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Inspire

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FIRST WORD

1ST DECEMBER 2013

VOLUME 14, ISSUE 3

Hello again and thanks for all the feedback about the last issue—good to know how it is received and I'm particularly appreciative when an email suggests an idea for a new article!

In this issue I have led with contributions from four of the five members who were awarded a grant to attend the recent ERS conference in Barcelona. Such grants are one of the many benefits available to members of the ARTP and I have listed (some of) these before the grant winner articles. Free membership of the ERS is also available to ARTP members under the age of 35 so check that all of the younger physiologists in your department are joining!

Talking of the ERS, this issue also contains a link to a 'hot off the press' article from their 'Breathe' journal describing the Global Lung Function Initiative (GLI). GLI has important implications for our profession and the equipment we use, reflected by a recent endorsement by the ARTP. I am grateful to the Editors of 'Breathe' for allowing this article to be made available to ARTP members. The beauty of the electronic publication format means that 'Breaking news', such as this, plus the result of Election for the first ARTP President, announced 4th December, can be displayed in this issue along with an opening message from the President, Dr Brendan Cooper.

Add in the regular features (including an excellent guide to replacing your lung function equipment in 'On the Blower'), an introduction to a new committee plus a high quality article from a Trainee Physiologist and you have a perfect festive issue!

Finally, although I began writing this on a wet November evening, this is the final issue of 'Inspire' for 2013 so may I take this opportunity to wish you all a Merry Christmas and a Happy New Year. This is also the final issue before the ARTP annual conference so I hope to see you there in Blackpool - the link is below (embedded in the picture) if you don't know already!

Any comments or suggestions for future issues please email me at : inspire@artp.org.uk.

AIDAN LAVERTY

A WORD FROM THE CHAIR

Another update and message from your Chair. It has been busy since I last updated you. The theme of events this time has been ***collaboration***. There are many professional organisations out there who share a common goal and yet do not currently work together to achieve their aims. I personally believe that we can achieve much more by working together. One of my ambitions as Chair is to forge better relationships with these organisations and to be inclusive in discussions in the hope that this will lead to a better future for us and our patients.

With this in mind, I was lucky enough to be invited to the 25th Anniversary Conference of the British Sleep Society (BSS), which was being held in Edinburgh. Now this isn't the Whisky and Cheese talking here, which was one of the themed evenings, but it has to have been one of the best conferences I have attended, bar our own conference of course. The enthusiasm among the delegates for their profession was brilliant and the quality of speakers was outstanding. Presentations that stood out were the Treatment of Insomnia' by Professor Espie, 'Sleep and Circadian Rhythms' by Professor Foster and 'CPAP: How it happened' by the founding father Professor Sullivan. I'll be seeing if we can entice some of them to come and talk at our conference in the future. We then had an excellent session on the Saturday morning where representatives from ARTP and BSS got together to discuss current professional issues. We were able to update each other on the issues faced by each organisation and leaving that session I felt a real sense of being prepared to work together to achieve our goals. There is now a real drive from both organisations for us to work more closely together following this meeting and I look forward to seeing the results of future collaborations in due course.

The sleep manufacturers gave good representation at the BSS, as they and the respiratory manufacturers always do at the ARTP conference. All respiratory and sleep manufacturers are a great support to ARTP and it is always great to receive their feedback and suggestions. I'm sure all of you will have had many discussions with your various manufacturer representatives and also value their opinion. ARTP have regular contact with many of them through our Manufacturer's Liaison Committee, very ably led by Nigel Clayton. I'm keen to strengthen our relationship with our manufacturer colleagues and so we will be meeting with representatives of Barema, who are the trade association for anaesthetic and respiratory equipment, to discuss the current situation from both our perspectives. I would like to ensure that we develop a more symbiotic relationship, as I know there is a lot we can learn from each other.

We had a very successful National Strategy Day on 8th November, where leaders in the fields of sleep and respiratory physiology and their representatives were updated on important national issues, such as Modernising Scientific Careers and the Higher Specialist Scientific Training Curriculum, IQIPS and Respiratory Coding. Heads of departments were also updated on the work some of the sub-committees have been up to. A big thank you to everyone that came along and especially to those who contributed to the day. There was some lively debate and the feedback received this year has been great. I'm hopeful that the information received has been cascaded down through the teams. If there is anything that would entice you to come along next year then just drop me a line and we'll see what we can do.

We are now only two months away from the highlight of everybody's year, the annual ARTP conference, this year being held at the Hilton Hotel in Blackpool. We have some fantastic invited speakers confirmed this time round. Professor John Moxham of King's College Hospital, London, a previous special award winner, will be giving the P.K. Morgan memorial lecture. New sessions introduced this year following feedback received last year are some excellent masterclasses on lung function reporting, non-invasive

ventilation and lung imaging. We have some paediatric respiratory and sleep sessions again along with the usual sleep track on the Friday. We have the lunchtime workshops too, having seen the titles for this year there are some fantastic learning opportunities, from both respiratory and sleep. There have been many of you submitting abstracts on your current research, which is fantastic. These are always great sessions to attend to see what others around the country are doing . We will have the poster sessions again this year, plus four abstracts will be selected for oral presentations and there will be prizes for the best abstracts. Come along and you may find listening to the presentations gives you ideas for research you can conduct in your own departments. I'm confident there is something for everyone at this year's conference so get registering. Also the sooner you register the better the chance of being guaranteed accommodation at the venue.

Obviously the education, learning and professional development opportunities at the ARTP conference are second to none. However, there is also the opportunity to network with colleagues, meet up with old friends and make new ones. This comes back to collaboration. Chat to like-minded colleagues and see if there is something you can learn from their practice or vice versa. Don't be afraid to share ideas and future directions. Think about collaborating on your research ideas, there is strength in numbers and a larger cohort to analyse will only strengthen your outcomes. However, don't just wait for the conference to do this. Collaboration is possible all year round. Contact your colleagues, find out what they are up to, let's all get working together and ensure the ARTP goes from good to great and stays there.

Please do get in contact at chair@artp.org.uk, I'm always pleased to receive your ideas and comments.

Karl Sylvester

ARTP Honorary Chair

ARTP Presidential Voting Results

Following the recent voting by ARTP members it is with great pleasure that we announce the election into office of Dr. Brendan Cooper as the ARTP President.

We are delighted that Brendan has agreed to take on this important position and I'm sure you will all join us in congratulating him and wishing him all the best in his new role.

There will more on this post in the next issue of 'Inspire' but in the meantime Dr Cooper had the following message for ARTP members:

Dear ARTP Members,

I am delighted and grateful to have been elected by the membership to be the President of the Council of the Association for Respiratory Technology & Physiology. I feel privileged to have this opportunity to act as a figurehead at this important period in our history as we try and take forward the message of standards and quality in respiratory and sleep physiology during this period of transition in UK healthcare. I aim to fulfil your expectations and hopes for the future of ARTP, but I also want to fairly represent those who didn't vote for me and those who didn't vote at all.

I have always tried to be visionary and a strategist for the ARTP, and over my years of service I have tried to steer the ship in a direction that is inclusive, ambitious, promoting our objectives, but ensuring we achieve the highest standards of governance and best practice as a professional body.

To many members, the structure of the ARTP is either irrelevant, complicated or a complete mystery. As President of the Council, I want to make the structure and function of the ARTP Council, ARTP Board and Committees as transparent, honest and meaningful to you as possible. As an organisation, I want you to know what we (the Board & the Council) are planning, how we achieve it, when it is achieved - but this process can only work if you can tell ARTP what you want us to do. As your elected President, please feel free to email me directly on president@artp.org.uk with your ideas, comments, grumbles about ARTP (within reason!) and expectations of your ARTP and your President.

The ARTP Council is the overseeing "check and balance" of all the ideas that the Executive Board want to implement, but it needs the advice of experts (our non-executive directors in finance, legal, workforce and patient issues) to ensure we are acting in accordance with the objectives of the ARTP, within the Charities Commission guidelines and within the legal frameworks we are obliged to keep to maintain appropriate professional governance. I look forward to working with our esteemed non-executive directors and leading the Council, to help them to help you.

I look forward to your further support and contribution to the best physiological professional body in Europe! It's time to roll the sleeves up and get on and further raise the profile of ARTP. Take a deep breath in…….!

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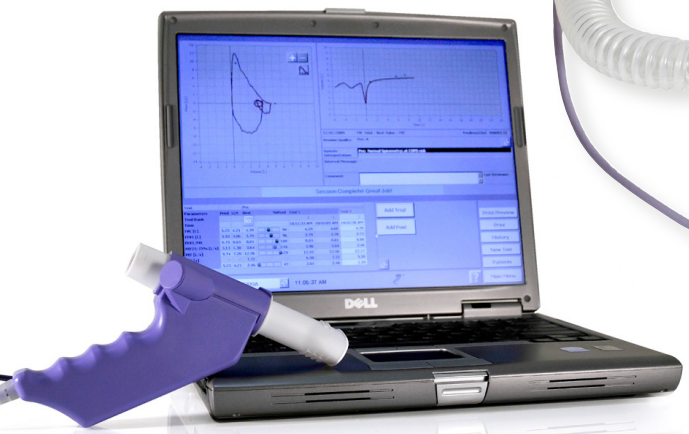

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ARTP EUROPEAN RESPIRATORY SOCIETY GRANT WINNERS

Each year the ARTP awards grants to allow members to attend selected meetings or to extend their work experience or learning practice. Overleaf we have articles from those who were awarded grants to attend the European Respiratory Society Annual Congress in Barcelona this year. As well as conference grants, other ARTP membership benefits are listed below.

MEMBERSHIP BENEFITS

The ARTP:

- Is the sole professional organisation in the UK for practitioners working in respiratory physiology and technology
- Develops training strategies, training materials and runs its own national training course and meetings for members
- Holds a major national annual conference. (with preferential rates for members)
- Provides the only national professional examinations for practitioners in
    - Spirometry
    - respiratory function testing.
- Produces 'Inspire' - the official journal of the ARTP
- Circulates national job vacancies
- Publishes guidelines and standards for good practice
- Funds grants to enable members to attend important national/international meetings and courses.
- Works closely with lung function equipment manufacturers and respiratory pharmaceutical companies
- Works in conjunction with the British Thoracic Society to produce national guidelines and standards for good practice in the performance of respiratory measurement
- Works closely with the NHS Executive & the Department of Health in formulating policy and in the strategic direction of the profession
- Is a founder member of the Conference of Clinical Scientists Organisation (CCSO) and is a member of the Association of Clinical Scientists
- Is a founder member of the Institute of Physiological Sciences (IPS) and the Federation of Healthcare Scientists (FedHCS)
- Has close involvement with Assembly 9 of the European Respiratory Society
- Allows free membership of the European Society for members under the age of 35

For more information please follow this link:

http://artp.org.uk/en/join-us/membership-benefits.cfm

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INTER-OBSERVER REPEATABILITY OF HEIGHT MEASUREMENTS IN THE SLIC STUDY

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Portex Department, UCL Institute of Child Health and Great Ormond Street Hospital for Children, London

INTRODUCTION

Spirometry is the most commonly used technique for assessment of lung function and correctly interpreting results is vital. To correctly interpret results requires an accurate age, weight and height to be recorded as discussed in the ATS/ERS guidelines [1]. The guidelines focus on how spirometry assessments should be undertaken and appropriate quality control, however only briefly mention the measurement of height. This may be because it is presumed the measurement of height is simple; however an inaccurate or unreliable height measurement may greatly influence the interpretation of a lung function result. Parker et al. [2] examined the effect of estimated height and measured height on lung function reference values. It was found that subjects overestimated their height by as much as 7cm giving as much as a 300ml mean difference in the predicted FVC values. The effect of this overestimation on clinical interpretation was significant, especially in the elderly who tended to overestimate their height, such that up to 25% of healthy patients could be classified as restrictive and 33% of restrictive patients were categorised as more severe than when calculated using a correctly measured height for the interpretation of lung function.

Accuracy and repeatability of height measurement can be greatly influenced by posture, investigator technique and equipment so protocols must be standardised and steps taken to assure the quality of data collected [3, 4]. Reference equations already have known limitations [5] so reducing any other form of error is vital for accurate interpretation of lung function. Errors caused by measuring height may be particularly a problem in young children and the elderly where standing still or straight are more difficult but accurate interpretation is vitally important.

With developments in stadiometer technology it should be possible to take very accurate height measurements in the lung function laboratory [4]. However can reliable height measurements be achieved while outside of the laboratory environment and when using a more basic portable stadiometer? The aim of this report is to discuss the repeatability of height measurement of children when carried out by different investigators.

Figure 1 Correct measurement of height using the Leicester Height Measure

METHOD

As part of the Size and Lung Function in Children (SLIC) Study, children aged 5 to 11 years were recruited and assessed in school. The study was approved by the local research ethics committee and written informed consent/assent was obtained from all parents and children participating in the study. Height measurements were made by 7 different investigators using a portable Leicester Height Measure (LHM) which was calibrated regularly using a calibration rod.

A protocol adapted from the current clinical guidelines [6] was developed and investigators were trained by a physiologist experienced with this protocol. Training took the form of repeated measurements of people and objects of different heights by the investigator; their technique was refined until competency, (accuracy and reliability of measurements) was achieved. Training formed part of the staff induction for

the SLIC study.

Children were instructed to remove shoes and any hair ornaments which may have interfered with the measurement. The subject was then asked to stand as shown in Figure 1 with, feet flat on the floor and heels against the heel plate. The back, shoulders, head and buttocks were against the back board of the stadiometer. The head was held in the horizontal in Frankfort (orbito-meatal) plane [3, 6]. The Investigator then placed hands under subject's ears on the mastoid process to assist with posture, the subject was asked to breathe in and then relax but to stay tall.

Measurements were recorded to the nearest 0.1cm. Measurements were taken twice, if values were within 0.2cm, or three times if within 0.4cm and the mean height was reported. The child would then step out from the stadiometer and another investigator, blinded to the results of the initial recording, would then also perform the same measurement.

RESULTS

Paired measurements were successfully carried out in 54 children. The investigators were ranked in order of length of time on the project, and in each pair were defined with investigator one being the person who had been working on the study longer.

The mean difference in standing height measurements between investigator 1 and investigator 2 was 0.11 cm (95% CI: 0.02, 0.19), as shown in figure 2. However, although the difference tended to be significant (p=0.011) it cannot be considered clinically important as it is only 0.1cm. In addition the limits of agreement (LoA) between the two measurements ranged from -0.47 to 0.68 (figure 2).

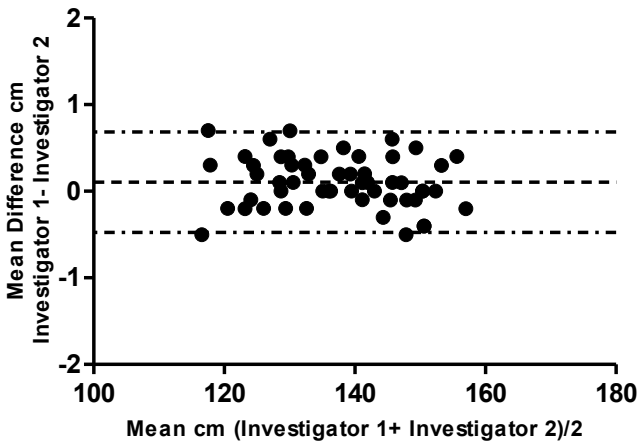

Figure 2 Bland-Altman of standing height measurements show difference between first and second investigator measurements, dashed lines indicate upper and lower limits of agreement and mean difference

DISCUSSION

The SLIC study results presented here illustrate that even with a low-tech stadiometer in a field study environment, when working with children as young as 5, repeatable and accurate height measurements can be achieved. As only 8 (15%) of the measurements had a mean difference of greater than 0.5cm and the overall mean difference was 0.1cm it is unlikely that changing investigator would have had an effect on the clinical interpretation of the spirometry results for these children. As shown by the narrow 95% CI, a clinically significant difference has not been shown, although it was significantly different. A 0.1cm

difference is very close to the accuracy of the stadiometer itself and it is unlikely there would be an effect on predicted values and therefore clinical interpretation at this level.

Lung function laboratories routinely use more complex (digital or fixed position) stadiometers than the portable research stadiometer used in this study. It can be assumed that with proper training by experienced physiologists and an appropriate calibration very accurate results should be achievable. However it is important that regular calibration and quality control are carried out to ensure standards remain high and retraining is available if necessary, as is the case for the spirometry testing itself. As previously discussed, the implications for clinical spirometry interpretation may be large if equipment is not maintained or height measurements are carried out incorrectly.

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LUNG FUNCTION IN NEVER SMOKING PATIENTS WITH ALPHA-1-ANTITRYPSIN DEFICIENCY

R Edgar & R Stockley

University Hospitals Birmingham NHS Foundation Trust

AIMS

Alpha-1-antitrypsin deficiency (AATD) is a recognised susceptibility factor for the development of COPD although the natural history in the absence of smoking is poorly documented.

METHODS

We assessed the FEV1 (% predicted using ECCS reference equation, n=200) and Kco (% predicted using Cotes reference equation, n=199) in 201 consecutive PiZZ, never smokers referred to the UK AAT database. This data was compared to their age at assessment grouped as individuals under 45 and ≥ 45 years age. Index patients (those who presented with symptoms) were also compared to non-index patients (those identified by family screening)

RESULTS

The patients age ranged from 16-76 years and overall there was a significant negative correlation with FEV1 (r=0.353; p<0.0001) and Kco (r=0.448; p<0.0001). However the data suggested that most of the decline occurred after the age of 45 (figures 1 and 2) with no relationship with age for those < 45 years, similar to data distribution reported previously by Piitulainen and colleagues [1].

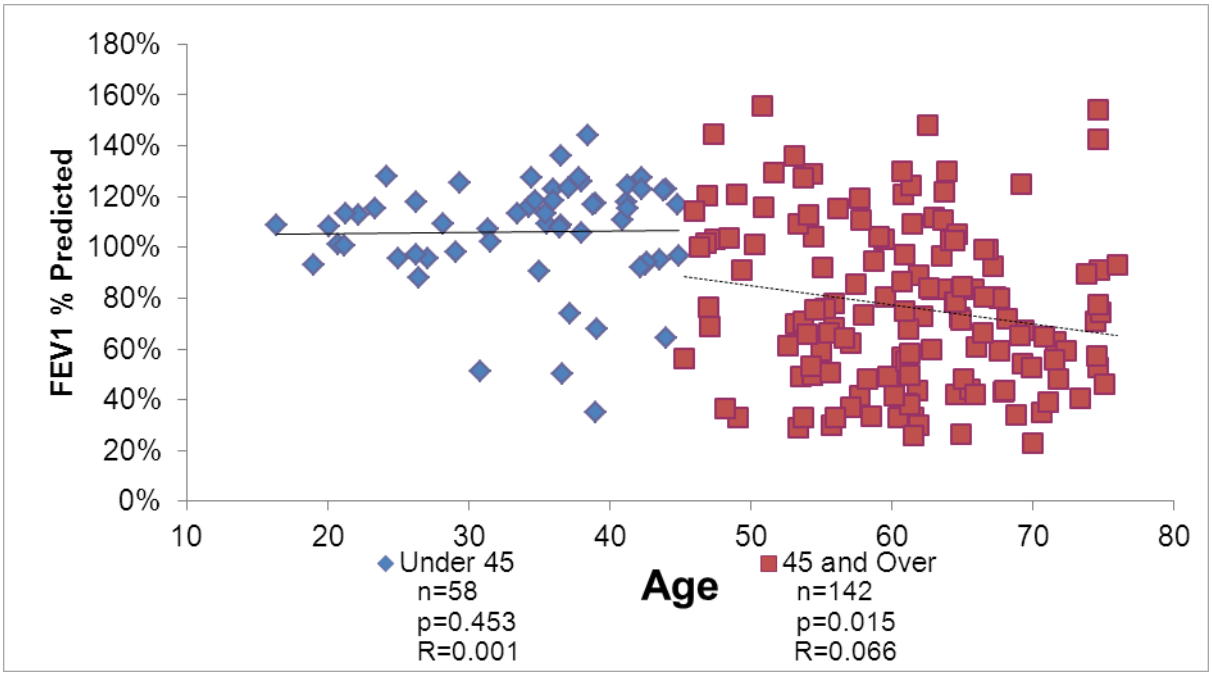

Figure 1 – FEV1 groups < 45 years and ≥ 45 years age

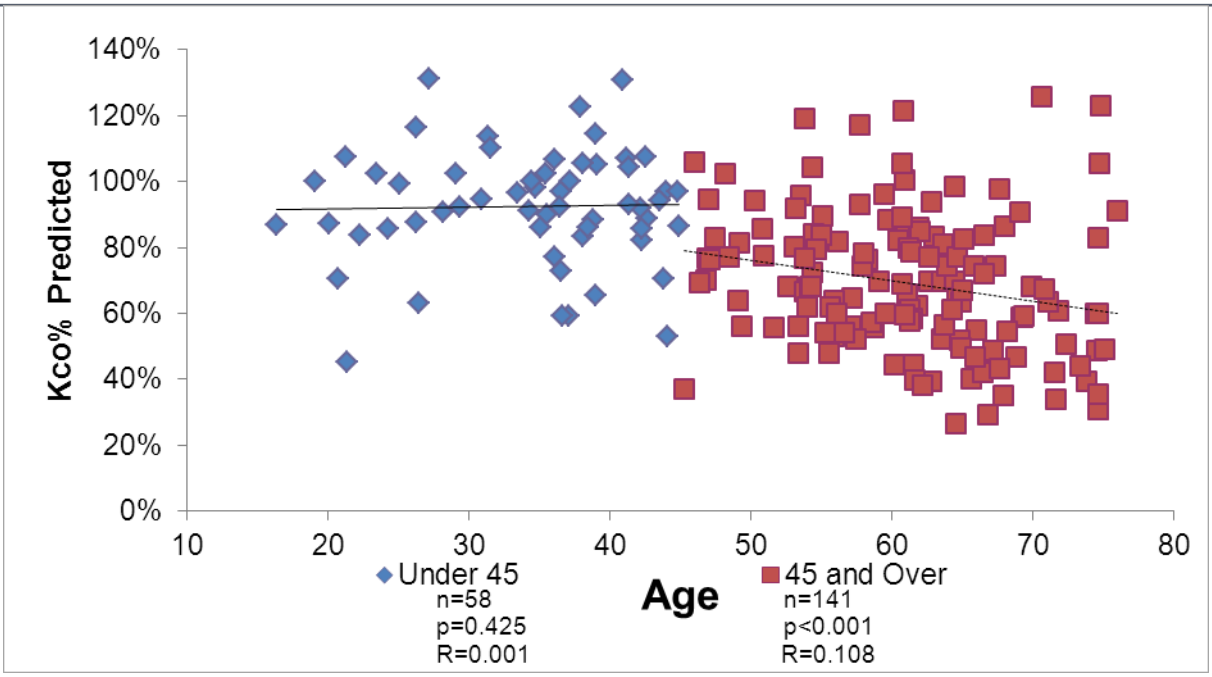

Figure 2 – Kco groups < 45 years and ≥ 45 years age

Under the age of 45 (n=58) the median FEV1 was 110.1% predicted (IQR 95.5-119.4) and was below the normal range (<80% predicted for age sex and height) in 6. The mean Kco was 92.4% predicted (SE 2.3) and below the normal range in 10 subjects. Over 45 years age (n=142) the median FEV1 was 72.6% predicted (49.9-101.9) and mean Kco was 69.4% predicted (±1.7). Both FEV1 and Kco were significantly worse in the 45 and over group (p<0.0001).

Nevertheless there were clearly patients who had abnormal lung function (as defined by values <80% predicted for age, height and sex). For FEV1 under the age of 45 this was 10.3% of the patients and increased to 58% over the age of 45. The distribution of data for Kco showed slight differences to FEV1 with more abnormal tests in 17.2% (p<0.03) of patients under the age of 45 and 59.7% over the age of 45 (figure 3).

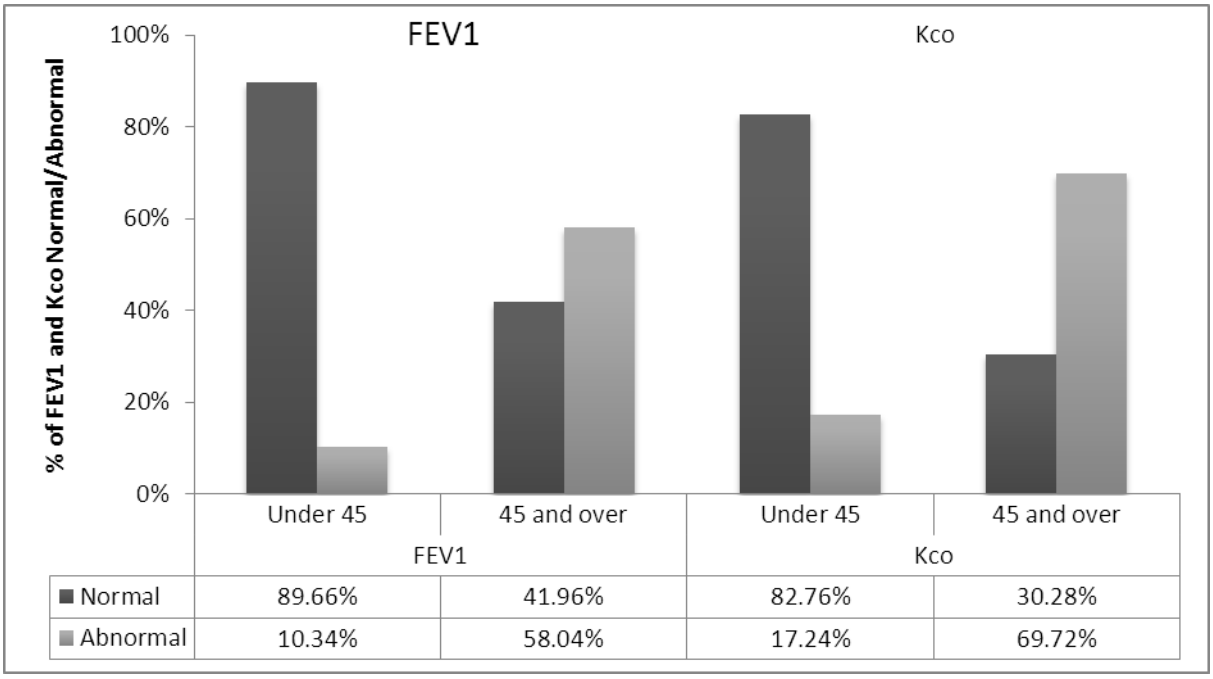

Figure 3 – FEV1 and Kco normal and abnormal values in age grouping

This data was influenced by the acquisition status of the patients as those detected by family screening had better lung function (p<0.0001) than those who had presented with clinical symptoms. The median FEV1 was 110.1% predicted (97.1-120.6) for the non index patients (n=60) and 72.6% predicted (49.9-100.7) for the index patients (n= 141) and mean Kco was 85.6% predicted (±2.4) for non index patients and 72.0% predicted (±1.9) for index patients.

The acquisition status also affected the group data related to age, with non-index patients having similar (though statistically higher) FEV1 before compared to after 45 years age. Clearer age differences were seen for FEV1 in index patients and for Kco in both index and non-index patients (table 1)

Non Index		Index	
Median FEV1 % (IQR)		**Median FEV1 % (IQR)**	
<45	**≥ 45**	**<45**	**≥ 45**
n=28	n=32	n=30	n=111
116.2	102.3	104.4	65.6
106.0-122.7	79.9-119.2	91.9-116.0	46.0-89.1
p=0.018		*p<0.0001*	
Mean Kco % (SEM)		**Mean Kco % (SEM)**	
<45	**≥ 45**	**<45**	**≥ 45**
n=28	n=32	n=30	n=110
96.0	76.5	89.1	67.3
2.2	3.3	3.9	2.0
p<0.0001		*p<0.0001*	

Table 1 – Acquisition status data

Figures 4 and 5 show the proportion of patients with normal or abnormal lung physiology according to age and acquisition status. For index patients less than a third have preserved FEV1 after the age of 45. However 75% of non-index patients still have a normal FEV1 over the age of 45 years.

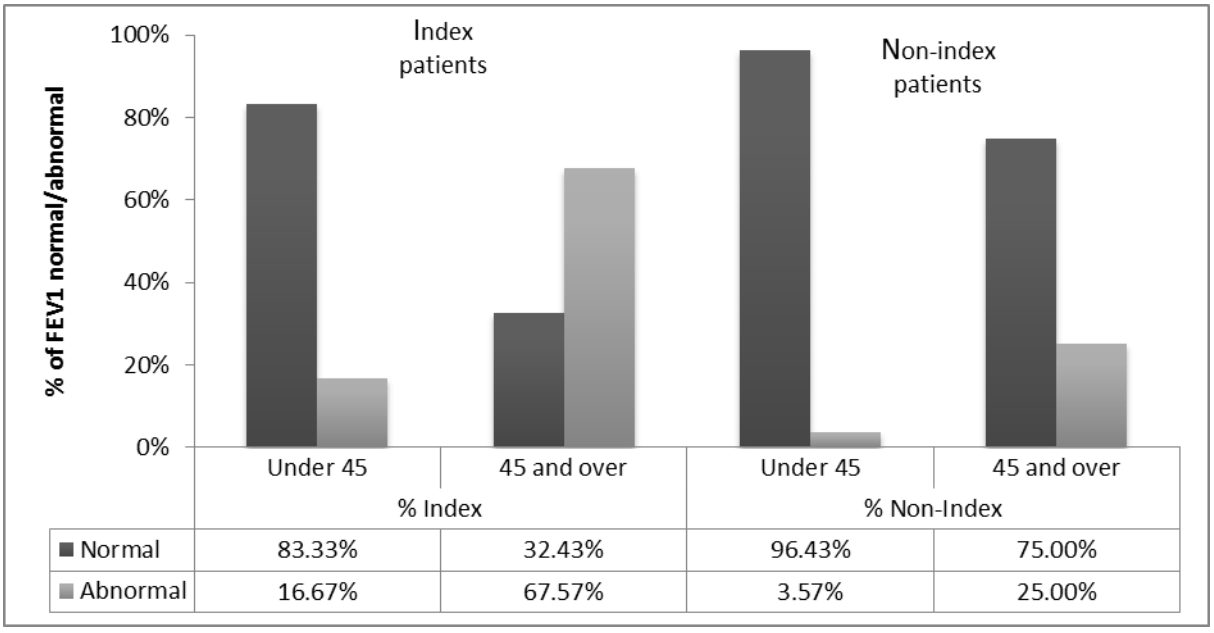

Figure 4 – FEV1 normal and abnormal values in acquisition grouping

Again the data for Kco showed a different distribution with age depending on acquisition status. More index patients had an abnormal Kco under the age of 45 and most (72%) had an abnormal Kco over the age of 45. For the non-index patients under the age of 45, 7.1% had an abnormal test but over a third retained values in the normal range over the age of 45.

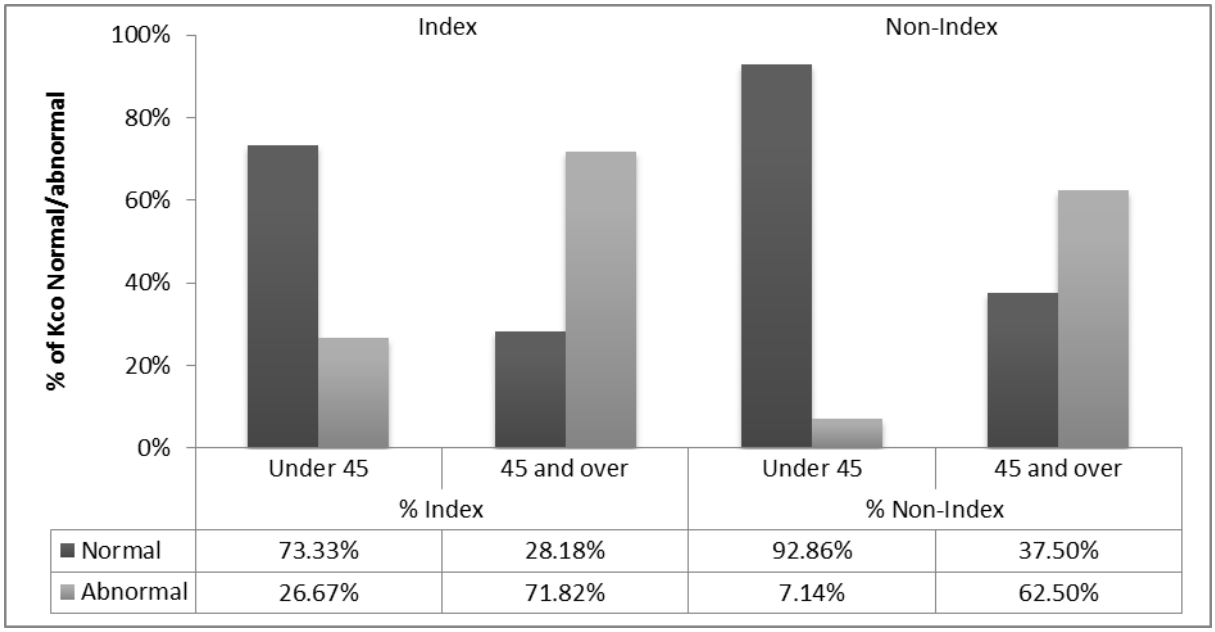

Figure 5 - Kco normal and abnormal values in acquisition grouping

CONCLUSION

Although AATD influences lung function independently of smoking there is a broad impact on physiology which remains normal in many patients suggesting other epigenetic influences (heritable changes in gene expression, not caused changes in the underlying DNA sequence).

As in other studies non index patients have better lung function than index patients although under the age of 45 this difference for FEV1 is minimal.

The data confirms the added advantage of measuring gas transfer in all patients with AATD to determine the presence and progression of lung disease.

REFERENCE

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AN AUDIT OF ADVERSE EVENTS DURING PULMONARY FUNCTION TESTING (PFT) AND CARDIOPULMONARY EXERCISE TESTING (CPEX) IN PRE-OPERATIVE ABDOMINAL AORTIC ANEURYSM (AAA) PATIENTS

McArthur S, Robson A, Mitchard N, MacLeod J, Innes JA.

Respiratory Physiology Service, Vascular Laboratory, Royal Infirmary of Edinburgh

INTRODUCTION

AAAs are often found incidentally or if patients are symptomatic, however a new AAA screening programme has been implemented in Scotland for men aged over 65 and shall be available to all men aged over 65 years by the end of 2013. If a patient is found to have an AAA diameter >5cm surgery is recommended. As part of the pre-operative assessment for suitability for surgery, the patients must undergo a barrage of tests including pulmonary function (PFTs) and cardiopulmonary exercise testing (CPEX) - Figure 1. These tests are used to help stratify the patients' risk of surgery versus the risk of death due to the AAA. It has also been shown that CPEX testing is the only means of predicting 30 day outcome and 30 month mortality in this patient group (Hartley et.al, 2012).

Due to the introduction of the screening programme a greater number of patients will require testing. However, the presence of AAAs is classed as a relative contraindication to testing (1996 AARC documents and ARTP part 1 manual) due to the increase in thoracic pressure generated during testing. There are few evidence based guidelines with regard to testing patients with AAAs (Cooper, 2011) especially in patients with AAAs of >6cm. Myers et al carried out a study in 2011 to assess patient safety in those with AAAs during CPEX testing and found no serious events, however those patients AAAs were smaller in size ranging from >3cm to <5cm.

This study looked at adverse events during PFTs and CPEX testing in patients with AAAs ranging in size up to 11cm.

CT Scan
Pulmonary function tests (PFT))
Cardiopulmonary exercise testing (CPEX)
Stress echo
Chest x-ray
MRSA screening
Blood tests
Electrocardiogram (ECG)
Echocardiogram

Figure 1: Pre-operative tests for AAA repair

METHODS

Demographical and test data were collected during the pre-operative assessment of patients (n=150) during the period 26/09/2011 to 31/10/2012. Patients had spirometry, CO transfer testing (Collins CPL) and CPEX testing (Carefusion Masterscreen Bike) as is required by the AAA assessment protocol at the RIE. Patients had their AAAs measured anterioposteriorly using ultrasound or by CT of aorta as part of this protocol. Data on co-morbidity were extracted from the patients' clinical notes. Patients whose AAA diameter was not measured at time of testing were excluded from the analysis. Ethics approval for this study was not required, as we have carried out a retrospective audit of data obtained for routine clinical use.

RESULTS

150 patients (30 females) were included in the analysis, age range 31-89 years old (mean 73 ± 7.8 (SD)). All patients were Caucasian, with the large majority being smokers (n=50) or ex-smokers (n=89). A large number of the patients were overweight (BMI 25 to 29.9 kg/m2, n=74), obese (BMI ≥30 to 39.9 kg/m2, n=32) or extremely obese (BMI ≥40 kg/m2, n=3) with a smaller number being the ideal body weight (BMI=≥20 to 24.9kg/m2, n=38) or underweight (BMI <20kg/m2, n=3). Patients were classified as having small (3.0 – 4.0 cm, n=4), medium (4.0 – 5.4 cm, n=22) or large (>5.5cm, n=124) diameter aneurysms. Seventeen patients died during the study period, with the causes of death shown in Table 1. None of the deaths were related to either PFT or CPEX testing.

Cause of death	Size of AAA (cm)	Co morbidities (if known)
Unrelated to AAA		
⇒ Cardiac arrest	7.0	-
⇒ Lower lobe squamous carcinoma	6.1	COPD, AF, TIA
⇒ Metastatic squamous cancer	6.4	-
Ruptured AAA		
	10.0	-
	6.4	AF, Past MI
	6.1	Angina
	9.2	Hypertension
Post-op AAA repair	6.1	COPD
⇒ Multi-organ failure	6.0	-
⇒ Respiratory failure	8.5	-
Cause Unknown	6.3	TIA
	7.0	Hypertension, past MI
	7.5	-
	6.9	Hypertension, Diabetes
	6.4	-
	6.6	CAD
	6.8	IHD

Table 1: Cause of death, size of AAA and known co-morbidities within the cohort

Patients carried out spirometry (n=150), gas transfer (n=147) and CPEX (n=140). 3 patients had no gas transfer results due to 1 being deaf, 1 unable to follow instructions and 1 unable to tolerate mouthpiece. 10 patients did not have CPEXs due to being symptomatic at time of testing (n=4), hypertensive at time of test (n=1), IHD and obesity (n=1) and cause unknown (n=4). Most patients (n=125) had at least one or more listed co-morbidity as shown in Table 2.

Respiratory (n=52)	**Cardiac (n=86)**	**Vascular/ Endocrine (n=72)**	**Cancer (n=4)**
Asthma (8)	Past MI (18)	Previous AAA repair (1)	Breast (2)
Asbestosis (1)	Angina (16)	TIA (9)	Metastatic(1)
Emphysema (5)	IHD (26)	Diabetes (14)	Rectal (1)
Bronchiectasis (1)	AF (11)	Hypertension (48)	
Bronchitis (1)	Past Heart Transplant (1)		
COPD (32)	Past CABG (13)		
Pleural Plaques (1)	AVR (1)		
Previous pneumonectomy (1)			
Pulmonary Fibrosis (2)			

Table 2: Known co-morbidities within the cohort

No adverse events were recorded during testing other than cough, chest tightness, light-headedness and breathlessness.

DISCUSSION

Most patients in the study had AAAs >5.5cm (n=124) but this is due to the fact that patients are only assessed for surgery once their AAA reaches 5.5cm. Patients with smaller AAAs may be assessed for surgery but only if they have other risk factors in place. There seems to be a genetic pre-disposition towards developing an AAA however this was not investigated within the remit of this study. Seventeen patients died throughout the duration of the study; 4 of ruptured AAA (sizes= 9.2cm, 10cm, 6.4cm, 6.1cm), 3 post-repair complications (respiratory complications and multi-organ failure), 3 unrelated to AAA and 7 of unknown cause. Only the patients' basic case notes were able to be accessed during the study so not all cause of deaths could be found however none of the deaths were associated in time with (or within 30 days of) of PFTs or CPEX testing.

CONCLUSION

No significant adverse events were observed during PFTs and CPEX testing in patients with small, medium and large AAAs, even those presenting with other co-morbidities. The status of AAA as a relative contraindication to PFT may need to be reassessed, at least in a hospital setting.

FURTHER RESEARCH

Ultimately the best way to measure the stresses placed upon AAAs during PFT and CPEXs would be the use of transoesophageal and transdiaphragmatic balloons or monitoring the AAA by a visual means such as ultrasound or MRI. The limitations of ultrasound would be interference of the chest wall and abdominal muscles during spirometry and CPEXs. With this study a collaborative effort between sites would be valuable as the greater number of tests performed without incident would indicate a certain level of safety or allow risk to be stratified.

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A REVIEW OF THE USE OF ARM-SPAN MEASUREMENT AS AN ALTERNATIVE MEASURE OF STANDING HEIGHT IN PREDICTING LUNG FUNCTION

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INTRODUCTION

Appropriate interpretation of lung function measurements requires comparison to reference data which should adjust for differences in height, sex, age, ethnicity and body size. Height is one of the main determinants in predicting lung function, however accurate height measurements in some patient groups (e.g. those with musculoskeletal deformities) may be challenging, therefore alternative anthropometric measures may have to be considered. The 2005 ATS/ERS task force: "Standardisation of lung function testing" suggests arm-span measurements (taken from fingertip to fingertip from outstretched arms at a 90 degree angle) as a surrogate measurement for height in these patient groups. Arm-span can then either be directly substituted for height or estimated height can be calculated from the use of a regression equation or a fixed ratio (i.e. arm-span/fixed ratio). This article will review the literature on the use of arm -span measurements as a surrogate of height and the impact on interpreting lung function.

In 1970, Johnson et al found good correlation between observed height (standing height) and arm-span in 139 healthy adult subjects when using a fixed ratio of 1.03 as recommended by the ATS/ERS taskforce. Seventy five scoliosis patients were also included in the study and in addition to standing height and arm-span measurements, "un-deformed height" was calculated from the use of roentgenograms. This involved an X-ray image of the spine and a mathematical formula to calculate the spinal curvature (Cobb method). Un-deformed height based on the roentgenograms was considered the gold standard since they corrected for even minor curvatures of the spine. There was a close correlation between arm-span and un -deformed height. The patients also performed spirometry and the impact of different height measures to interpret lung function was reviewed. 15% of spirometry results would have been classified incorrectly if using standing height instead of un-deformed height. The authors recognised that achieving an un-deformed height using roentgenograms would not be feasible in a lung function laboratory setting, and therefore recommended using arm-span measurements with the fixed ratio of 1.03 to estimate height in this patient group.

Ashutosh et al also investigated the impact of using standing height, arm-span (without adjustment) and estimated height (from arm span with a fixed ratio) on the interpretation of spirometry results in a North Indian sample group. Both arm-span and estimated height proved a good predictor of standing height. The study found when arm-span was substituted for standing-height during spirometry interpretation, 84% of patients were categorised and classified correctly whereas use of estimated height was slightly higher with 86%. This group later advised a using a fixed ratio of 1.024 in the North Indian population (rather than applying the fixed ratio of 1.03 based on Caucasian subjects or a regression equation).

The impact of age, sex and ethnicity on standing height and arm-span, was also reviewed by Parker et al, They investigated the use of a fixed ratio (specific to sex and ethnicity) or a regression equation to estimate height and found the fixed ratio became less accurate at predicting height at the extreme stature (i.e. <152cm or >191cm), with a mean error of up to 2.5cm. In contrast, using a regression equation that adjusted for sex and ethnicity was more accurate in estimating height in their study population.

Despite the evidence for use of fixed ratios/regression equations in adults, in children there is good evidence to use arm-span as a direct substitute for standing height. In 1996 Hibbert et al measured standing height and arm-span annually in a large cohort of Australian children aged 8-18years, and demonstrated excellent correlation between direct arm-span measurements (unadjusted) and standing height. Subsequently the guidelines released by the British Thoracic Society for respiratory management of children with neuromuscular weakness advised that arm-span should be used as substitute for height when performing lung function tests. Furthermore Lidia et al assessed the correlation in standing height and arm-span when used to predict Lung Function in 6-10 years. The study showed a good correlation between the two measurements, however the authors suggested the two measurements can be interchangeable. The consensus among experts would be to remain consistent with the measurement of choice (ped-lung forum, 10/10/2013).

This review has highlighted that arm-span measurements are an appropriate surrogate for standing height in those subjects in whom we cannot achieve an accurate standing height. In adults estimated height is calculated from arm-span with the use of a regression equation or using a fixed ratio (which may differ for ethnicity and sex). For paediatrics the arm-span measurement can be used directly as a measurement of estimated height. Limitations of this technique however should be acknowledged since arm-span maybe difficult to achieve in neuromuscular patients, who have significant contractures, and other anthropometric measurements (e.g. Ulna length) may have to be considered.

If standing height is not used to derive predicted lung function, the method of height estimation must be clearly documented on the report.

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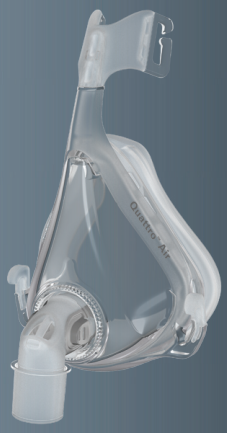

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PERFORMING LUNG FUNCTION ON PATIENTS WITH NON-TUBERCULOUS MYCOBACTERIUM

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INTRODUCTION

Non-tuberculous mycobacteria (NTM) are a group of environmental organisms which can cause chronic infection in patients with inflammatory lung diseases and have been associated with poor outcomes for patients with cystic fibrosis (CF) and non-cystic fibrosis bronchiectasis [1]. Previous research indicated that NTM was largely environment acquired, however researchers at the Cambridge Centre for Lung Infection (CCLI) at Papworth Hospital, UK, have found that person-to-person transmission can occur [2]. As a precaution, additional infection control measures have been implemented to minimise cross-infection risk whilst performing lung function tests in patients with CF and non-CF bronchiectasis.

The aims of this article are:

- to raise awareness of NTM as a clinical issue when performing lung function in these patient groups and draw attention to recently published work
- to outline additional infection control measures introduced at Papworth Hospital to minimise cross-infection risk
- to outline some of the practical implications of introducing these additional measures in patients with NTM
- to encourage debate and highlight the need for further research in the area

BACKGROUND

NTM are environmental organisms most commonly found in soil and water primarily affecting hosts with compromised lung defences such as those with structural lung disease or immunodeficiency. Patient groups at risk are therefore those most vulnerable to infection, for instance, those with CF and non-CF bronchiectasis. Of the NTM species, the two most common mycobacterial groups in question are Mycobacterium avium-intracellulare complex (MAC) and the Mycobacterium abscessus complex (MABSC). MAC is reportedly the predominant mycobacterium in the US, whereas in Europe, MABSC predominates. In CF, infection with MAC and MABSC has been associated with worsening symptoms, increased rate of lung function decline and poor outcomes post-transplant. In Europe, MABSC has emerged as a multidrug resistant pathogen in CF, and is notoriously difficult to eradicate. [3].

To date, research has largely centred on CF, and in 2003 a large multicentre CF study in the US reported an overall prevalence of NTM at 13% [4]. More recent evidence suggests that the prevalence of NTM recovered from respiratory secretions is increasing in CF [5]. Observed increases could be due to increased environmental acquisition or improved surveillance; however, new research suggests that person-to-person transmission may occur [2]. Researchers at the CCLI at Papworth Hospital, UK, have used DNA sequencing technology to sequence the genomes of 168 isolates of MABSC from 31 infected CF patients between October 2007 and April 2011. They found that by looking at the relationship between

samples, they could determine where infection had likely passed from person-to-person. Previous research found MABSC isolates to be unique, supporting environmental acquisition rather than person-to-person transmission [4,6]. These studies had used few patients from the same CF centre, and this new research has enabled researchers to identify a cluster of near-identical isolates of MABSC in 11 patients all from the same centre. These isolates were more closely related than those seen within the same individual, highly suggestive of person-to-person transmission. This pioneering research is the first to demonstrate evidence of person-to person transmission of MABSC.

The Papworth Hospital study was published by 'The Lancet' in March 2013 and also included detailed environmental testing to identify possible opportunities for transmission of MABSC both in and out of the hospital. No exact source of transmission between patients was established. There were many potential opportunities for transmission identified, all within-hospital, including both inpatient and outpatient care. Clustered cases were significantly more exposed to hospital than reference cases, and therefore more likely to be exposed indirectly to infected patients. The exact mechanism of cross-infection remains elusive, yet the number of patients recovering isolates of MABSC continued to rise during the data collection period. [2]

As of September 2013, the prevalence of patients with MABSC infection currently being segregated at Papworth Hospital was 6.69% (18/269 patients).

Strict infection control measures were put in place within the centre in 2004 following UK Cystic Fibrosis Trust guidelines [7], including within-hospital patient segregation, individual en-suite rooms for inpatients and separate outpatient clinics (including separate spirometry devices) for patients with pathogens such as Burkholderia cepacia complex, Pseudomonas aeruginosa, and Methicillin-resistant Staphylococcus aureus (MRSA). The researchers hypothesised that within-hospital transmission was indirect, identifying potential sources including fomite contamination (since MABSC is dessication resistant) and aerosol generation. Aerosol generating (e.g. cough-inducing) activities such as physiotherapy and lung function testing were therefore deemed higher risk as they could lead to cross-infection through inhalation of airborne water droplets. [2].

Lung function tests (particularly spirometry) are performed routinely in patients with CF and non-CF bronchiectasis. These data (most notably the forced expiratory volume in 1-second (FEV1)) are used as a marker of disease severity, to monitor treatment effects and to predict mortality. Since the development and widespread popularity of barrier filters in lung function testing, there has been very little research conducted into the risk of cross-infection. Kendrick, Johns and Leeming [8] provide a good review of literature regarding infection control of lung function equipment, concluding that lung function is safe to perform on the majority of patients. They stressed the importance of adequate cleaning/disinfecting protocols and the need for appropriate precautions in the minority of patients e.g. those with mycobacterium tuberculosis, MRSA etc., advocating further research in the area. Given the rise in the number of patients infected with NTM at Papworth Hospital despite conventional infection control measures, and in light of recent evidence, there is insufficient evidence to refute claims that lung function testing may contribute to the person-to-person transmission of NTM.

IMPLEMENTING NEW INFECTION CONTROL MEASURES

In 2013 the CCLI at Papworth Hospital began to introduce new infection control measures to minimise the risk of transmission of NTM between patients. This included continuous sputum screening for all CF patients, more stringent outpatient segregation and negative pressure rooms for inpatients infected with NTM. In this time the protocol for performing lung function tests on patients infected with NTM has evolved and remains a working document. The changes reflect the need to minimise the risk of cross-infection via fomite contamination and/or aerosol generation.

The current standard spirometry protocol is based upon a combination of ARTP and ATS/ERS guidelines and reflects the need for appropriate infection control precautions where indicated [9-10]. These include having a signed request form with the infectious status of the patient, comprehensive pre-test questioning to screen for contraindications and the use of a disposable electrostatic barrier filter, mouthpiece and noseclips for each patient. CF or non-CF bronchiectasis patients generally perform spirometry on a portable desktop device (attached to a PC with a wipe-able keyboard) or using a wedge-bellows spirometer which is then wiped clean after each use with a sanitising wipe. Outpatients are given one of 11 designated clinic rooms all fitted with a desktop spirometer. Spirometry is generally performed first and the patient remains in their clinic room to be seen by other members of the multi-disciplinary team including a consultant before leaving.

For patients infected with NTM, the general principles of the protocol are the same as in non-NTM patients, with modifications which aim to minimize cross-infection risk. Outpatients infected with NTM are allocated rooms furthest from non-infected patients, and unlike when occupied by non-NTM patients, these rooms are not reused until potential airborne droplets have settled and the room can be thoroughly disinfected. From a practical lung function perspective, extra precautions have been added to the pre-test set-up and performance of spirometry. Trolleys containing additional resources for testing NTM patients e.g. anti-sporicidal wipes are taken to the testing area but remain outside the clinic room at all times. Tests are performed using a desktop spirometer but the standard device is removed from the room prior to the arrival of the patient. Each infected patient has a flow head and tubing for single patient use which are stored separately to prevent fomite contamination. Four base units are designated for use with NTM patients only, and these are verified for use as part of the modified set-up procedure (see below):

NTM SET-UP PROCEDURE

1. **Confirm patient and room allocation (check for any changes).**
2. **Obtain flow head (either patient's own or set up new if required).**
3. **NTM trolley taken to test area.**
4. **Set-up room with base unit (from trolley) and place new filter in each base unit.**
5. **Verify appropriate flow head with NTM syringe for patient and prepare for testing with electrostatic filter, mouthpiece and noseclips. Remove patients' labelled clear bag for flow head from room. Store in NTM trolley until after testing.**
6. **Place pen and raw data sheet, anti-sporicidal wipe, microfibre cloth, sputum pot and clinical waste bag in allocated NTM room.**
7. **Ensure working scales in room to measure patient weight.**

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If more than one patient infected with NTM is expected, additional clinic rooms are set-up simultaneously prior to clinic for efficiency purposes. Following their arrival, the practitioner will perform spirometry using a modified protocol designed to protect the patient, the practitioner and all other patients- infected or non-infected (see below):

NTM PATIENT TESTING

1. Move trolley as close as possible to room where testing to be performed.
2. Ensure room has been prepared and device verified (prepare and verify if not – see set up procedure).
3. Apply personal protection:
    - Put on apron
    - Put mask on ensuring correct mask and fitting according to fit test instruction
    - Assemble and put on eye protection
    - Put on 2 sets of gloves
4. Enter room and remove patients' labelled clear bag from room after confirming identity. Test patient as per usual spirometry protocol. Record results on data sheet and dispose of data sheet in clinical waste bag on completion of tests (do not add any patient identifiers). Print 2 sets of results (1 for clinic, 1 for database entry).
5. Dispose of mouthpiece and electrostatic filter in clinical waste bag.
6. Disconnect base unit.
7. Wet the anti-sporicidal wipe & microfibre cloth.
8. Whilst still in room, remove eye protectors, apron and 1 layer of gloves. Dispose of in clinical waste bag. Leave bag by door.
9. Remove base unit and flow head from room.
10. Put apron/paper towels on floor outside room.
11. Clean down base unit and flow head with anti-sporicidal wipe.
12. Remove mask and place in clinical waste bag (just inside room).
13. Leave for 1.5 minutes contact time.
14. Clean down with microfibre cloth.
15. Dry with paper hand towel.
16. Put patients own flow head in patients' labelled clear bag.
17. Put base unit back into trolley.
18. Remove gloves and place in clinical waste bag (just inside room).
19. Wash hands.

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PRACTICAL IMPLICATIONS

The protocol presented is intended to minimise cross-infection risk and protect patients/staff. It offers a feasible method of performing spirometry on patients infected with NTM at a time when monitoring lung function is vital. The practical application of implementing such a protocol is more challenging. A great deal of preparation, resources and time has been spent to ensure that the protocol is workable. There have been a number of issues encountered, including:

- The protocol being devised without complete understanding of the precise mechanism of cross-infection.
- Practitioners needing to be fitted for a mask (e.g. FFP3); two team members subsequently being trained to use a fit testing kit for this purpose.
- Resources necessary to purchase flow heads for single patient use and devices for use in NTM patients only; plus extra consumables required to adhere to the protocol.
- Length of time taken for staff to familiarise themselves with the new measures, and increased time to perform the test using the new protocol. Originally, a standard spirometry test (taking 10-15 minutes with a non-NTM patient) could take up to 45 minutes using the modified protocol, however, through its evolution and staff familiarity a typical test will now take 20-25 minutes.
- Further modifications required for inpatients (tested in their individual negative-pressure rooms) as the protocol outlined only considers outpatients.

Despite the problematic nature of devising and implementing a new protocol for patients infected with NTM, the need to protect patients and staff has remained the driving factor for change. It is too early to report on the impact of these changes on the prevention of the further transmission of NTM, but the department will continue to function in the best interests of its patients to ensure that any risk is minimised.

CONCLUSION

It is important to raise awareness of NTM as a clinical issue particularly in patients with CF and non-CF bronchiectasis. There might also be implications for other patients with compromised lung defences including those with COPD, although this remains to be determined. It is hoped that staff performing lung function tests in these patient groups will be encouraged to read the key text and consider the possibility of implementing stricter infection control measures in patients infected with NTM. The protocol presented is currently used at Papworth Hospital to protect patients and staff in the hope of minimising the risk of person-to-person transmission of NTM. More research is required to identify the mechanisms by which person-to-person transmission of NTM occurs, but also in quantifying the risk of cross-infection during lung function before a best way forward can be developed.

KEY TEXT

Bryant JM, Grogono DM, Greaves D, Foweraker J, Roddick I, Inns T, Reacher M, Haworth CS, Curran MD, Harris SR, Peacock SJ, Parkhill J, Floto RA. Whole-genome sequencing to identify transmission of Mycobacterium abscessus between patients with cystic fibrosis: a retrospective cohort study. The Lancet 2013; 381: 1551-60.

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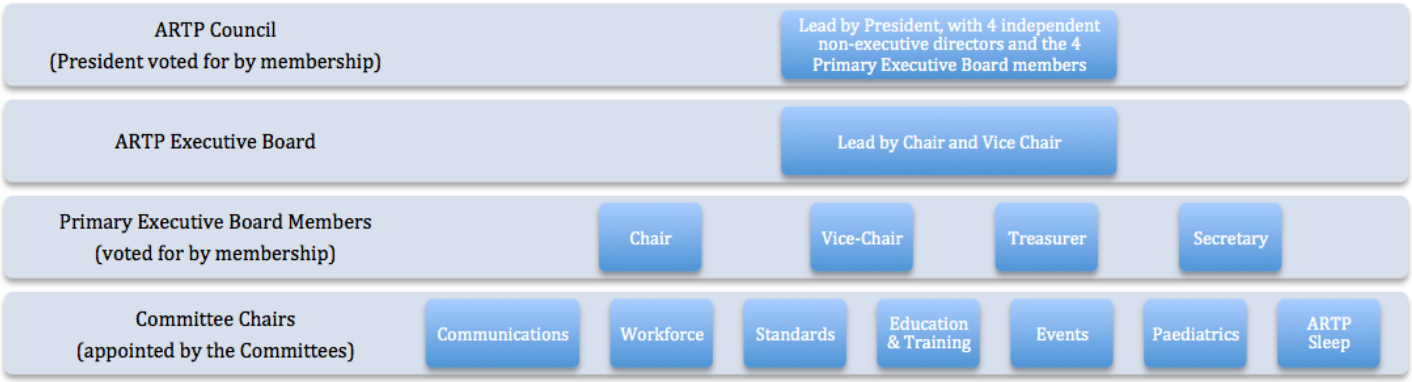
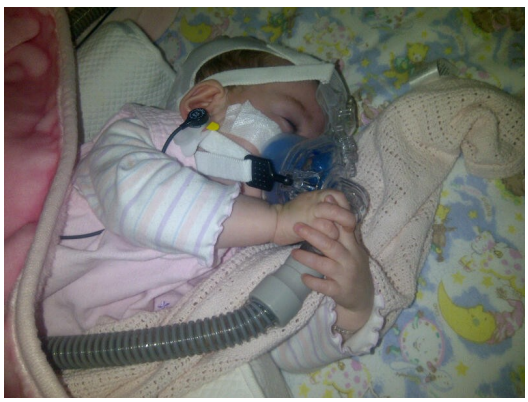
MEET THE COMMITTEE—PAEDIATRICS

ARTP business is currently broken down into seven key committees, each of which appoints a Chair. The Figure (and embedded hyperlink) below is taken from the ARTP website. The most recently formed committee is Paediatrics and I have asked the co-chairs, Laurie Smith and Kylie Russo, to provide an introduction below.



The ARTP Committees



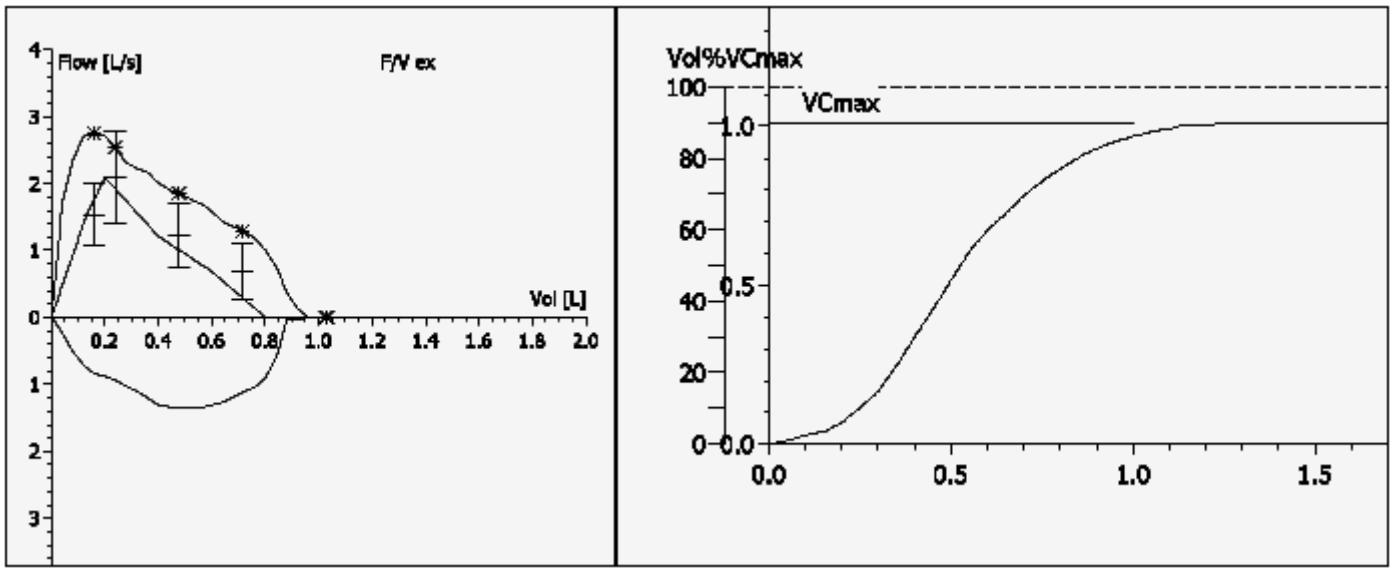
PAEDIATRIC WORKING GROUP – THE BEGINNING

At the ARTP conference in 2013, the new format of the ARTP constitution was revealed. The constitution was to be formed of working groups dedicated to pushing forward their individual specialisms. Under this new constitution it was unclear where the speciality of Paediatrics would fit in.

The discussion was then taken up by a group of senior Paediatric Physiologists at the conference to discuss how we would like to move forward with our speciality within ARTP. In the past this role has always been occupied by 1 person only to make ARTP paediatric decisions, this we decided, needed to change and our own working group began to take form. As it stands we are made up of a core of senior paediatric specialists spread throughout the country.

MOVING FORWARD

The paediatric working group was born out of an underlying frustration that paediatrics was often under-represented in the ARTP and the knowledge that the fundamental differences between adults and paediatric was frequently overlooked. Children are not just 'small adults'; their respiratory system is undergoing extensive growth and development throughout infancy, childhood and adolescent years. A full term baby will be born with approximately half the number of alveoli as their adult compliment, and there will be rapid alveolar development within the first 6 months of life. Throughout early childhood, there is rapid development where the alveoli increase in size and number and further airway elongation and enlargement



occurs at differing rates. Such that the ratio of airway to lung volume (FEV1/FVC) changes throughout childhood, and very small children performing spirometry may empty out their entire vital capacity in less than a second. This makes the interpretation of our results challenging, with the emphasis being to look at trends where possible, as opposed to one off measurements and using an individual lower limit of normal instead of fixed cut off points. Our patients may be born with lung disease or develop disease during a vital point in their growth and development which can have life-long consequences. The combination of a developing respiratory system and progressive respiratory disease makes our speciality within the ARTP unique and complex. Paediatric Respiratory and Sleep physiology is a rapidly evolving field that is ever adapting to new research and work being performed. The guidelines that we work to may be adaptations from adult practices, a result of specific research performed within an individual specialised paediatric centre, or in collaboration with other international paediatric centres. As a result routine lung function and sleep assessments may differ amongst laboratories. We aim, with this group, to try to address some of these issues within ARTP. Whereas in the past, new starters struggled to find information on best practice, we will now provide a reference point for issues related to paediatrics.

HOW TO GET INVOLVED

There is a newly set up specialist ARTP–Paediatric forum that is open to all. This sub forum is for all questions or discussions with a paediatric theme and already has senior physiologists and clinicians from around the country involved. To add your name to this, simply email us your details.

There is a well established paediatric sleep video conference that takes place quarterly and there is a pilot version of this taking place for exercise testing, this is currently for centres performing full Cardio-Pulmonary Exercise Testing, but will hopefully adapt into a more general lung function video-conference in the future.

Recently there has been some excellent work performed by paediatric specialists working in the education group, the result of which is a specialist ARTP spirometry course aimed solely at paediatrics. But there is more work to be done in collaboration with the education group, for physiologists coming through the system and only working with children, both in supporting them through the system and delivering paediatric specific training. So if you would like to directly contribute to this or work with us to help represent Paediatrics within the ARTP, then please contact us using the details below (on the blue footer).

UPDATES ON THE GLOBAL LUNG FUNCTION INITIATIVE

Dr Jane Kirkby, Great Ormond Street Hospital for Children NHS Foundation Trust

In 2012 the Global Lung Function Initiative (GLI) published Multi-ethnic reference values for spirometry for the 3-95 year age range: the global lung function 2012 equations. This presented a unified and global approach for the interpretation of spirometry data and was the first study to present spirometry prediction equations spanning 3-95 years for ethnic and geographic groups from 26 countries. In the last year GLI has been recognised as a major step forward in interpretation of spirometry and in September this year, the ARTP officially endorsed these equations. Despite knowledge of the advantages of these equations, and endorsement from all the major respiratory bodies, implementation of these equations has been challenging. The authors have therefore published an article in 'Breathe' that "dispels some of the myths of lung function test interpretation". The editors of 'Breathe' have kindly agreed to waive the copyright for this article, thus enabling full access to ARTP members. A link to the full article can be found here:

http://www.ersjournals.com/site/Breathe/012113.xhtml

ON THE BLOWER

By Brendan Cooper, Nigel Clayton, and Alan Moore

20+ Years and going strong?

It was back in to 1990s that the first edition of **On the Blower** (OTB) first hit *'Inspire'* (or '*Breathe* 'as it was then!) and for over 20 years we have been bringing the news and views about manufacturer's, equipment and services in lung function and sleep to ARTP members. The *Breathe/ Inspire* archive is not fully up on the ARTP website yet but all the back-editions have been scanned for the 30th Anniversary and ever since then. We hope readers find the articles relevant, challenging, and entertaining as well as a source of useful information. We rack our brains to come up with novel ideas and news, but really we would like to hear from ARTP readers about what they want to hear about in OTB. Please contact us with your ideas. If we don't know what subjects you want, we can't inform you of what subjects/equipment to cover. Get in touch soon. **BC**

ERS POINT Winners 2013

As you're aware ARTP holds the annual Manufacturer's Awards at the ARTP Conference and the results are based on the membership feedback questionnaire sent out each year before conference. In a similar vein, as reported in the last edition of OTB the ERS established the **P**roduct of **O**utstanding **Int**erest (POINT) Award 2 years ago to promote innovation in medical devices in respiratory medicine. The results of this year's POINT award were finally made at the ERS Congress in Barcelona back in September. The top four finalist products and the reasons why they have been chosen were summarised in the last OTB article but appear in Table 1

Device	Type	Company	Website
NOX T3 sleep study device	Diagnostic	Nox Medical	www.noxmedical.com
Spiropalm 6MWT spirometer for exercise tests	Diagnostic	CosMed	www.cosmed.com/spiropalm6mwt
Optiflow oxygen interface	Therapeutic	Fisher & Paykel	http://www.fphcare.com/respiratory/adult-and-pediatric-care/optiflow/
FlowSafe ll oxygen mask	Therapeutic	Mercury Medical	www.mercurymed.com

Table 1: POINT 2013 Finalists

The Results

The finalists presented in a tense atmosphere, each allowed to use up to 10 slides and have 10 minutes exactly to deliver their product. The final points were awarded by the judges (erm, guess who?) and the audience had an influence on the quality of the presentations. All four presentations were to a very high standard and the results were;

POINT Therapeutic Award for Optiflow presented to F&P

POINT Diagnostic Award for Spiropalm 6MWT presented to Cosmed

The **POINT 2013 Therapeutic** device winner was **Optiflow** from **Fisher & Paykel Healthcare.** The device offers the ability to comfortably deliver a complete range of humidified oxygen concentrations and flows. It is more comfortable for patients who don't tolerate a full oxygen mask and are sensitive to using nasal prongs.

and the winner of the **POINT 2013 Diagnostics** device was **Spiropalm 6MWT** from **Cosmed**.

This device allows the physiologist to measure spirometry, minute ventilation, SpO_2 and HR during the 6 minute walk test. Assessment of dynamic hyperinflation during the course of the test can be monitored by recording tidal volume, inspiratory capacity and minute ventilation. This piece of kit will no doubt have many applications, including routine assessment of breathless patients and in research where pre- and post-treatment measurements of ventilation can demonstrate response when there is no change in FEV_1. This device could also be used during shuttle walk tests where patients frequently achieve their maximal exercise capability.

I hope you've all submitted your Manufacturer's Survey for 2014 to Nigel, otherwise he won't be able to wear that same dinner jacket for the 23rd year in a row!!! It would also be interesting to hear whether ARTP members would be interested in a "POINT" type of competition by ARTP in the future. Please let us know. **BC/NC**

Innovate or Stagnate?

Innovation usually changes the way we practice respiratory medicine, particularly with regard to diagnostics and treatments. However, what do we mean by innovation. Innovation can mean different things to different people. There are many definitions of innovation, each emphasizing a different aspect of the term. The *Oxford English Dictionary* defines "innovation" as *"to make changes in something established, especially by introducing new methods, ideas, or products"* The word "innovation" comes from the mid 16th century: from Latin *innovat-* 'renewed, altered', from the verb *innovare*, from in- 'into' + *novare* 'make new'.

However, in business innovation is often confined to completely novel new ideas and concepts. For example, one definition of innovation is reflected in novel outputs: a new product or a new quality of product; a new method of production; a new market; a new source of supply; or a new organizational structure, which can be summarized as 'doing things differently'. These all qualify as innovation.

For ARTP members, innovation usually means a new technique or device, perhaps first viewed at the extensive ARTP Conference Exhibition or mentioned in OTB. It often results from "translational research" from a novel scientific technique perhaps presented at a talk or poster session one year, but appearing as a finished model a few years later. The difficulty for clinical staff is deciding whether the apparent new innovation will revolutionise the market and specialty or whether it is "false dawn" that fails to catch on because of complexity, reliability issues or because it just isn't easy to use. Sometimes new ideas just don't work and only very few go on to succeed in the mainstream.

One area of innovation that can change practice is what is termed "disruptive technology/ innovation" where a new technology going in one direction of development is hi-jacked by another field and unexpectedly creates a completely new and unforeseen market that changes the world forever. We have seen this in everyday life with disruptive technologies like; the Model T Ford replacing the horse & cart; LEDs replacing light bulbs, etc. Another example is the development of digital cameras – who buys a roll of film from Agfa/Kodak these days? Originally digital cameras were seen as "high end" development for complex cameras for professional photographers. Now, most mobile phones incorporate a high quality digital camera as standard. Similarly, far-eastern cars were initially imported into Europe as cheap models with lots of "gimmicks" like electric mirrors, air conditioning, power-steering and trip computers that have eventually became the norm for all European vehicles. Disruptive technology often causes "step changes" in markets and the healthcare market is no different.

In respiratory healthcare, often a "high end" research technique is captured by a smaller company that can utilise the technology to produce lower cost, high volume devices. This can be seen in the spirometer market with the pneumotachograph "gold standard" being firstly replaced with turbine devices in the 1980s and then in the 1990s turbine devices were themselves under threat from the ultrasonic spirometers which can be seen at the exhibition stands today. Another example is the development of the CPAP machine and nasal/facemask for sleep apnoea which was then exploited in a vast range of complex to design, but simple to use non-invasive ventilators (NIV). Indeed this ventilator market continues to develop year on year as a mix of bench science, clinical usage and medical research refining and simplifying patient treatment through improved comfort and improved functionality.

Here are some excellent examples of innovation that were on display at the recent ERS Congress in Barcelona. In the diagnostic devices, there were some interesting developments on established

technology including;

The **Signostics Signos RT** is a small affordable completely portable ultrasound system which looks like a good example of "disruptive technology" for simple point-of-care applications such as pneumothoraces and AAA screening.

Forced oscillometry is a test for airways function that has predominantly been offered on large lung function systems, but the **Thorasys TremFlo** is an example of creating a more portable device for use in paediatric clinics. Oscillometry has the advantage of not requiring maximum volition manoeuvres like spirometry but has never caught on widely for a variety of technological reasons including the lack of reliable reference values. Perhaps in this device we re-apply an established technology to improve paediatric lung function testing.

Another paediatric innovation is the **VoluSense** which is a tidal breathing monitor for neonates which can monitor breathing pattern. It non-invasively measures lung function parameters including tidal volume, tidal flow and thoraco-abdominal asynchrony in neonates. The device uses a wrap-around vest worn by the baby which is well tolerated and avoids a mask. This clearly has potential to change practice in routine care.

The therapeutic devices have offered several interesting examples of innovation;

A completely new innovation can be seen in the **Alair System Bronchial Thermoplasty** as a treatment for some asthma patients by allegedly reducing the thickness of airway smooth muscle via a series of bronchoscopic procedures. This is a radically different therapy which whilst validated, will require further clinical audit, appropriate training of staff and a cost analysis at local level. Innovation is not always about devices, sometimes it's about completely different approaches and technology.

Ventilators were represented by non-invasive **ResMed Stellar 150** at one end of the market and the **GE Engström Carestation** at the other. The GE Engström Carestation is a critical care respiratory system with a new exclusive **FRC INview** technology, which enable real-time FRC measurement whilst being ventilated. This copyrighted design may well set a trend in competitor devices that may see all ventilators offering integrated FRC measurement technology on NIV devices in a few years. The Stellar 150 whilst not totally innovative in its concept has raised the bar to ensure greater competition in the home NIV sector by offering graphic displays of breathing during use.

Whilst these examples illustrate the messages of innovation, they do not recommend one device over another – that is for each ARTP purchaser and clinician to decide which the best device for their service.

The innovation pathway is a long and often slow process with testing, regulatory hurdles and development of concept proceeding before any larger scale manufacture and marketing of devices hits the stands at the ARTP Exhibition. On average from an initial idea to a mainstream device on the market takes about ten years, and many would be manufacturers fall by the way side as the result of politics, economics and other players in the market. Healthcare staff can often forget the difficulties of bringing a device to market, but fortunately, ARTP has an outstanding exhibition at Conference where a lot of the innovative devices get an airing. For attendees at ARTP Conference getting around the stands and seeing what's new, what's changed or what's withdrawn is a vital part of a Conference experience.

Don't forget – try and come to the Blackpool ARTP Conference in January and see the manufacturer's exhibition or failing that, if you're under 35years, join ERS for free and view the *ERS Buyer's Guide* on-line for free.

Equipment 'Highlights' at ERS

ERS Barcelona: Sleep/CPAP/NIV

The ERS exhibition was impressive and extensive but was a bit of a damp squib in general on the lung function equipment front. Some of the sleep companies were keen to show off their cloud based technologies but there are considerable reservations as to whether the IT infrastructures in most European countries including the UK at present are capable of coping with these technologies in a robust enough and uniform manner. What has been coming for a number of years is Wireless/Bluetooth enabled CPAP and NIV devices which then allow you to monitor your patient progress and compliance remotely. Unlike the rest of Europe, the roll out of Broadband in the UK is a complete dog's breakfast with quite large areas of the UK having extremely slow/pointless Broadband speeds and some dwellings, despite having a phone line, having no Broadband access at all. So, that is one big negative. Well, can Mobile phone communications be used instead I hear you ask? Well…….. How many of you fall regular victim to Vodafone, O2, T Mobile, Orange (or No Range as they're often better known), EE which stands for Everything Everywhere (or more possibly accurately Nothing Anywhere), Three (which is about the number of places in the UK you can get a decent signal) to the absence of a 3G signal or, worse, no signal at all?

So, is there an ulterior motive for the push on remote monitoring? Well, the companies will collect all the data on your patients on their Cloud technology and then enable you to have access to the data. Will this be free? Certainly not – and you could have to pay a hefty price for the use of their services. The whole purpose here is to try and tie you as the customer into a binding and long term relationship with a specific provider so that it becomes extremely difficult to change supplier of CPAP and NIV devices. Yes, they will have you tied up good and proper. If you think getting your PFT data from one company database to another is difficult, you "ain't seen nothing yet". There are no codes of conduct or statutory instruments laid down to cover the way this service provision operates apart from the companies having to provide secure servers to store the data on. Once a company has your patient data, it's likely to be stuck there in perpetuity. So, think long and hard before you sign on the dotted line.

The plus side, as the companies will readily point out to you, is convenience for your patients and savings on staff because there is a reduction in face to face contact time. However, don't we all know as sleep and ventilation professionals that having face to face contact with patients yields significant benefits? This of course all falls in to place with the Any Qualified Provider (AQP) and the innovation drive that the current government has been steering through in the background. It is claimed AQP is not a way of privatising healthcare in the UK, but then again the same administration said HS2 is not a way to boost votes outside London in the next election!!!

ARTP members need to look at the technologies and make their minds up as to whether it is for your patients and your service. I would urge the cautious approach. Basically, outside the big cities, my advice would be to forget this technology at present and, in large parts of Northern Ireland, Scotland, Wales and the North of England, you haven't a hope for the foreseeable future. Even in the big cities, Broadband and Mobile signal provision can still be a real issue. You should engage with your local commissioners and advise them of the folly of unproven and probably expensive technology that few patients are keen to have.

PFT Equipment

Whilst one or more of the OTB team is sometimes aware of companies that have new products in the pipeline, it would be wrong of ARTP to make this information, which is sometimes made known to us on a personal, confidential basis, available in the public domain. You might argue that there is nothing wrong in passing this information to professional colleagues. However, if ARTP did this, it is highly likely that none of you would buy anything from the existing product ranges and you would wait for the new stuff to arrive. This would hit the cash flow positions of the companies badly and unfairly and the OTB team has no wish to do that. What the OTB team does feel at liberty to talk about are developments in software which will be available for existing equipment that we become aware of, so here goes. The OTB team can only report on what people show one or more of us so those companies who don't bother to invite us to see their wares don't get a mention here. Reference will be made later to key markets overseas and the implications of significant changes in balance in those markets.

On Show at ERS

CareFusion were keen to show off the fact that their SentrySuite (or JLab 6 as VMax users may view it) has the potential to operate from a Windows based tablet device. Whether they will actually bring this to market or not is debatable and I do wonder whether there is actually market demand for this. Nothing really clever in this. A tablet running Windows is a PC – so I don't really get the point except that it is smaller than a PC display. How many of you want to carry a tablet around whilst you're testing your patient? Most of them aren't exactly lightweight. No doubt CareFusion will enlighten me at some stage.

Medical Graphics which, as the more astute amongst you may have noticed, has undergone a re-branding of the parent company in the USA to MGC Diagnostics following an influx of new management accompanied by swish new logos and promises of commitment to excellence. Well is there any evidence of change? I was invited to view the development of their next generation Breeze software which, so far, covers Demographics, Spirometry, TL_{CO} and Nitrogen Washout. Was I impressed? As many of you will know, I'm not easily impressed but I have to say that what I saw was visually quite stunning and most certainly at the forefront of what we should be expecting to see from PFT companies. A lot of graphic design input and customer input has obviously gone into the development. VMax users may see this as a natural home given that their beloved systems have been consigned to history (see later). Given the drabness of SentrySuite and of some of the software around from rivals, when this comes to market it should prove very popular.

NDD were displaying the latest version of the Easy on-PC and EasyOne Pro software. It all works very nicely and seeing one of the smaller companies develop innovative systems and pleasing software is something we should all encourage.

ERS Buyers Guide 2013/14

This is an excellent production for which our own Brendan Cooper can take some credit. It contains an excellent article entitled "Replacing your Lung Function Equipment : What do you need to know?" written by Julie Lloyd and Brendan. Please ensure that you read it before starting the replacement procedure for your equipment; it could well save you making a potentially very expensive mistake.

I would add to what is in the guide by saying:

- In a tender document, specify that 50% of the score awarded to each item of kit evaluated will be for the user's evaluation. You may have to negotiate this with your procurement colleagues but it is well worth doing battle with them over. After all, you have to use it. Remember that it is illegal to evaluate equipment under EU law once an EU tender process is under way. You must do all your evaluations in advance of the process.
- Insist that there are financial penalty clauses built into the tender specification and final contract for supply to penalise poor equipment service and untimely repair. Yes, make the companies pay if they do not adhere to whatever service and support levels are specified in the eventual contract.
- Most PFT companies will only guarantee that their software will work on PCs supplied and specified by them. This means in effect that you will be living with outdated PC technology very soon after you take delivery and a few years down the line you may be faced with a hefty bill to up replace failed PCs. Indeed you will always pay these companies a premium price for the PCs. However, there is one company out there in what I would refer to as the major league who have engineered their testing equipment so that you can even purchase your own PCs providing that they meet a minimum specification. The reason their software will run on most PCs is that they have not engineered it to be critical to the hardware timings of a specific PC brand and specification. Their PC prices also appear to be considerably lower than those of rival companies with no loss of performance, reliability or functionality.
- Nearly all of you would like to be able to transfer your patient data from your old system to your newly chosen one even if it is not from the same company. Some companies will tell you that this is not possible. Some will tell you that they can transfer the numerical data to the new system. Wouldn't it be nice though if you could take your graphics like your Flow/ Volume loops along with each patient trial? Well, the good news is that there is one company who are claiming they are able to do exactly this from the databases of the major players in the market. I have no reason to doubt the claim. I'm not going to tell you which company it is but a few phone call enquiries will enable you to find this out for yourselves rather easily. Again, make your decision on what you want and write it into a tender specification. That way you can evaluate and get the best deal for your service.
- Write it into your tender specification that any company which provides you with an encrypted database must unencrypt it without charge at your request, at any time. Any company which then puts in a charge for allowing you to have an unencrypted database (and there is one company which has often done this) can be ruled out on the basis of failing to comply with your tender specification.
- As I have previously advised via On the Blower, make sure that any company you are considering purchasing from is financially sound and has the resources to sustain a service to you over the expected life of the equipment.

AM

Leap Year Software

Kimberley Jenkins at Milton Keynes Hospital raised the following point on the ARTP forum just recently regarding nSpire nSight software and leap year dates of birth.

*"The system does not recognise the following dob "29/02/19**" because it doesn't recognise any leap years. We have had to put a patient DOB on for 28th instead – which is not good!*

Obviously, I do not need to point out to my learned colleagues that putting in an incorrect date of birth because of software limitations is not acceptable. At best, this causes poor patient data recognition. At worst, it counts as falsifying the patient records and healthcare professionals can be prosecuted for falsifying patient data (Francis Report).

I am assured by nSpire that their American colleagues are "working on a software patch."

Keith Butterfield at Dorset County Hospital also alerted the forum of a similar problem with CareFusion Sentry Suite software. He also went on to say:

"Mind you this does raise the question of what is the patients 'true age' – I had a friend who was born on 29th Feb and really he shouldn't have been allowed into the pub for his party because it was only his 7th birthday!"

I checked the latest version of SensorMedics Vmax Encore software V.21-2A and can confirm this works fine with leap years.

Regarding all other manufacturers, I suggest you test your systems to check the software does recognise the leap year. If you identify a problem, please raise it on the forum so that we can take this forward with the manufacturers. Many thanks to Kimberley and Keith for bringing this to our attention.

Intermedical Update

The latest version of the Ndd Easy on-PC and EasyOne Pro/ProLab software is now available; this will include an HL7 interface to allow the exchange, management and integration of electronic healthcare information. Included in the latest release will be new Bronchial Provocation protocols, which add to the currently available ATS and Mannitol protocols. All these updates can be downloaded free of charge from the Ndd website ww.ndd.ch

Ndd has also just released a PC tablet based solution for 6 minute walk tests which uses a wireless Nonin wrist oximeter that transmits the data whilst the patient is performing the test. The system automatically creates a PDF or Word report from the test which includes overall distance the patient has covered.

Aerocrine launches the NIOX VERO

The Niox Vero was launched in October this year and has many superior features to the Niox Mino.

Features include:

- fully portable device, battery powered so that it can be moved across and used in different departments
- shorter start up time so it can be used quickly
- LCD colour display, with visual incentive facing the patient now, so easy to use
- quicker FeNO analysis time than Niox Mino, with analysis done in approx. 1 minute

- device now lasts for 5 years or 15000 tests (compared to the Niox Mino 3 years)

- calibration and maintenance free

Medical Graphics software updates

Some manufacturers have still not woken up to the fact that customer service is paramount in achieving future sales. Medical Graphics is one of several forward thinking companies who take customer service very seriously and now provide the GLI reference equations on all their new systems and are also offering free upgrades to this version for all existing customers.

Love Medical adds nitrogen washout to its systems

Love Medical has just announced the release of the nitrogen washout method for measuring lung volumes. This will integrate with any of their existing systems including body box, diffusion system and also with the CPET system. Love Medical is also offering a complementary full network facility, including installation support, with all Spirostik spirometry systems.

Love Medical has just moved into new premises in Manchester

Unit 1 Willan Enterprise Centre

Fourth Avenue, Village

Trafford Park

Manchester

M17 1DB

Tel: 0161 976 2744

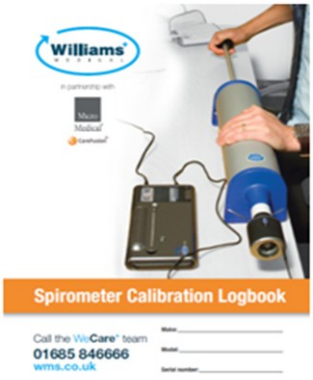
DeVilbiss launches Compact 525 Oxygen Concentrator

The latest Compact 525 oxygen concentrator has been designed to deliver up to 5 litres per minute with high oxygen concentration across all flow rates. Its features include a fire protection adapter, visual and audible alarms for low oxygen levels, power failure, pressure drop and 3 years warranty as standard (an optional extended 2 year warranty package is also available).

Also just released is the Innova Nasal CPAP mask. To minimise necrosis and other irritations, DeVilbiss has designed the mask such that it rests lightly on the face. The AIR°gel™ seal provides a cushion that ergonomically adapts to unique facial features, ensuring a great seal without the need to over-tighten the straps, reducing discomfort, skin irritation and air leaks.

FREE Respiratory Support from Williams Medical

A FREE, support tool has been produced by Williams Medical to help ARTP members achieve the ATS/ERS 2005 guidelines and should also prove useful in achieving the IQIPS award which all UK physiology labs should be striving to achieve. Williams Medical, the distributor and UK service provider for Micro Medical spirometers, have partnered with CareFusion to create a "Spirometer Calibration Logbook. Designed for use with a 3 litre calibration syringe, this handy aid allows you to log and store all the key information required for your daily accuracy checks; invaluable for quality control and audit purposes. You can request your copy today by calling the Williams Medical Supplies Sales Team on 01685 846666.



In addition, Williams Medical is also offering FREE technical support to any ARTP member who might ever have a query about the working condition of their Micro Medical spirometer. Including FREE software integration and updates, the technical team are available to help on 01685 845555. **NC**

Complaints

Don't forget, if you have any problems regarding equipment malfunction, quality control / calibration, service response times, software issues etc. please feel free to voice your opinions off the forum by contacting the Manufacturers Liaison Committee direct at Watchdog@artp.org.uk. We will then be able to collate this information, including verification of accuracy, before commencing on an appropriate course of action.

Finally, to all the manufacturers who may be reading this article, please remember to keep us posted with details of any new products you are about to release on the market. Details should be sent to nigel.clayton@uhsm.nhs.uk.

BARBARA OATWAY

The ARTP is sad to hear that Barbara Oatway passed away in Strathcarron Hospice on 25th October 2013.

Barbara was the head of department at Forth Valley Royal Hospital (formerly at Falkirk Royal Infirmary).

She became an ARTP assessor in 2003 and served as the secretary of the ARTP Scottish Forum from 2005 – 2010.

Our thoughts are with her family, friends and colleagues.

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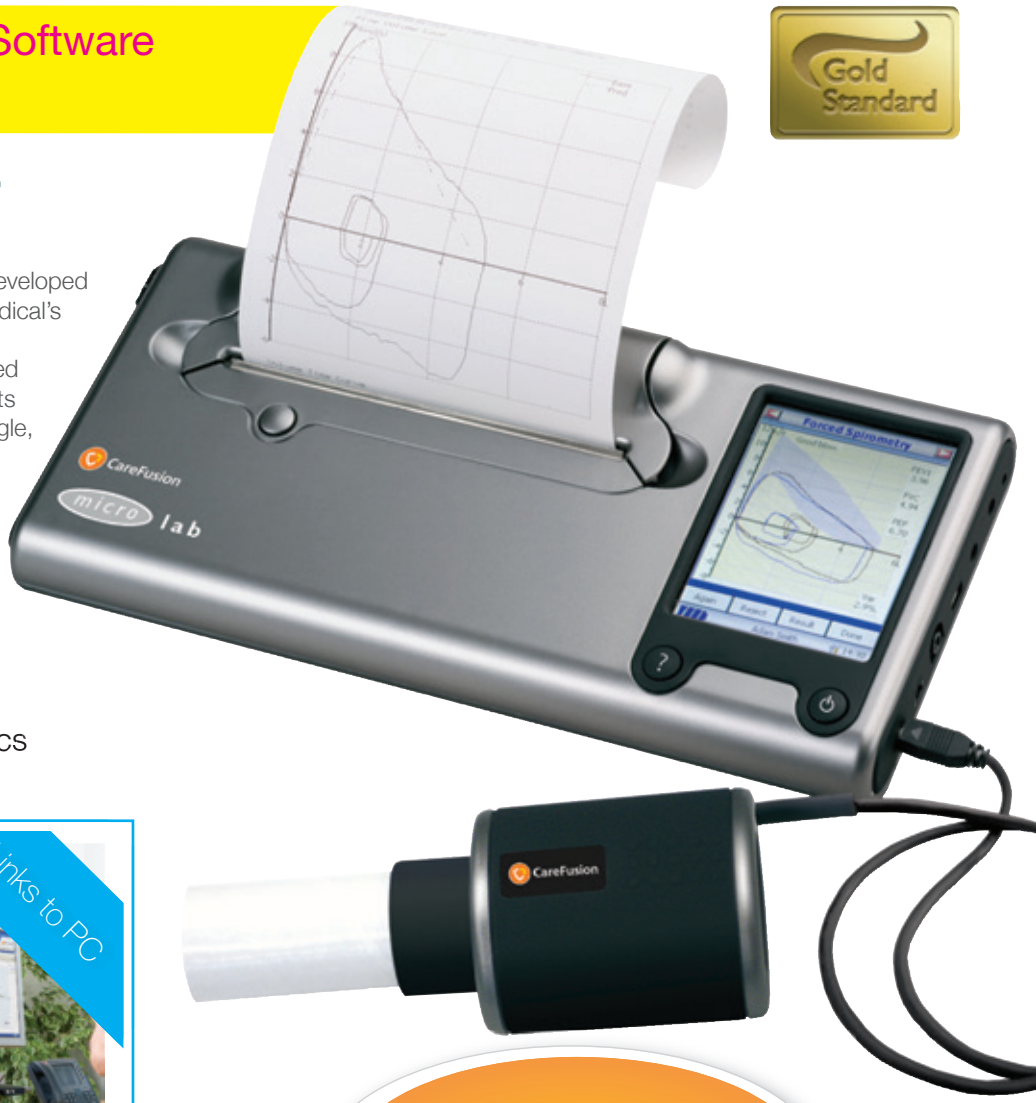
MicroLab Spirometer

Highly portable and beautifully designed, the new generation MicroLab has been developed for the professional. Employing Micro Medical's acclaimed precision GOLD STANDARD Digital Volume Transducer (especially suited to measuring very low flow rates in patients with COPD) the instrument has a wide angle, high-resolution colour touch-screen.



- ☑ Easily Portable
- ☑ Lightweight
- ☑ Built-in Printer

W3551 MicroLab Spirometer and SPCS

(Please quote ARTP when ordering)

Call us for **Preferential Prices**

- The GOLD STANDARD in spirometry
- FREE training
- FREE technical support
- FREE product demonstrations

*ARTP FREE software promotion available between December-1st and January-31st 2014 (unless otherwise agreed)

For more information, or to arrange a visit with one of our Dedicated Respiratory Specialists

Call the WeCare+ team on ***01685 846666***
or go to ***wms.co.uk***

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