but who do not meet the entry criteria. In addition the RCCP will be able to demonstrate both maturity and umbrella organisation. This initiative is supported by the Chief Scientific Officer of the Department of Health. There will be an annual £12 application fee for registration with the voluntary registration board. It is important for those people who would not meet the entry criteria proposed under a State Registration Board to realise that it is both more difficult and much more expensive (up to £250) to achieve registration within the state registered system. It is anticipated that all members of RCCP would automatically transfer to State Register when the formal petition is approved by HPC.

The benefits of statutory regulation for Clinical Physiology is a consolidated approach for the disciplines within and recognition as a professional group with protection of role within the NHS. To have recognised professional standards of practice and assessment of competence and regulated training programmes. This will ultimately provide protection of public and give employers quality assurance. Finally the approach should aid to recruitment and retention and give enhanced career prospects.

Entry to the voluntary register (Registration Council for Clinical Physiology)
These are the agreed requirements for entry to the register, although as outlined earlier individuals with experience and who can provide evidence of competence will be eligible to apply under the acquired rights provision (It is anticipated that the majority of practitioners within the disciplines of Clinical Physiology will gain entry to the register).

1.) Academic qualification (1st degree in Clinical Physiology) or accepted equivalents during interim period followed by
2.) Evidence of satisfactory assessment of competence (usually carried out by a recognised professional body in the speciality) and satisfactory completion of training in a trainee post or equivalent appointment and
3.) Relevant experience in an appropriate post (eg MTO) which, added to the training period, amounts to not less than 4 years or

4.) Six or more years of post qualification experience relevant to the work of a clinical physiologist and
5.) Assessment of suitability for registration and
6.) Provision of a written undertaking to observe a high standard of professional conduct and
7.) Declaration of support for the Registration Council which is responsible for the Register of Clinical Physiologist

The accepted equivalent qualifications recognised before 2006 are as detailed in Table 1. It should be noted that for other qualifications to be considered details of the course content will need to be provided.

Table 1:
MINIMUM CRITERIA FOR ENTRY ONTO VOLUNTARY REGISTER BEFORE 2006
(1) ACADEMIC QUALIFICATIONS

Before 2003 – BTEC/SCOTVEC ONC/OTEC/NC in Science (MPPM option)
From 2003 - BTEC/SCOTVEC HNC/HTEC/HND in Science (MPPM option) or Dip HE in Clinical Science/Clinical Physiology

Hearing Therapy
Before 1997 Cert HE in Hearing Therapy
From 1997 Dip HE in Hearing Therapy

Other Qualifications which will be considered
BTEC/SCOTVEC ONC/OTEC/NC/HNC/HND
or Dip HE/BSc/BA/Postgraduate Diploma or equivalent qualification in Health related Science Subject
MPHIL/MSc/MA in Audiology, Epileptology, Health Sciences
RGN or nursing degree
PhD in Health related Science Subject

The accepted evidence of competence in the form of professional body examinations are outlined in Table 2.

Table 2:
CRITERIA FOR ENTRY ONTO THE VOLUNTARY REGISTER ASSESSMENT OF TRAINING

Audiology
Part 1 and 2 BAAT examinations
Cardiology
Before October 1st 2000 - ASCST or MSCST
From 2000 - ASCST part 1 and 2
Gastrointestinal Physiology
From 2001 - AGIP Final examination and assessment in GI physiology
Hearing Therapy
Before 2001 – Minimum 210 clinical hours and log book, or placement record, and exit academic equivalent
From 2001 - BSHT Certificate of Competence
2035 clinical hours over minimum of 3 years and log book
Neurophysiology
ECNE part 1
From 2006 - ECNE part 1 and 2
Respiratory Physiology
Before 2001 ARTP/BTS National Assessment
From 2001 ARTP/BTS Examination part 1 and 2
Cardio-Respiratory
ASCST part 1 (or ASCST before Oct 2000) and
ARTP/BTS part 1 (or National Assessment before 2001)

NB. Level 3 NVQ's in Physiological Measurement can also be used as evidence of competence

CRITERIA FOR ENTRY TO THE REGISTER FROM 2006 CAN THEREFORE BE SUMMARISED AS:

1st degree in Clinical Physiology with a discipline specific route from an approved course in UK University or College of Higher Education or other equivalent qualification approved by the Registration Council or the State Registration Board
PLUS
Professional Body Examinations to provide evidence of satisfactory assessment of competence to a level determined by the Registration Council or the State Registration Board

It should be noted that this entry criteria may need to be modified for Audiology and Hearing Therapy to allow for validation of the proposed degree programme in Audiology.

Part of the requirements for application to the register will be a report on training received and expertise gained during training in support of application for admission to register. This will need to cover:

- Experience is needed to demonstrate competence in: performing a range of diagnostic and therapeutic techniques including calibration and quality control procedures as appropriate, having communication with clinical and paramedical staff, the interpretation of results and/or development of treatment plans. Also managing and planning your work activity, being able to produce presentation of work at a professional meeting along with teaching and training

- Evidence of personal initiative including project work, and any other relevant responsibilities and contributions

Whilst all of the arrangements are being finalised for the formation of RCCP and before you receive the official registration forms from your professional body you can start to prepare this report. It should be no longer than 4 typed pages. To help you complete the registration form all of the professional bodies within Clinical Physiology will be producing an example completed form.

Proposed changes to academic courses
These changes are being made in conjunction with current and potential education providers and can be summarised as from 2002:
- BSc Clinical Physiology with specialist routes in Cardiology, GI Physiology, Neuro-Physiology and Respiratory Physiology
- BSc Audiology (incorporating hearing therapy)

The BSc Clinical Physiology will be A Level entry or equivalent qualification/s delivered over 4 years in part time, in preferably a block release format. It is proposed that core modules will be delivered at several locations, discipline-specific modules (all of which will contain relevant underpinning knowledge) will be offered at a limited number of Higher Education Institutions, professional practice/vocational training elements may be an integral part of the overall degree and provision will be included for a HE diploma exit point after 2 years. The course content is summarised in Table 3.

The BSc in Audiology is being tailored specifically for all practitioners in Audiology and will only be available in a limited number of Higher Education Institutions.

To support the changes in both the education and training requirements in Clinical Physiology a strategy document has been prepared which will be circulated to Education and Training Consortia and to Chief Executives / HR Directors of Trusts.

Table 3:
Clinical Physiology BSc (Hons) (4 years part time)

CORE MODULES
Anatomy and Physiology
Applied biological sciences
Disease Processes
Therapeutics
Health service practice
Physics, physiological measurement and instrumentation
Mathematics, Statistics and IT
Communication and psychology of disease
Study skills/research and development techniques
Dissertation (8000 words)

SPECIALIST MODULES
Cardiology
Gastrointestinal Physiology
Neurophysiology
Respiratory Physiology

Questions Raised at the Clinical Physiology/(CCP) Statutory Regulation of Practice Roadshows

Compiled by: Anne Burge, Neurophysiology Department,
City Hospital, Dudley Road, BIRMINGHAM B18 7QH

Also with acknowledgement and thanks to Christine Downie (Monklands Hospital) for collating feedback from the Heads of Department Meetings into a comprehensive report used to develop this article.

1. **Why are the expectations of the CP competent practitioner much higher in comparison with other groups e.g. physiotherapist and radiographers**
   The Clinical Physiology group has set Registration at the independent competent practitioner level. To register below this level would not achieve the aims of statutory regulation of practice which is to ensure practitioners are trained and educated to a nationally agreed standard required to give the public confidence in professional practice.
2. **Why are full time degree students disadvantaged in that they will not be able to become a state registered practitioner at the end of the degree?**
   Both full and part time students can attain this. The key issue is whether the time spent in the work place is enough to obtain the required standard of practice to enable them to function independently and attain professional examinations of competence. If a full time degree course does not achieve this against specified training outcomes for each of the disciplines, these students will need to spend a little more time in the workplace before they can achieve registration to ensure both parity of skills and protection of the public.
3. **Where will the specialist underpinning knowledge be delivered?**
   It is anticipated that it will be impossible for every local education provider of the Clinical Physiology degree course to be able to offer all of the specialist options. The relatively small numbers involved make it non-viable. Therefore it is likely specialist delivery will be limited to a few centres. The amount of sites for each group is likely to be determined by the size of that group and therefore the demand.
4. **What happens if you didn't get support from your Trust in the past for CPD activities and therefore have no information to put on the Registration forms?**
   Put that information down on the form or on your written submission. Also it needs to be remembered CPD activity not only occurs outside of the Trust on paid courses but also as - Departmental/Regional meetings, Audits, Secondments, local Trust initiatives etc
5. **If you work across several professional groups e.g. Cardiology, Respiratory and Neurophysiology do you have to submit several forms?**
   No, one form is sufficient. All of the professional qualifications need to be listed or evidence of training received on competence to practice in all areas of practice.
6. **How will everyone know who to contact as proposers in the initial stages of setting up the register?**
   The information will be available through your professional representative on the Registration Council. Details of how to contact these people will be published via your professional body.
7. **Is there a minimum grade for the independent practitioner?**
   Grading has been a common question. Grading is not connected directly to State Registration. It is hoped there will be a common approach to the grading of the independent practitioner but it is outside of the control of the State Registration system. Hopefully with the introduction of "Agenda for change" which will precede changes in the present pay system, parity will be achieved across different employment groups with the same entry qualifications.
8. **Can a Clinical Scientist propose you?**
   No only other practitioners on the register can propose new applicants.
9. **What will happen to new students who have only just started a BTEC National Certificate course?**
   New entrants will continue to be educated and employed as in previous years. They will however, not be able to apply for registration until they have completed 4 years in service and have obtained all of the required qualifications and professional exams as stated in the entry requirements to the Register. For example: - if they are new to service in 2000 they will need to obtain a higher qualification e.g. BTEC at HNC or Higher National Diploma by 2004 to enable them to apply to the register as well as the relevant professional examinations. Whenever a change in entry requirements is made, new entrants are always likely to be the most affected. What is important is not to disadvantage them in future by denying access to qualifications that are needed. To help in this respect an education and training document has been produced by the Clinical Physiology Group.
10. **How do we go about ensuring we have education providers in the local area?**
    The Clinical Physiology Group needs the details of any local providers to join the education forum meetings that are currently underway. If there is no local provider it may be necessary to set up a multi disciplinary team to enter into discussions with local providers. Details of the degree modules can be accessed via the Clinical Physiology Education Liaison Officer.
11. **Is there a pre registration level available?**
    No, this is not appropriate. Statutory regulation of practice is designed to protect the public and this can only be achieved by ensuring only competent practitioners operate independently. Registrants may have a role in managing other levels of staff but it is not within the remit of the Registration Council or any State Registration Boards to regulate the practice of other levels of staff.
12. **Will Statutory Regulation sort out the anomalies in grading across the country?**
    This has already been covered in question 7. There is no formal link between State Registration and grading. Hopefully though, success in this process can only serve to improve understanding of the level at which practitioners operate and this plus the new pay structure for the future may well improve matters.
13. **If you were exempt from doing the BTEC academic qualification and only attained professional exams what will happen?**
    You will need to apply under the grandparenting arrangements unless you have relevant qualifications which can be considered.
14. **Can Level 3 NVQ's in Physiological Measurement be used instead of professional exams?**
    As the entry requirements state, the NVQ qualification will be considered as evidence of competence.
15. **How will the Registration forms be distributed?**
    Professional bodies will distribute registration forms to members with examples of how the forms should be completed. A letter will also be sent to all heads of departments with details of how to obtain registration forms for non-members; this will be via the registered office of RCCP.
16. **Will there be guidance and an example of how to fill the forms in available?**
    There are guidance notes with the forms and each professional body is planning to distribute an example of a completed form to its members.

17. **Do we have a web site and do we plan to publish the registration form on it?**
Clinical Physiology have just purchased a web site and it is hoped that details will be available once we have a web-site manager.
18. **Can we submit a CV instead of filling in the forms?**
A CV can be submitted as additional information but all sections of the form must be fully completed before practitioners will be considered for entry to the Register
19. **Do I need to get a degree even though I am now at a senior level within the profession?**
It is not necessary to obtain a degree for long standing competent practitioners. It is probably more appropriate to access proposed MSc courses in the disciplines Access to these courses is often via portfolio evidence of life long learning, including experiential and the course is likely to be much more appropriate.
20. **What type of evidence of CPD will be required for re-registration?**
Until the new Health Professions Council [HPC] is established and publishes guidelines we do not know requirements. The advice though is to ensure you keep some sort of a record of CPD activities. Some professional bodies are offering advice on professional portfolio development.
21. **If you are multi-disciplinary do you need to have evidence of CPD for all aspects of your role?**
We would expect this to be a requirement, but will have to wait for the requirements from the new HPC.
22. **What happens if you go into a specialist area at a later stage?**
This is not a problem and in most groups is what will happen. Practitioners will still only be state registered at the basic level. Professional bodies will probably develop evidence requirements to practice at a specialist level of competence or even professional body examinations if not already in place.
23. **What happens to your registration if you take a career break?**
Again we will have to await HPC's guidelines but it may be similar to nursing and other professional groups with refresher courses and supervised practice for a specified time.
24. **Is there an anticipated date for application by Clinical Physiology for consideration for State Registration to the Health Care Professions Council**
We are hoping to be ready to apply to HPC as soon as its doors are open which is anticipated as September 2001.
25. **How do we get onto the voluntary register – with regards proposers?**
Each professional body will hold a list of people who are already registrants to act as proposers and will do their best to propose applicants by finding someone local to the applicant to verify the information provided.
26. **When will the forms be available?**
The forms will be available when Clinical Physiology Group becomes a limited company and formally becomes the Registration Council for Clinical Physiology which is anticipated in December 2000.
27. **How do agency workers fit in?**
All staff working in or contracted to work by the NHS will be required to be State Registered. This obviously includes Agency staff.
28. **Does this apply to staff from abroad with different qualifications?**
Yes. Overseas qualifications and experience will be required to meet the same standards and will be looked at on an individual basis. In the future if they are not accepted qualifications it may be necessary for overseas applicants to take professional exams before obtaining State Registration.
29. **If someone does not choose to go on the register what happens to him or her ultimately?**
Once we become a state registered group Trusts will be unable to employ this member of staff as a state registered practitioner. This does not mean they will be unemployed but will not able to carry out the function and use the protected title. Most Trust's from a Clinical Governance point of view will want to employ staff whose practice is regulated by statute.
30. **Will MTO grades will be replaced by clinical physiology grades?**
No. Under Agenda for Change a total new pay structure is being proposed and this will define pay against job evaluation rather than protected titles.
31. **Where do Vision Science MTO's stand?**
They are not covered at present by clinical physiology but may be included in the future, together with other groups of staff. It is recognised that there are several groups of staff requiring statutory regulation and RCCP may extend voluntary registration to new groups in the future. They would still have to meet the same academic entry requirements.
32. **If you don't hold professional exams can you be state registered?**
Yes. Experienced competent practitioners will be able to become registered under the acquired rights and grandparent clause
33. **Should you put relevant health care qualifications and experience down even if you don't use them now?**
Yes it is all evidence of experience in the NHS and may well give more evidence of competence to practice than it first appears.
34. **If a new student starts now is it enough for them just to have professional exams?**
No they need both academic and professional qualifications. They will not be able to access the grandparent clause, since they will have to satisfy the 6 year rule. Therefore all new students should attain the academic and professional qualifications laid down in the list for criteria for entry. By 2003 they will need a relevant qualification at BTEC HNC/HND or DipHE level and by 2006 a degree in Clinical Physiology plus professional exams for entry to the register. This means that all students from 2000 need to be educated to BTEC HNC/HND level or equivalent and from 2002 should be starting a degree course if they want to achieve state registration in 2006.
35. **If you are involved in both Cardiac and Vascular how is it covered under registration procedures.**
Under RCCP cardiology is a recognised professional group but as yet vascular work is not covered and will not be subject to assessment but may well be in the future – see question 32.
36. **What will it cost and what does this money pay for?**
The cost for registration under the voluntary registration system of RCCP will be £12 annually. This cost will cover the registration process including all of the administrative costs needed to support the Council. This cost is less than most State Registration Boards. It is worth noting that the cost under the voluntary register is the same for all entrants applying to the register including those applying under the grandparent clause which is not the same as under the full State Registration system. This is in the region of £125 with extra costs if an interview is required.
37. **Will Trusts be informed about the changes in education and training requirements for Registration?**
Once RCCP is established we will be formally notifying Trusts of all of the requirements to enable them to manage the situation for the future.

AUSTRALIAN AND NEW ZEALAND SOCIETY OF RESPIRATORY SCIENCE

Melbourne 7th - 9th April 2000

A REPORT BY Dr ADRIAN KENDRICK

Clinical Scientist, Respiratory Dept and Sleep Unit, Bristol Royal Infirmary

Sounds more like an extravaganza gastronomique extraordinaire to me!!! Ed

This year the Thoracic Society of Australia and New Zealand (TSANZ) held itís meeting at the Melbourne Convention Centre. Just before this meeting the Australian and New Zealand Society of Respiratory Science (ANZSRS) had held itís annual scientific meeting under the title of "Quality Assurance in the Respiratory Laboratory".

Melbourne is a busy city founded during the reign of Queen Victoria (1837 - 1901). It is very multicultural and energetic, with a striking blend of the past and present. Its trams run to time, are comfortable, and appear to run everywhere. There are plenty of parks and St Kilda's beach area is a short tram-ride away. Shopping is not too bad either, with a mix of traditional and modern stores (Daimaru).

Then of course there is the food - my favourite! Britain has lost many of its open-air street markets, but not Melbourne. The Queen Victoria Market is a haven for people who love food - fresh vegetables, fresh meat and fresh fish galore. As we lived within 10 minutes walk dinner was bought fresh most days - crabs, prawns, yearling steak, pork, exotic fruit and vegetables - need I say more? For the real foodies, you can even take a guided walking tour - the "Foodies Dream Tour", which last about 2 hours and allows you to sample Emu sausages and Wallaby pies - yummy.

Anyway, enough about food, what about the meeting? The Welcome reception (more food) opened the meeting at the Rialto Towers (7th April). The lift took 38 seconds to the observation deck on floor 55 where the reception was being held. The views, albeit at night, were stunning, the food was good as was the beer. To complete the evening Professor Michael Pain (Royal Melbourne Hospital) reminded us about the good old days of lung function measurement when you had to build blood gas analysers, everything was mechanical and not a computer in sight! The blood gas analyser, circa early 1960's looked like a water bath filled with dirty washing up water, but apparently it worked - you just could not get very quick answers. Michael's talk was, as ever, not only very illuminating, but also full of wonderful humour.

The real work started on Saturday 8th. The "Jeff Whitelaw Plenary Session" opened the meeting, paying tribute to the late Jeff Whitelaw. Associate Professor Robert Jensen (University of Utah) presented an interesting talk entitled "Statistics for Respiratory Scientists" and in particular on the range of statistics used in quality assurance and for reference equations. What is accuracy, precision, the estimated mean, and how do we adequately sample a population? For QA, using Bland-Altman plots or similar provides a useful guide to assessing errors. For reference equations, what population do we use, how do we select them and how do we establish reference equations for routine use? Finally, what is normal and how do we establish the lower limit of normal? The final thoughts were – statistics are here to stay so get a suitable package, use it and do not panic.

The key points from the oral and poster sessions were –

- Maureen Swanney (Christchurch, NZ) presented data showing that the FEV6 may be useful index in place of the FVC, especially in patients with severe COPD. Further work on the FEV6 was presented at the ATS in Toronto.
- Adrian Kendrick (Bristol, England) noted that the FEV1/TLC ratio may a useful index to differentiate between patients with normal lung function and those with airway obstruction, restrictive defects and combined defects.
- Alan Crockett (Flinders Medical Centre) described additional indices of Forced Expiratory Time (FET), Volume of Back Extrapolation and the FET to Peak Expiratory Flow (FETPEF) provided useful, additional indices that can be used as part of a QA programme.
- Danny Brazzale (Austin & Repatriation, Heidelberg) observed that using rapid gas analysers, the identification of the alveolar plateau is easier during TLCO measurements. A more accurate assessment of the effects of dead space washout volume can be obtained. These were compared to the ATS criteria for washout volume and it was observed that higher washout volumes than those in the ATS recommendations are required to adequately flush deadspace gas during TLCO measurements.
- David Johns (Alfred, Melbourne) presented a new, novel device to produce a known value of TLCO and VA to validate testing systems. This system has been designed to evaluate equipment performance or to quantify measurement accuracy and precision. The device was within 3.3% error from the target value for TLCO, within 2% for VC and 0.4% for VA, demonstrating that this physical method provides an accurate system for assessing TLCO.
- Michael Brown (Royal Brisbane) investigated simulated altitude using a reduced FIO2. Breathing an FIO2 of 13% ((3750 m) mean resting SaO2 was 87%, dropping to 78% at peak exercise. Mean max workload and VO2 was 85% of the max workload on air whilst mean peak ventilation was 75% of predicted MVV. The results are similar to those reported from maximal exercise parameters at high altitude and should therefore allow assessment of the effects of altitude on drugs etc.
- Stuart Jack (Alfred, Melbourne) evaluated the new Medical Graphics lung function equipment and found it accurate, reliable and easy to use
- Billy Skoric (Alfred, Melbourne) assessed nebulizer and pressure output from the Mefar dosimeter using the LiCl technique – different batches of nebulizers and different driving pressures give different aerosol outputs.
- Jacquelyn Furler (Canberra Hospital) produced a standardized 6 minute walking protocol to allow any department to perform this test and exchange results thereby not requiring the patient to undergo repeated unnecessary tests. The protocol is simple and easy to use requiring a pulse oximeter, stopwatch and a very long corridor. Within their hospital, data is now shared between departments.
- Ahmed Badawy (Toorak Gardens, SA) demonstrated that two methods of histamine challenge testing ñ Jaeger dosimeter vs Wrights gave differing results in the same subjects. Only 3/11 positive responders using the Jaeger showed a similar response on the Wrights at PC20 whilst 6/11 had a borderline response on Wrights. This demonstrates that different challenge systems may produce different results in the same subjects.
- Annette Dent (Prince Charles Hospital, Brisbane) demonstrated the familiar problem of different spirometers giving different answers in the same patients. Comparing the Vitalograph wedge-bellows to the Jaeger CompactLab flow sensor, differences of > 500 ml (> 14% predicted) were observed between the two systems in patients with COPD/asthma and around 220ml (> 5% predicted) in normal subjects. Caution should be used when comparing spirometry using different measuring devices in patients with lung disease as observed differences in VC may influence therapeutic decisions.

- Paul Finlay (Monash Medical Centre, Melbourne) studied patients with COPD and possible swallowing difficulties. Using breathing patterns and videofluoroscopy, there was a greater incidence of penetration or aspiration in the COPD group compared to normals, which was possibly due to an increased incidence of inspiration directly following swallowing in the COPD patients.
- Belinda Breust (Princes Alexandra Hospital, Queensland) demonstrated that there is clinically significant interlaboratory variability in heart rate, maximum ventilation, maximal VO2 and maximum work rate. Coefficients of variation (CV) ranged from 0.6% to 10.5% within systems, whilst between systems the CV ranged from 1.2% to 13.4%. The differences were due to different predicted equations, calibration factors and instrumentation.
- Evangelia Daviskas (Camperdown, NSW) demonstrated that an acute dose of Mannitol increased mucus clearance acutely in patients with bronchiectasis, but also the effect extends to beyond 24hr. The optimum daily dose and the long-term clinical benefits have yet to be determined.
- Michele Rozee (Flinders Medical Centre) assessed the minimum lung function for the Lion Alcometer SD-400. This new device requires and minimum mean flow rate of 19.6 l/min, sustained for 2.13 seconds with a mean volume of 0.7 litres required. Resistance was a mean of 1.22 kPa/l/s. This is a considerable improvement on previous devices, but a clear relationship was shown between FVC and the ability to provide a sample. Subjects with a low FVC were generally unable to provide adequate samples.
- Sean Homan (Queen Elizabeth Hospital, Woodville) assessed the effects of lung volume reduction surgery (LVRS) on lung function and concluded that changes in the ventilated lung volume were necessary for an improvement in spirometry following LVRS.
- Gary Nolan (Gosford Hospital, NSW) described the effects of postural loading on respiratory muscle strength in chronic airflow limitation (CAL). Postural loading was applied by getting the subjects to bend over, thereby compromising diaphragm function. In patients with CAL, there was a greater limitation in lung function than compared to normal subjects.
- Alison Hansford (ResMed) rounded off the meeting with a short talk entitled "On Top of the World.....Almost" and showed some spectacular slides of her recent climbing trip.

The day finished off with more food and drink – the ANZSRS Dinner, held in the Grand Hyatt Melbourne. Good food, beer, wine, prizes and great company made for an excellent night.

The Sunday meeting (9th April) commenced with a symposium on "Quality Assurance in the Respiratory Laboratory".

- John Martin (St Vincent's Hospital, Melbourne) highlighted the sources of errors in spirometry, and the problems of volume and flow measuring devices, patient problems (leaks, effort, posture etc.)
- David Johns (Alfred, Melbourne) highlighted the problems with TLCO – inter-laboratory variability, instrumentation, leaks, linearity, standardization and the need for an absolute standardization system for TLCO measurements.
- Peter Rogers (Concord Repatriation Hospital, NSW) outlined the problems of lung volume measurements, particularly the problems of black boxes (computers) and the give (fast easy and automatic) and take (loss of control, someone else's specifications). How do we calibrate a black box, with what and what does it mean? Can we calibrate it the way we want to?
- Jeffrey Pretto (Austin & Repatriation, Heidelberg) outlined the range of errors in the pre-analytic, analytic and post-analytic phases of blood gas analysis. Emphasis was placed on the pre-analytic phase with potential errors including air bubbles, heparin dilution and subject stability. The effects of these were described.
- Brenton Eckert (Princess Alexandra Hospital, NSW) highlighted the problems of reference values in laboratories, what they mean, what age groups can we apply them to and differences observed in measured and stated height. So what is normal in your laboratory?
- Robert Jensen (University of Utah) outlined the validation of equipment in terms of QA, the limitations of point calibrations, of flow-based and volume spirometers and how we should test and calibrate them using a pulmonary waveform generator to pass the ATS recommendations. Further outlines on TLCO calibration systems, exercise systems and lung volume systems were also briefly outlined. In conclusion, validation is an excellent tool to teach you exactly how your device operates in theory and practice and enables you to interact with manufacturers about technical issues.
- Lloyd Penberthy (RCPA-AACB Chemical Pathology QA Programs, Flinders Medical Centre) illustrated the many problems associated with QA in blood gases analysis. The talk was illustrated with many plots of assessing QA and how for a fixed known sample of PO2 or PCO2 widely different values can be obtained from apparently calibrated blood gas analysers. For instance, for a target PO2 of 54 (5 mmHg, values ranging from < 41 mmHg to > 67 mmHg were obtained. Similarly, for a target PCO2 of 45.5 (3.6 mmHg, values ranged from < 36.0 to > 55.0 mmHg. Methods of analysing, presenting and summarizing the data were illustrated. Overall, a well designed QA program is an essential tool for peer review and self-assessment although the question of accuracy is difficult to solve. New approaches are being sought to extend assessment beyond simple statistics and to introduce the concept of Clinical Acceptability of results.
- Stephen West (Westmead Hospital, NSW) and Rein Simmul (Royal North Shore Hospital, NSW) outlined the processes of accreditation of respiratory laboratories and the evaluation of equipment respectively.

To conclude the meeting, the final session outlined challenge testing and aerosol performance.

- Sandra Anderson (Royal Prince Alfred Hospital, NSW) outlined the problems with challenge testing, including which indices to use, the right terminology, convincing colleagues that actually challenge testing is useful and why, and what is normal. The suitability of exercise challenge, hyperosmolar challenge was also outlined. Guidelines have been produced – ATS (2000), ERS (1993), but more work needs to be done to deal with new drugs and how to assess their usefulness.
- David Johns (Alfred, Melbourne) ended the meeting outlining evaporative loss and aerosol output from jet nebulizers. Factors affecting output include solution temperature, the environment, static charge, fill volume, nebulization time, driving pressure, residual volume viscosity and surface tension. Assessing aerosol output and the effects of driving pressure can now be easily assessed using LiCl (Ward et al, ERJ 1998) which is easier to use than NaF (Dennis et al, Thorax 1990). Knowing the performance of nebulizers is important, not only in clinical practice, but also when using nebulizers for challenge testing.

The meeting was very good, and very clearly outlined the problems of quality assurance and where we might go in the future. Clearly more needs to be done both by the users and by the manufacturers.

It was good to see colleagues that I last met up with in Perth a few years ago. For those interested in going to the meeting next year it is in Brisbane 16th to 18th March 2001. Now let's get some more food and beer!

BURSARY REPORT

The report below represents a change from many of the articles on scientific research, or meeting reports that usually make up the majority of material for Inspire.

We feel that this excellent and thought provoking article puts emphasis on another important part of our work that is often undertaken but rarely acknowledged. I would welcome reader's comments and viewpoints. Perhaps it may encourage others to write articles on other wider and more diverse issues – Ed.

In March 2000 we were told at the weekly CF team meeting that one of the consultants had been asked to go to another Trust region to see a very sick cystic fibrosis patient. We will call her Lucy, and she was 20 years of age.

She had suffered from cystic fibrosis all of her life and had led, up to this point, a very full life. She attended school, then went on to college in Coventry to study photography. She had many friends there and was sad to leave them to return home because of her illness.

It was decided, because she was so ill, that she be transferred to the Adult Cystic Fibrosis Unit in Edinburgh for further treatment. She duly arrived and the CF team was asked to pop in and visit her when they had a spare minute, just so that she had some visitors.

To add to her problems, Lucy's mum was a single parent who had psychological problems due to the guilt she felt at Lucy's birth, and also the fact that Lucy had cystic fibrosis. This led to her mum being admitted on many occasions for psychiatric treatment. But the thing that stood out to the outsider in her stay with us was the great concern and love that they had for each other.

At this stage, her mum was an also an inpatient in her home area and had to come with a nurse escort to visit Lucy. This was sometimes difficult to arrange, but they kept in touch by telephone most days. Her room was made to be like a bed-sit. Sometimes you could not move in it for equipment, cuddly toys, magazines and people! And, wherever possible, there was laughter.

We had to carry out daily spirometry on her, when she was well enough, but often she was not. She always wanted all your news, family news, what you had been doing at the weekend. If you were going on holiday, she requested that you take plenty of photographs and send her postcards so that she could visit the area by pictures as she knew she would never see them herself.

Lucy became a part of my life; I visited her daily and, on occasions, my husband and I would visit her. My hairdresser came to cut her hair on her day off. On the arranged day Lucy was unwell and the nurses told the hairdresser she would not be able to have it done, but when they checked she was adamant that she wanted it cut. When I arrived she had come off Bi-Pap and was holding the oxygen mask to have her hair cut so that she could "look pretty". She loved chatting-up the doctors, but with a special respect for the consultants! Always with a twinkle in her eye. Whenever possible we brought her up to the department for coffee and cakes; she loved that, but as we all know we work in busy departments so it was not often possible, but she appreciated it anyway.

The CF nurses arranged a few visits out; as she had to be on oxygen all the time it sometimes proved difficult, but they managed. On one of these occasions she went to a shopping center to buy presents for her mum and friends, and also clothes for herself, when she came back she was elated.

I myself have a grown-up daughter (who is also a trainee Respiratory technician), and when I would buy her a top or anything, I bought one for Lucy too. So for that time it seemed as if I had 2 daughters, and Lucy used to laugh and ask what Cara thought of that. I told her it was okay and that Cara had always wanted a sister or brother anyway. Or when I went off on holiday or for the weekend I would ask her if there was anything she would like. She would always say just bring yourself back and come to see me soon, and would give me a big hug before I left, (and when I came back). But I always had to remember the photographs and I would always hunt for a "wee pressie".

I was going on holiday in September, her 21st birthday was the weekend I returned home, and the consultants gave the go ahead to arrange a 21st in the ward as by now she was unable to go any distance. The teaching room was the venue, many plans were made and Lucy gave out the invitations to all the friends she had made.

I arrived back on the Friday afternoon with a message to phone work as soon as possible. I knew why .... Lucy had died four days before her 21st birthday and two days before her party.

She was actually buried on her 21st birthday, and as many as possible from the team attended the service. Her 21st presents were flowers, and instead of laughter there were tears.

The reason I have written this article is because I feel we sometimes forget the person behind the patient and, in this circumstance, we as staff could help. Yes many of the Respiratory Unit staff gave up their free time especially at the weekend, but not one of us minded. But you do not even have to do that, just try to remember that the patient is a person. We don't know how they are feeling; nervous, frightened and very vulnerable when they enter our department, and it is important that they are put at ease when we are doing the tests.

Who knows - in some little way we may help someone.

Yes we have to perform the many technical tests and achieve the best results, but we must not forget the patient whilst doing that. Lucy was probably an exception as she had little family support, and was a young, long-term patient with cystic fibrosis, but it brings it home, for many of us, our work is more than just a job.

I would like to take the opportunity to thank the ARTP Executive for granting me a bursary for my travel expenses to the Winter 2000 meeting in Daventry.

Jill Fallen, MTO3/MTO4
Respiratory Function Lab., Western General, Edinburgh.

SCIENTIFIC PAPER

The Nitrogen recovery method of lung volume measurement : A validation against multibreath helium and body plethysmography.

Carter R, Banham SW, Stevenson RD.
Department of Respiratory Medicine, Glasgow Royal Infirmary
North Glasgow University Hospitals NHS Trust

Abstract

The Transflow (Morgan Medical, Kent, England) is designed as an open circuit system to provide a method of lung volume determination utilizing nitrogen recovery (NR).

We have validated this technique against body plethysmography (BB) and multi-breath helium dilution (MHD) in patients according to the degree of airflow obstruction based the level of the FEV_1 (n = 50 in each group). Subject Categories: no airflow obstruction (FEV1/FVC >70%), mild airflow obstruction (FEV1 <80% >60% predicted, FEV1/FVC< 70%), moderate airflow obstruction (FEV1 <60%>40% predicted, FEV1/FVC<70%), and severe airflow obstruction (FEV1 <40% predicted, FEV1/FVC <70%).

In the patients with normal lung volumes or restrictive defects and no airflow obstruction, there was good agreement between all methods of measurement. Bland and Altman analysis [NR v BB mean difference –0.03 Litres (SD 0.13), NR v MHD mean difference –0.02 (0.09)] with the differences between the various methods evenly arrayed around zero difference; this relationship was similar at all values of TLC. The same relationship was observed for patients with mild [NR v BB mean difference –0.05 (0.16); NR v MHD –0.04 (0.12)] and moderate obstruction [NR v BB mean difference –0.21 (0.27); NR v HMD –0.14 (0.12)]. Although there was a tendency for the difference to increase with increasing airflow obstruction there was no significant difference between the mean NR volume (litres) and TLC BB or TLC HMD in patients with no obstruction [NR 5.48 (1.15), MHD 5.50 (1.22), BB 5.51 (1.22)]; mild [NR 6.10 (1.21), MHD 6.09 (1.22), BB 6.15 (1.23)] or moderate obstruction [NR 5.82 (0.99), MHD 5.90 (1.01), BB 6.03 (1.06)]. In the patients with severe airflow obstruction, however, the NR volume (Mean 6.29 (1.16) was significantly lower than both HMD TLC [6.73 (1.22); Mean difference –0.44 (040); p <0.05)] and BB TLC [7.23 (1.40) Mean difference –0.94 (0.69); p <0.01] but did give a better estimate of the true lung volume than a single breath helium dilution alveolar volume (V_AHE 5.49 (1.22); p<0.01). Linear regression analysis showed there was a significant relationship between the degree of airflow obstruction and the difference between the NR alveolar volume and MHD TLC [Difference = 0.0178 (FEV1/VC%) – 1.08 litres; correlation coefficient 0.63] and BB TLC [Difference = 0.0281 (FEV1/VC% - 1.715 litres; correlation coefficient 0.67].

In conclusion, there is good agreement between the NR method and TLC by MHD and BB in patients with moderate, mild and no airflow obstruction. There is, however, a tendency for the difference between NR and the other methods to increase with increasing airflow obstruction that becomes significant at more severe levels of airflow obstruction. The NR lung volume gives a better estimate of the total lung capacity then the single breath helium dilution alveolar lung volume in patients with more severe airflow obstruction although this is still a significant underestimate compared to body plethysmography and multi-breath helium dilution.

Introduction

The Transflow (Morgan Medical, Kent, England) has been designed as an open circuit method of lung volume determination utilizing nitrogen recovery. The principles employed in the measurement of total lung capacity with this method derive from the calculation of the recovery of resident inert gas in the lung in the course of a full vital capacity manoeuvre following the inhalation of a gas mixture of known constituents. Cumming and co-workers[1] have comprehensively reviewed the factors influencing the level of nitrogen recovery. The calculation of total lung capacity by this method is performed during the breathing manoeuvre for the measurement of the single breath transfer factor. In the conventional single breath method the gas mixture contains helium, carbon monoxide, oxygen and nitrogen. The resident nitrogen very rapidly assumes an equilibrated concentration within the lung after its modification by an incoming mixture of gases. Helium, which is traditionally used to measure alveolar volume, by comparison as a constituent of the incoming mixture and not hitherto represented in the lung, takes relatively longer to reach equilibrium[2]. It is suggested that the nitrogen recovery method because of the greater mixing efficiency of nitrogen than helium will yield results of total lung capacity which are closer to body plethysmographic and closed circuit multibreath helium dilution estimations than the single breath helium alveolar volume. A recent article by Cliff et al[3], however, showed that although the nitrogen recovery method worked well for subjects with normal lung volumes and no airflow obstruction when compared with multibreath helium and body plethysmography there were marked discrepancies in patients with lung and chest disorders. In particular the nitrogen recovery method agreement with multi-breath helium and body plethysmography was poor in patients with airflow obstruction. In this study, however, there was no separation of the subjects according to the level of airflow obstruction. In order to assess the effect of the degree of airflow obstruction on the discrepancy between the nitrogen recovery method and more traditional methods of measuring total lung capacity we have repeated this comparison in groups of patients with no airflow obstruction through to severe airflow obstruction. In addition, we compared the total lung capacity obtained by nitrogen recovery to that calculated from the single breath helium concentration to assess if nitrogen recovery gives a better estimate of the true lung volume in patients with airflow obstruction.

Methods

Body plethysmography (BB) is the method of choice in our laboratory for the estimation of total lung capacity. After performance of this test and based on the measurement of dynamic spirometry we separated the patients into groups of subjects who showed no

airflow obstruction (FEV_1/FVC ratio > 70%), mild obstruction (FEV_1 <80% >60% predicted, FEV_1/FVC <70%), moderate obstruction (FEV_1 <60% >40% predicted, FEV_1/FVC <70% and severe airflow obstruction (FEV_1 <40% predicted, FEV_1/FVC <70%). Vital capacity (VC) was also measured.

After informed consent was obtained the patients went on to perform a multi-breath helium dilution (MHD) and estimation of nitrogen recovery (NR) total lung capacity in random order. The NR lung volume was performed on a Transflow System (Morgan Medical, Kent, England) the lung volume being obtained during the measurement of the single breath transfer factor for carbon monoxide. We have previously given a description of the Transflow system and validated the measurement of the single breath transfer factor against a traditional method of measurement [4,5].

The alveolar volume for nitrogen recovery is calculated from the following equation:

$V_A(N^2)$ = (Volume Inspired – Dead Space)*[(Alveolar N^2 – Inspired N^2) / (Alveolar N^2 – Expired N^2)*0.95]

Dead space = Instrument dead space (breathing valve, barrier filter volume, and mouthpiece volume) + anatomical dead space. Alveolar N^2 represents the percentage of inert gas in the alveolar volume during quiet respiration after drying of the gas and removal of carbon dioxide (83.9%).

This equation compares with the alveolar volume using single breath helium which is calculated from the following equation:

V_A (HE) = (Volume Inspired – Dead Space) * [(Inspired He) / (Expired He*0.95)]

Only tests where the inspired vital capacity agreed within 85% of the best vital capacity obtained on relaxed or forced spirometry were used in the analysis. A minimum of two technically acceptable and repeatable measurements were averaged and used for analysis.

The multi-breath helium dilution (MHD TLC) technique was performed using a Model B System (Morgan Medical, Kent, England). Plethysmographic measurements were obtained in a computerized constant volume body plethysmograph (Sensormedics V6200, California, USA). Total lung capacity (BB TLC) was obtained by averaging a minimum of three technically acceptable manoeuvres against the closed shutter. The vital capacity used for MHD TLC and BB TLC was the highest obtained during any relaxed or forced expiratory effort.

Quality control and procedures of lung function testing were performed according to formal guidelines established by the European Respiratory Society (ERS)[6] and recommended by the British Thoracic Society (BTS) and the Association of Respiratory Technicians and Physiologists (ARTP) [7]. Predicted normal values of lung function tests were determined using the European Community for Steel and Coal equations [6].

Data presentation and statistics

Unless otherwise stated values are expressed as mean +/- standard deviation (SD). Comparisons between values obtained for the different methods of total lung capacity were performed using the paired samples Student's t-test and Bland and Altman analysis[8]. The relationship between the degree of airflow obstruction and the measurement of alveolar volume by nitrogen recovery compared to the traditional methods of TLC measurement were assessed by linear regression analysis. A level of $p < 0.05$ was considered significant.

Results

Table 1 shows the characteristics of the four subject groups separated by FEV1 % predicted, into no airflow obstruction, mild, moderate and severe airflow obstruction. In the subjects with no airflow obstruction 39 had normal lung volumes and 11 had a restrictive defect which was defined as a TLC BB of less than the following equation: [TLC predicted value – 2(SD)]. Of the patients with restrictive defects; 2 patients had rheumatoid arthritis, 2 patients asbestos related pleural disease, 4 patients connective tissue disease and 3 patients cryptogenic fibrosing alveolits. Of the patients with airflow obstruction; 59 had a diagnosis of asthma and showed a minimum increase of 200 ml and 15% in FEV_1 following bronchodilator administration; 46 had a diagnosis of chronic bronchitis and 45 had a diagnosis of emphysema (Chest x-ray, irreversible airflow obstruction and reduced transfer factor).

Table 1: Comparison of demographic details and baseline spirometry in patient groups

N=50	*Male/Female Ratio*	*Age (range) Years*	*Mean FEV1 (SD) % predicted*	*Mean FVC (SD) % predicted*	*FEV1/VC % (SD)*
No airflow obstruction	33/17	40.3 (18-53)	82.5 (14.9)	89.5 (16.4)	79.0 (4.6)
Mild obstruction	31/19	42.7 (23-61)	71.5 (5.5)	81.5 (7.9)	61.6 (4.5)
Moderate obstruction	35/15	55.2 (26-65)	50.8 (6.0)	74.7 (8.2)	48.2 (5.6)
Severe obstruction	39/11	57.5 (33-72)	32.2 (5.2)	67.2 (6.9)	34.3 (4.3)

The mean alveolar volumes and total lung capacities as estimated by the various methods of measurement are shown in Table 2. For subjects with no or mild airflow obstruction there was no significant difference between the methods of measurement although there was a tendency for the plethysmographic method to give the highest value and the single breath helium the lowest value for total lung volume and alveolar volume, respectively. In subjects with moderate airflow obstruction the value of alveolar volume as assessed by single breath helium was significantly lower than the other methods of measurement with body plethysmography giving the highest value for total lung capacity. In these groups of patients, the NR TLC was lower than both multibreath helium dilution and body plethysmography, however, this difference did not reach statistical significance. In subjects with severe airflow obstruction all methods of measurement were significantly different with as expected the body plethysmographic determination producing the highest value and the single breath helium determination the lowest. The NR TLC produced a higher value than the single breath helium estimation that was closer to but still significantly lower than both the estimation of total lung capacity based on multibreath helium and body plethysmography. Body plethysmographic estimation of total lung capacity was significantly higher than MHD TLC in these patients.

Table 3 presents Bland and Altman analysis data of NR alveolar volume against BB TLC and MHD TLC in the patient groups. This shows the increasing difference between both the standard methods of measurement and NR lung volumes with increasing severity of obstruction. This data is graphically presented in patients with no airflow obstruction (Figures 1 and 2) and with severe airflow obstruction (Figures 3 and 4). In patients with severe airflow obstruction there is a tendency for the difference between NR and BB TLC and NR and MHD TLC to increase with increasing lung volume.

Figures 5 and 6 show a significant relationship between the degree of airflow obstruction as expressed by the $FEV_1/VC\%$ against the difference between NR alveolar and multibreath helium dilution and body plethysmography for all patients with airflow obstruction (NR-MHD TLC, correlation coefficient 0.63; NR-BB TLC, correlation coefficient 0.67). This confirms the tendency for the difference between the single breath NR alveolar volume and the more conventional methods of measurement to increase with increasing airflow obstruction.

Discussion

In this study we have found that there is good agreement between the NR alveolar volume and TLC by MHD and BB in patients with mild to moderate airflow obstruction and in a group of patients with no airflow obstruction. There is, however, a tendency for the difference between NR and the other methods to increase with increasing airflow obstruction that becomes significant at more severe levels of airflow obstruction. When all the data points are plotted there is a significant relationship between the degree of airflow obstruction as assessed by $FEV_1/VC\%$ and the difference between NR alveolar volume and the more conventional methods of TLC estimation. The NR alveolar volume gives a closer estimate to the TLC as measured by MHD and BB than the single breath helium alveolar volume in all groups studied including those patients with severe airflow obstruction. In subjects with more severe airflow obstruction, however, this still represents a significant underestimation compared to MHD and BB TLC.

The difference between the value of single breath helium and NR alveolar volume is caused by the physical characteristics of the test gases and the condition of the solvent gas before and after the test [1]. Helium has a low density, high molecular speed and a large alveolar concentration gradient, but it also has a high viscosity. Nitrogen is less viscous than helium and a large volume of nitrogen is already resident in the lung at an elevated temperature and molecular speed. It has been shown by Chang et al[2] that the introduction of a light gas (Helium) into a heavier solvent gas (Nitrogen) has the effect of speeding up the molecular velocity of the heavier gas (Nitrogen) at the expense of the lighter gas (Helium). This effect greatly enhances the mixing of nitrogen but retards the distribution of the test gas helium within the lung. For this reason nitrogen mixes much more rapidly than helium within the complex alveolar tree. It is suggested that during a single breath manoeuvre the enhanced mixing properties of nitrogen within the lung will produce an alveolar volume that more closely reflects the TLC to which it is exposed. The current study supports this hypothesis in that the NR alveolar volume is closer to the TLC as measured by plethysmography and multi-breath helium dilution in all the patient groups studied.

When compared to the two most commonly used methods for the measurement of total lung capacity, multi-breath helium dilution and body plethysmography the NR alveolar volume compares favourably in subjects with no airflow obstruction. There is however a tendency for the difference between methods to increase with increasing airflow obstruction. This does not reach statistical significance until patients with severe airflow obstruction in which the limits of agreement between NR and MHD are –1.06 to 0.26 and between NR and BB TLC –1.87 to 0.37. There is an obvious bias in this group for the NR alveolar volume to underestimate the TLC as assessed by the more commonly used methods.

Both NR and MHD methods of measurement of the lung volume are inert gas dilution techniques and are therefore only measuring areas of the lung that the inspired helium or nitrogen is able to enter (communicating gas volume). In contrast, body plethysmography is a measure of compressible gas volume and measures all the gas within the thorax. Previous comparisons in normal subjects have shown excellent agreement between plethysmographic and dilutional methods for measuring total lung capacity[9]. Good agreement has also been shown between dilutional and plethysmographic measurements in patients with restrictive lung disease[10]. These findings are confirmed by the present study which also shows good agreement between the total lung capacity derived from the single breath nitrogen recovery method and multibreath helium and plethysmographic lung volumes in normal subjects and patients with restrictive lung disease.

In subjects with airflow obstruction some regions in the lung will be poorly ventilated during tidal breathing. In severe emphysema, bullous areas may be virtually unventilated. Body plethysmography measures compressible gas volume, which will include air that is in poorly or non-ventilated areas of the lung or trapped by closure of airways at low lung volumes. This means that gas dilution

techniques may underestimate the volume of gas within these poorly ventilated areas [10-12] as narrowed or closed airways do not freely admit helium or nitrogen. Single breath techniques are subject to greater error than multibreath methods when compared to plethysmographic methods[13]. In a group of 12 patients with chronic obstructive pulmonary disease Spence et al [11] showed that mean TLC was greater as measured by plethysmography than by helium dilution methods. The study by Dahlqvist and Hedenstierna [10] showed that helium dilution underestimated TLC by a mean of 0.9 litres when compared with conventional body plethysmography with the differences between the techniques increasing with increasing lung volume. In the present study the mean difference between helium dilution and conventional body plethysmographic TLC increased with increasing obstruction but was lower than previous studies with a mean difference of 0.5 litres in patients with severe airflow obstruction. This compares with the mean difference of 0.63 litres between multi-breath helium and conventional plethysmographic TLC in the study of Pare et al [12]. The largest differences between MHD and BB TLC in this study reflect those patients with the greatest magnitude of non-ventilated areas or emphysematous bullae.

The underestimation of total lung capacity using the single breath nitrogen recovery method has previously been shown by Cliff et a[3]. This study showed poor agreement between nitrogen recovery and helium dilution or body plethysmography especially for subjects with airflow obstruction. In this study there was no attempt to categorize the difference according to the degree of the airflow obstruction. The present study shows that the single breath nitrogen recovery method gives lower values than both MHD or BB TLC but that this method agrees sufficiently with the conventional methods in subjects with no airflow obstruction and in those with mild to moderate airflow obstruction to be of use in a clinical setting. The benefit of this system is that an estimation of the total lung capacity based on NR can be performed during the same manoeuvre as that required for the measurement of the transfer factor and that this therefore minimizes testing time and discomfort for the patient.

In subjects with more severe airflow obstruction however, the NR method gives a closer estimate than the single breath helium but still underestimates the true total lung capacity as measured by the two most commonly used methods. This confirms that single breath methods are subject to greater errors than multi-breath techniques. Differences between methods in this group of subjects are significant and variable which would preclude its use for accurate measurement of static lung volumes. Even in patients with airflow obstruction the NR method is able to give a value for TLC which is within 500 mls of that obtained by plethysmography in 16 of 50 subjects which suggests that even in the presence of severe airflow obstruction these particular patients have reasonable ventilation to all areas of the lungs. In keeping with previous studies there is a tendency for the difference between the single breath NR and BB TLC to increase with increasing lung volumes in patients with severe airflow obstruction. This presumably reflects an increasing degree of poorly or non-ventilated lung volume and emphysematous bullae in patients with more severe hyperinflation on plethysmographic lung volumes.

In conclusion this study shows that there is good agreement between the NR method and TLC by multi-breath helium dilution and body plethysmography in patients with normal lung volumes or restrictive defects with no airflow obstruction or in patients with mild and moderate airflow obstruction. This suggests that this method may be useful as a screening assessment where more conventional methods of measurement are unavailable. There is however a tendency for the difference between NR and the more conventional methods of measurement to increase with increasing lung volume and airflow obstruction that becomes significant at more severe levels of airflow obstruction when compared to both multi-breath helium and body plethysmography. The TLC obtained by NR in patients with severe airflow obstruction is a closer estimate than that obtained by single breath helium which supports the better mixing efficiency of nitrogen but it can still be a considerable underestimate compared to conventional methods. This study also confirms that body plethysmography provides the best estimate of total lung capacity regardless of the presence of airflow obstruction and this will remain the method of choice in our laboratory.

Table 2: Mean alveolar volume using the nitrogen recovery method compared to multibreath helium dilution, body plethysmography and single breath helium in patients with varying degrees of airflow obstruction

Category (N=50)	*SB Helium Alveolar Volume (V_AHE)*	*NR Alveolar Volume*	*MHD TLC*	*BB TLC*	*p-value*
No obstruction	5.24 (1.25)	5.48 (1.15)	5.50 (1.22)	5.51 (1.22)	NS
Mild obstruction	5.90 (1.31)	6.10 (1.21)	6.09 (1.22)	6.15 (1.23)	NS
Moderate obstruction	5.31 (1.04)	5.82 (0.99)*	5.90 (1.01)	6.03 (1.06)	*p <0.05
Severe obstruction	5.49 (1.22) **	6.29 (1.16)* **	6.73 (1.22)* **	7.23 (1.40)* **	*p <0.05 **p<0.01

Key: SB Helium Alveolar volume calculated from helium dilution during a single breath transfer factor measurement; NR Alveolar Volume calculated from Nitrogen Recovery method during a single breath transfer factor measurement; MHD TLC Total lung capacity derived from multi-breath helium dilution; BB TLC Total lung capacity measured in a constant volume body plethysmograph.

Values are Mean Litres (SD).

Table 3: Bland and Altman analysis of Nitogen Recovery lung volume (NR) compared to BodyPlethysmography (BB TLC) and Multi-breath Helium (MHD TLC) lung volumes.

GROUP N=50	NR- BB TLC Litres			NR-MHD TLC Litres		
Degree of Obstruction	**Mean Difference**	**S.D.**	**Limits of agreement**	**Mean Difference**	**S.D.**	**Limits of agreement**
None	-0.03	0.14	-0.31 to 0.25	-0.02	0.09	-0.20 to 0.16
Mild	-0.05	0.16	-0.37 to 0.27	-0.04	0.12	-0.28 to 0.20
Moderate	-0.21	0.27	-0.75 to 0.33	-0.14	0.12	-0.38 to 0.10
Severe	-0.94	0.69	-2.32 to 0.44	-0.44	0.40	-1.24 to 0.36

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ADDRESS FOR CORRESPONDENCE
Roger Carter, Principal Clinical Scientist, Department of Respiratory Medicine
Queen Elizabeth Building, Royal Infirmary, Alexandra Parade, Glasgow Royal Infirmary G31 2ES

Figure 1: Total lung capacity by Nitrogen Recovery versus Body Plethysmography in patients with no airflow obstruction N=50.

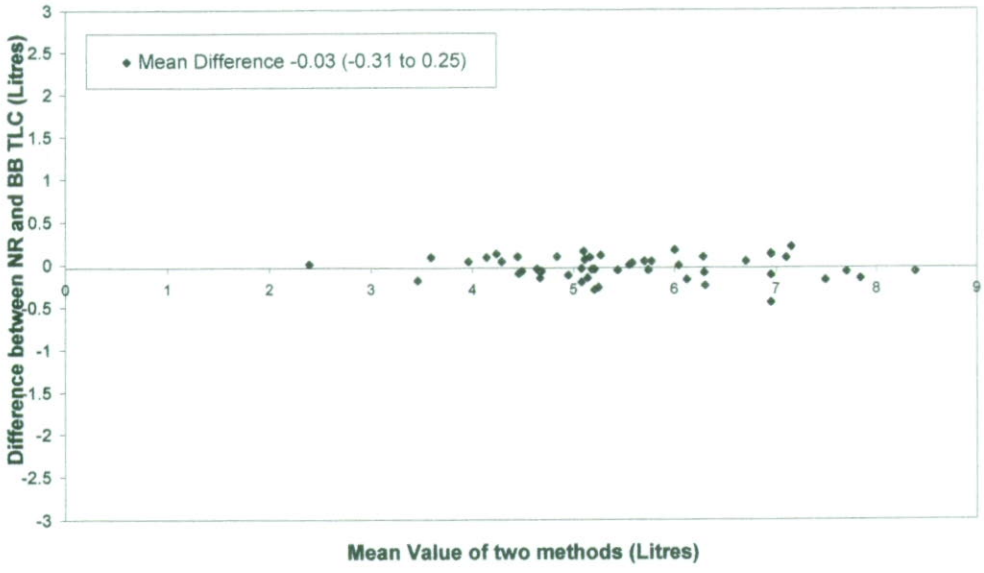


Figure 2: Total lung capacity by Nitrogen Recovery versus Multibreath Helium Dilution in patients with no airflow obstruction N=50.

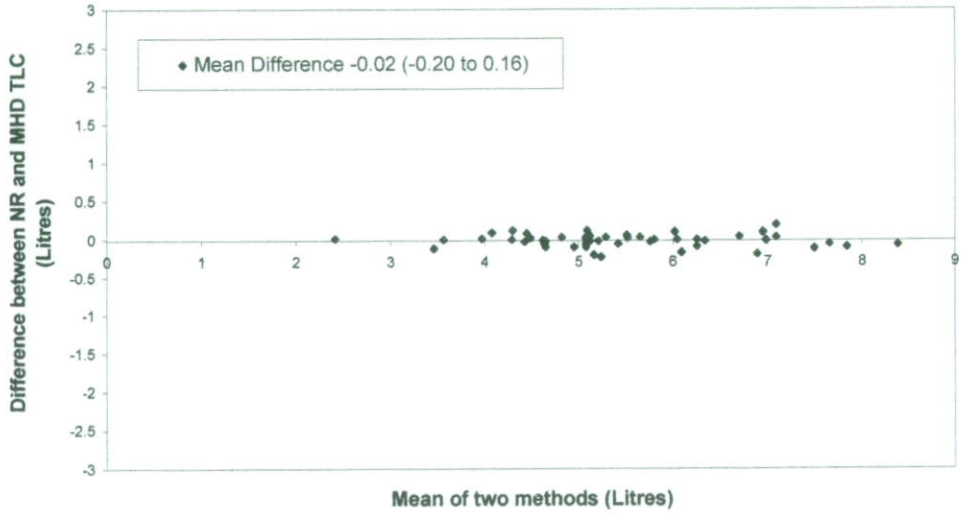


Figure 3:Total lung capacity by Nitrogen Recovery versus Body Plethysmography in patients with severe airflow obstruction (SG_{aw} <0.5) N=50

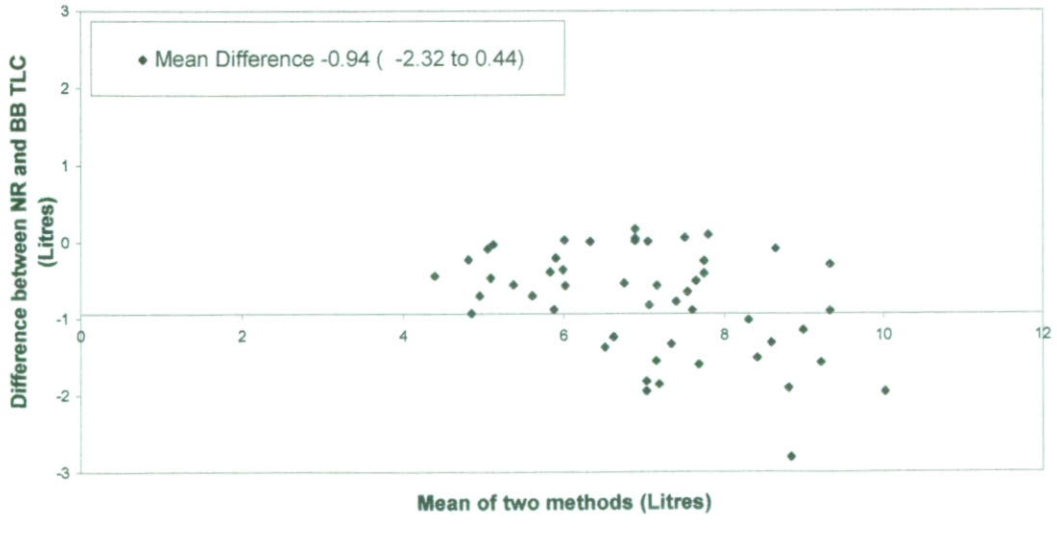


Figure 4: Total lung capacity by Nitrogen Recovery versus Multibreath Helium Dilution in patients with severe airflow obstruction (SG_{aw} <0.5) N=50

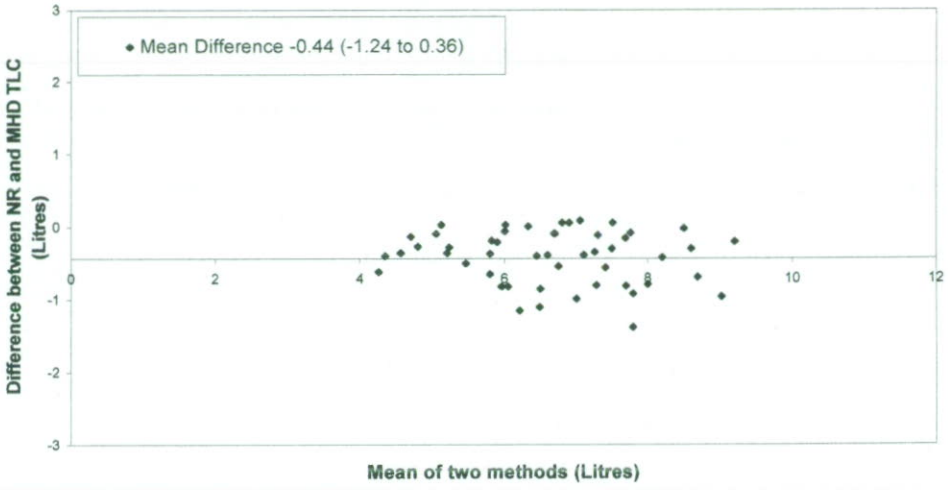


Figure 5: Difference between NR Alveolar Volume and MHD TLC against the degree of airflow obstruction

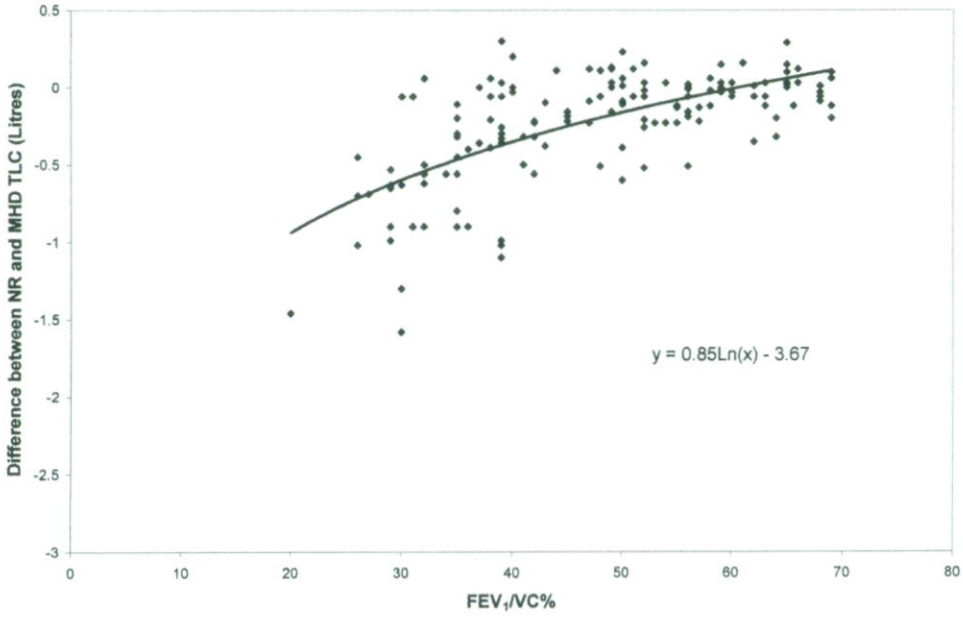
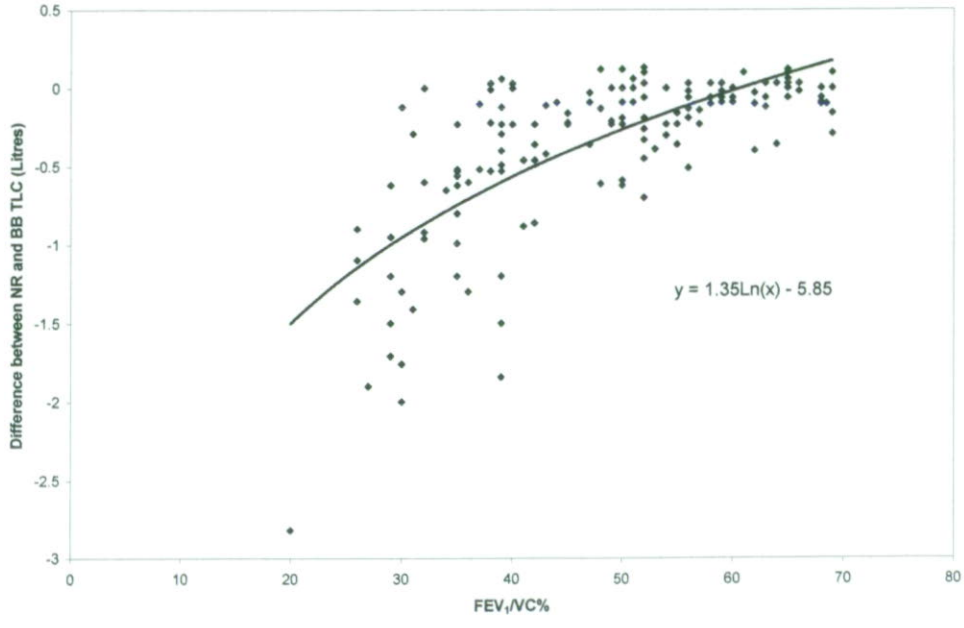


Figure 6: Difference between NR Alveolar Volume and BB TLC against the degree of airflow obstruction



"ON THE BLOWER" - Manufacturers News

1. Manufacturers Liaison

Firstly, I would like to welcome the **ARTP Manufacturer's Liaison Group** which now includes the addition of Nigel Clayton (MTO5, Wythenshawe Hospital) and Alan Moore (MTO5, Birmingham City Hospital) in the work of righting wrongs, passing on good advice and information and spreading peace and harmony amongst the manufacturers in general! The rest of the Manufacturer's Liaison Group is YOU! Thanks to the setting up of our excellent website, the **ARTP Forum** is the place to be to find out about problems, glitches, snags, solutions and advice. It's by you and for you, but this column will comment from time to time on some of the issues.

Well it's a while since we've had a bit of fun regarding our manufacturers and how we see their performance. It occurred to me that with this year being an Olympic Games year (Oh how we cheered when Denise won the heptathlon, how we cried when Steve Redgrave crossed the line for his fifth gold, how we winced when we realised it was 3 o'clock in the morning!) it may be fun to assign an individual game/sport to each of the manufacturers.

Boxing:	**Vitalograph vs MicroMedical**	They continue to battle for spirometer sales.
100m Hurdles:	**Mallinkrodt**	They're all over in a rush! (see below)
Marathon:	**Air Safety**	Like Anthony, they go on and on for hours!!!
Swimming:	**Beaver**	Provided they don't block the pool with a dam!
Synchronised swim:	**Jaeger**	They like doing the same thing with SensorMedics
Gymnastics:	**DeVilbiss**	They're forever going through hoops with Sunrise!
Sailing:	**ResMed**	Well Gary's usually full of wind about something!
Fishing:	**Pulmolink**	Derek Pike lives up to his name
Javelin:	**SSI**	They are always at the sharp end of their field
Cycling:	**Medic-Aid**	The equipment is expensive but comes with headgears
High Jump:	**Sensor Medics**	That's what they are for if the don't get their act together!
Water polo:	**Fisher & Paykel**	You don't get more humid than that!
4x100m Relay:	**Bayer**	They're forever passing the buck..er baton.
Heptathlon:	**Morgan Medical**	They always have to return 7 times to finish the job!

Thanks to the Manufacturers for taking part in this little bit of banter! You know I don't mean a word of it!!

2. Trade Stand

Lung function equipment

I'm actually going to give **Morgan Medical** some praise (don't worry, it won't last long!!) for being honest and open with their clients by admitting openly (on the ARTP Forum) that they have a staffing crisis regarding their engineers. Whilst this leaves them wide open to a full side-swipe from Manufacturers Liaison Group, I think it has been a very responsible action to "come clean" and admit the problem. At last. Kevin Hogben, assures me that members who have service agreements (that were recently hiked up quite a bit!) will be offered either an extension to their annual warranty or some deduction in the cost. I suggest you contact Morgan Medical directly. I would strongly advise the other competition to get their houses in order too regarding service contracts before having a go at Morgan customers!! Nevertheless Kevin, we expect a sensible solution to theses problems as quickly as possible, causing as little disruption as possible to lung function services. We'll be watching!

I see the press release from **ThermoRespiratory Group** begins to clarify changes to the joint ownership of **SensorMedics** and **Jaeger** worldwide (see Email Forum Digest in this issue). The outline of their plan is to develop "a strategic collaboration program" between the two companies. Rumour is that a new name will emerge for the joint company. After 1st November 2000, EME will only be selling SensorMedics critical care equipment but will retain the servicing of existing equipment for at least 2 years.

I have received a brochure from **MBO Suppliers Ltd** illustrating their range of nebulisers including a "pocket" nebuliser, the KarriNeb (£117) which looks particularly versatile. Has anybody tried their products? MBO can be contacted on **Tel: 020 8938 2375** Email: mbo@jenoptik-uk.com

I notice **Pulmolink** are celebrating 10 years as the UK distributor of Medisoft lung function equipment. Although Medisoft is a big supplier in France, Belgium and throughout Europe they are not so widespread in the UK yet. I have been impressed by their versatile software and to date I have received no complaints whatsoever about their product or back-up. Congratulations on ten years of experience Pulmolink!

PDS Research U.K. Ltd have sent me their latest catalogue containing details of spirometers, calibration syringes, filters, the Rosenthal Dosimeter and the Keystone pulmonary function analyser (no, you don't get 12 speeded up policemen free with it!!) They sell the KoKo range of spirometers, which I have yet to see any comparative studies on, so I cannot comment on the accuracy and reliability. Has anyone got any data? **Tel: 01474 832082** Email: Sales@pdsresearchuk.ltd.uk.

I have also received some information from a Spanish **company Sibelmed, Electromedicina** selling their Datospir 120 spirometer. It looks portable, fulfills all the ARTP preferred criteria, has a screen flow-volume loop, printout, etc. and even has an option for MEP/MIPs. If you have problems with the representative, all I can say is "I'm sorry, he's from Barcelona!!!"

Mallinkrodt have been acquired by **Tyco** a giant conglomerate (I think famous for making kids toys!) Allegedly they are to effectively hive the respiratory section (formerly **Nellcor-Puritan Bennett**) under the name of *Invacare*. Is it a question of time before **Ferraris** buy out Tyco and ThermoRespiratory buy out Ferraris ....and in the end **Nestle** will own everything!!!! (That reminds me - remember I wept of the demise of the original Milky Way bar in this column several years ago? Well, Cadburys have come to my rescue and launched the *"Shush"* bar - it's just like the old Milky Way. Who says *On the Blower* doesn't get results?) Mallinkrodt are selling the Nellcorr Oxismart pulse oximeter (£1600) which we have trialled against 4 other oximeters and found it to be as accurate as other oximeters although this machine measures functional and not fractional saturation- thus reading about 2% higher than the rest. They also have their "Score" oximetry analysis software available which costs around £1700. **Tel: 01869 322700.**

The globalisation monster creeps silently across our world. I notice **AirProducts** (who fail to feature in our article on ordering special gases) have increased their holding in the Spanish special gas company **Carburos Metalicos**. They acquired **Cryospeed** here last year so slowly it looks like they are moving towards a European monopoly on special gases. I have my doubts that in the long term this will be good news for the customer!!

I am regularly asked which spirometers are available in the UK. To save me a few return phone calls I shall list some of the companies who sell spirometers that I would deem to be suitable for use by practitioners in the UK:

Beaver	Tel: 01604 499427
Micro Medical	Tel: 01634 360044
PDS	Tel: 01474 832082
Vitalograph	Tel: 01280 8271100

Whilst this list is not exhaustive, you must also be aware that ARTP does not endorse any or all of their products!

Nasal assisted ventilation (CPAP, NIPPV, BiLevel, etc),
Resmed, are now selling the UltraMirage mask at £80. This is similar to the ordinary Mirage except that it has a swivel connector which means it is more useful for NIPPV valves. Confusion over Flaga Embletta - available from either SSI or ResMed.
Fisher & Paykel are now selling a combined CPAP and humidifier for £325 (list price). This is cheaper than buying the CPAP and then a humidifier separately and is worth considering. The CPAP has an hour meter (?compliance meter), tubing, case and filter and 2 chambers. I don't know how it performs, but it seems quiet enough. Tel: **Paul Jackson on 01628 626136**

Miscellaneous
"It's just a little prick with some needles!" How many times have you heard that about your SHO? But here we have some news on the real meaning behind the phrase. Skin prick testing solutions are now available (and have been for some time) from **ALK Abello (UK)**. They use standardised proportions of substance in their solutions and report a batch controlled QC system to ensure quality between batches. Most of their vials cost around the £20 - £25 mark. Details are available from ALK Abello, 2 Tealegate, Hungerford, Berks RG17 0YT, **Tel: 01488 686016**

3. ARTP Forum Feedback (Email: artp-forum@artp.org.uk)
For those of you not yet blessed/cursed with the use of the Internet and email, we are introducing here a regular section in *On The Blower* which summarises some of the issues that have been raised on the Forum. This is aimed as a supplement to the **Email Forum Digest** in this issue of *Inspire*. We hope that more of you contribute to the Forum, and even better if the "unconverted" of you, get on line and get up to date with day to day issues. The *Watchdog* will remain in *Inspire* for the foreseeable future.

The debate on the Forum predominantly between **Morgan Medical** and **Jaeger** about equilibration times for helium dilution tests was I feel, an attempt at discrediting one system over the other and was misleading. Neither company has the perfect system and, in the Morgan Medical case, I would say "people in glass body boxes should'nt throw stones!!" I won't mention service agreements at this stage.

The BTPS correction for volume measurement by flow measuring devices has had its annual airing. The application of the various gas laws still seems to leave manufacturers bemused. Knowing the conditions at the point of measurement (for expiration and inspiration) and converting back to BTPS, doesn't seem to be rocket science to most lung function staff!

The **SensorMedics** gas cylinder disposal problem begs the question why it hasn't been sorted out by the company more effectively before now. Let's hope Thermo Respiratory Group get to grips with it sooner rather than later.

4. Moans of the month:
The moans of the month include Morgan Medical (dealt with above). SensorMedics gas cylinders (also dealt with above) and an issue which we get asked about on a regular basis.

The ARTP/BTS Guidelines on Respiratory Measurement recommend the use of **standardised residuals** [S.R.] (as well as absolute values and % predicted values) when reporting lung function tests. I have been asked by users of Morgan Medical, Jaeger and Sensor Medics equipment whether it is possible to use S.R.s in their report forms. The answer from at least Jaeger and Morgan to customers seems to be "we've never done it before". I and several Exec. Committee colleagues have had report programmes written calculating SR values for both the Autolink and Benchmark reports. I also run our Jaeger Masterscreen reports with SRs calculated internally. If you haven't got these on your reports, ask your representative why they aren't on, and more importantly, when will they be put on.

5. Complaints Database and WatchDog.
The following complaints have been received:

Morgan Medical servicing problems (see above)
Angela Evans, MTO5, North Staffs Hospital, Stoke.
Jo Shakespeare, MTO4, Queen Elizabeth Hospital, Birmingham.

Outcome: Awaiting solution to staffing crisis - contact the company directly and repetitively regarding serious problems, and give them more time over less critical problems. To be reviewed. **Tel: 01634 373860**

Clement Clarke AC3000 Nebuliser overheating problem
Keith Butterfield, Wordsley Hospital, Stourbridge.
Several ARTP Forum users.

Outcome: The company will replace units free of charge. Check your serial numbers and contact them directly. *Tel: 01278 456240*

When writing to the Complaints Database and WatchDog, please state (i) exact dates, (ii) names of people you dealt with and (iii) state clearly your grievance. Also, give a summary account of the history of your complaint (a maximum of one page of A4). There is no need to send photocopies of correspondence at this stage.

Dr Brendan Cooper, (ARTP Manufacturer's Liaison Officer) Lung Function Department, Nottingham City Hospital, Nottingham NG5 1PB. DDI/FAX (24 hours): 0115 840 2615

Ordering of Special Gases for Lung Function Departments

Dr Brendan Cooper

Medical Gas Suppliers to Lung Function Departments

	BOC	Linde
Tel. No.	0800020800	01782 822058
Fax No.	**0800 136601**	**01782 822355**
Transfer test (e.g. Morgan)		
14% He, 0.3% CO, 18% 02, Bal N2	Yes	Yes
Cylinder sizes	AK / AV	10 / 24 / 50 L
Volume (cubic metres approx.)	5.961 1.49	2000 L
Pressure (Bar)	150	200
Cost per cylinder	**£128.50 / 90.52**	**£205 / £222 / £234**
Delivery charges	£19.95 per transaction	£18.69 per transaction
Rental Charges per month	£6.90	£7.52
Certificate of composition	Yes	Yes
Tolerance	+1- 5%	+1-2%
Medical quality	YES	YES
Manufacturers Specials License	ML/0735101	???
Delivery time	2 weeks	???
Cost of 1 cylinder per year	**£232 / £194**	**£314 / £331 / £343**
Transfer test (e.g. Jaeger)		
8% He, 0.3% CO, 18% 02, Bal N2	YES	Yes
Cylinder sizes	AK / AV	10 / 24 / 50 L
Volume (cubic metres approx.)	5.96 / 1.49	2000 L
Pressure (Bar)	150	200
Cost per cylinder	**£128.50 / 90.52**	**£205 / £222 / £234**
Delivery charges	£19. 95 per transaction	£18.69 per transaction
Rental Charges per month	£6.90	£7.52
Certificate of composition	Yes	Yes-
Tolerance	+ / -5%	+ 1 -2%
Medical quality	YES	YES
Manufacturers Specials License	ML/0735101	???
Delivery time	2 weeks	???
Cost of 1 cylinder per year	**£232 / £194**	**£314 / £331 / £343**
Transfer test (e.g, Sensor Medics)		
Acetylene/C0/methaneloxygen	Yes	N/A
Cylinder sizes	AK / AV	N/A
Volume (cubic metres approx)	5.96 / 1.49	N/A
Pressure (Bar)	150	N/A
Delivery charges	£ 19.95 per transaction	N/A
Cost per cylinder	**£396 / £316**	N/A
Rental Charges per month	£6.90	N/A
Certificate of composition	Yes	N/A
Tolerance	+ /- 5%	N/A
Medical quality	YES	N/A
Manufacturers Specials License	MU0735101	N/A
Delivery time	2 weeks	N/A
Cost of 1 cylinder per year	**£499 / £418**	N/A
Helium Dilution		
14% He, 21% 02, Bal N2	9% He, 35% 02, Bal N2	Yes
Cylinder sizes	L / V	10 / 24 / 50 L
Volume (cubic metres approx.)	6.58 / 1.31	2000 L
Pressure - (Bar)	137	200
Cost per cylinder*	**£84.55 / £59.30**	**£154 / £166 / £175**
Delivery charges	£19.95 per transaction	£18.69 pertransaction
Rental Charges per month*	£6.90	£7.52
Certificate of composition	Yes	Yes
Tolerance	+ / - 5%	+ / -2%
Medical quality	YES	???
Manufacturers Specials License	BS.341 NO.3	???
Delivery time	2 weeks	???
Cost of 1 cylinder per year*	**£187 / £297**	**£263 / £276 / £284**
Exercise/Blood gas analysis		
5% C02,12% 02, Bal N2	Yes	Yes
Cylinder sizes	L / V	10 / 24 /50 L
Volume (cubic metres approx.)	9.81 / 1.35	2000

* Based on delivery and rental for 12 months

Introduction

I have been reviewing the ordering of special gases for lung function departments. Despite writing to the three main companies I have only received satisfactory answers from BOC and Linde. If Air Products cannot be bothered to send the information to help our members after 6 months notice, we cannot be bothered to include them in this survey! We have also excluded the non-re-usable gases supplied by SensorMedics and Puritan Bennett, Radiometer, etc.

Aim

The aim of this survey was to see how much it would cost to order special gases for (i) a gas transfer test (ii) helium dilution test and (iii) an exercise system from the main medical gas suppliers. The transfer test gases are split into a typical mix for Morgan, Jaeger and Sensor Medics systems.

Methods

The cylinder size, volume and pressure of gas, the cost per cylinder, delivery charges, quality and delivery time were all requested from the manufacturers. An overall cost per cylinder (excluding VAT) was calculated. This data was accurate at the time of writing, but prices may have changed since.

Results

The results from this survey appear in the table below. The results show;

1. The cylinders of transfer gases are consistently more expensive from Linde than from BOC by about 50%.
2. The SensorMedics cylinder from BOC was over 100% more expensive than the Morgan and Jaeger equivalents. However, the amount of gas used per calibration/test needs to be taken into consideration.
3. The Linde gases are more expensive than BOC across all the gas mixes.
4. Buying smaller cylinders is a very expensive way of ordering gases.
5. It is not easy to estimate from the companies the exact cost per litre of each gas.
6. Cylinder rental is not cheap and the onus is on the customer to return empty cylinders
7. Special gases contribute a significant running cost to lung function services.

Comments

It would be helpful if a "cost per litre" figure could be supplied by the gas suppliers so that true costs could be estimated. The BOC monopoly is gradually being broken for medical gases, but it doesn't look like the competition are driving down prices to the customer. Systems involving bar coding and cylinder audit would dramatically decrease the cost of using cylinder gases for the NHS.

Feedback from ARTP members on the ARTP Forum indicate a mixed opinion of the companies. Adrian Kendrick at Bristol Royal Infirmary finds BOC both "quick and reliable" and reminds me that he wrote an article for Thorax a few years ago on this subject. Joan Ashley from a different part of Bristol (Frenchay) praises Linde and comments on their "quick" service. However, Laura Watson from QMC, Nottingham has had "awful problems" with Linde regarding certification, wrong (non-medical) gases, although she says they are cheap for oxygen. I too have had problems with Linde regarding delivery of empty cylinders, damaged threads on the cylinder head and poor delivery practice. Both Nottingham hospitals praise BOC on price and delivery although in the past they have been slow to chase up empty cylinders. On balance it looks as if where you are may decide how good a service you get from the medical gas manufacturers.

Meeting 2001

Blackpool Hilton Hotel,

22nd-24th February, 2001

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