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INSPIRE

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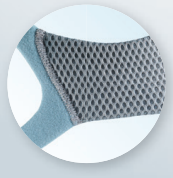

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First word

Dear Readers,

Welcome to the spring edition of *INSPIRE*. No doubt, many of you will have been busy compiling your research abstracts for the ARTP 2024 conference in Harrogate and will have been relieved with the customary (although not mandatory) deadline extension! We have had a record number of abstracts submitted this year and I am really looking forward to the poster sessions, which have become a favourite for me, to see everyone's innovative work. I hope that some of you have also submitted your abstracts to the European Respiratory Society conference which takes place in the beautiful city of Vienna this year.

We have a packed issue with some very interesting reads. Julie is signing off in her final few months as Chair and it should be noted the excellent job she has done, guiding the ARTP through some difficult times and seeing it flourish again coming out of the pandemic. She will be relieved that she won't have me harassing her to submit her quarterly '**Word from the Chair**'. There is a last minute submission which is a **testimonial** to the terrific Tracey Fleming, who is retiring this year. Along with the usual manufacturer news, we have a special edition of '**On the Blower**' with an article summarising the recent 'Westminster Health forum on sustainability in the NHS'. The first in the series of '**Physiologist life stories**' looks at the career of our own Karl Sylvester and '**Lab in the limelight**' gives us a tour of Phil Lawrence's proud paediatric lab at Alder Hey. Along with an article on bronchodilator responsiveness criteria and the regular instalment of '**Fresh air**' from the research committee and an insight into the experience of some of our **apprentices**, there really is something for everyone to enjoy.

Finally, I'd like to say a big thank you to Brendan Copper as he steps down from the editorial board. He has been a vital part of the editorial team and his contribution will be sorely missed. On that note, if we have any keen physiologists with some quick-fingered editorial skills please drop me an email or even better catch up with me at conference.

Paul Burns
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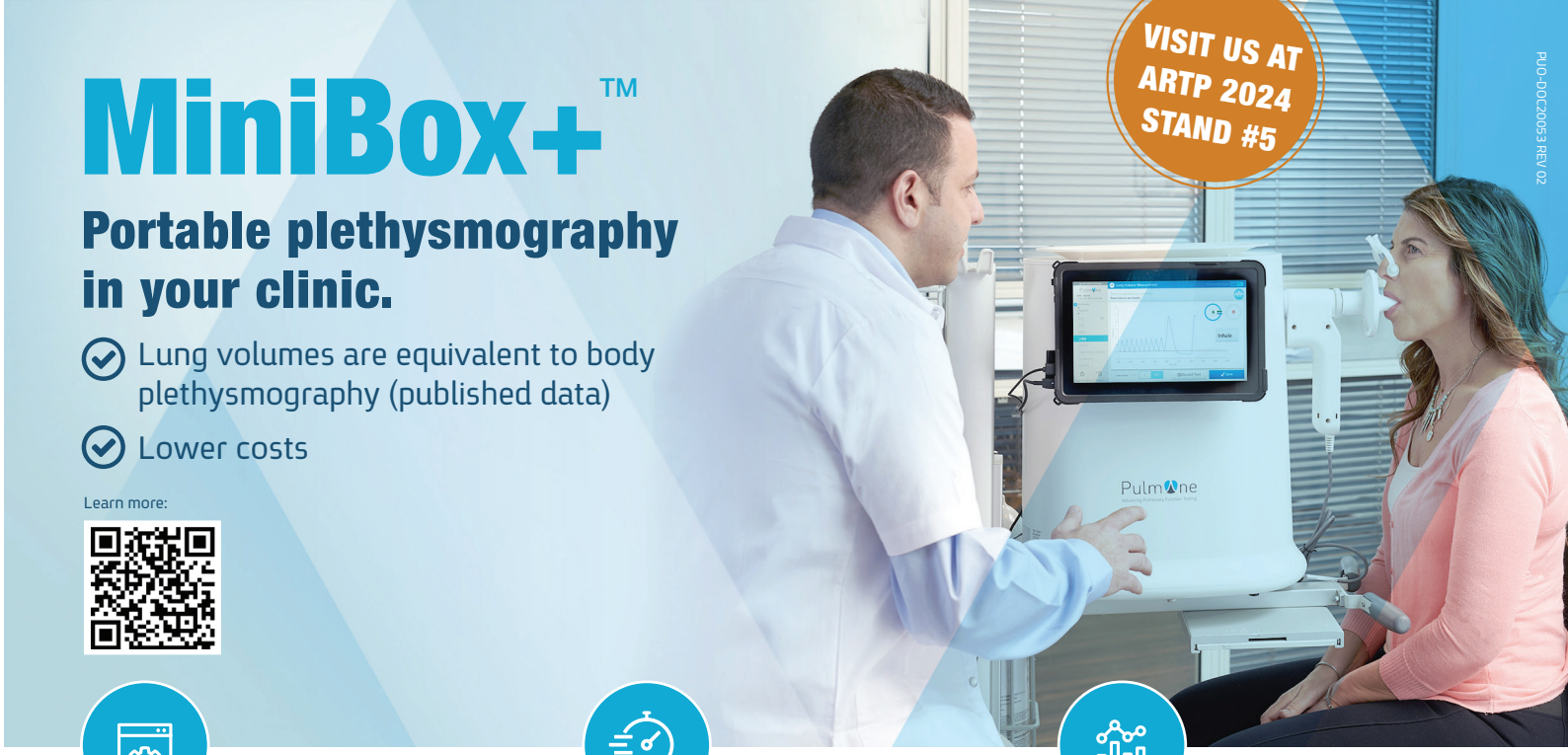

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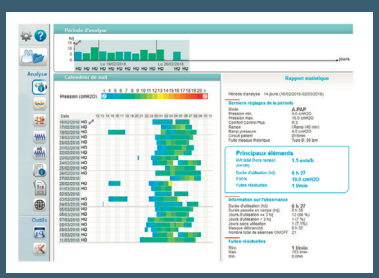

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A Word from the Chair

Julie Lloyd, *ARTP Honorary Chair*

Welcome to your Spring edition of Inspire and to what will be my last 'Word from the Chair,' since my term as Honorary Chair will come to an end following the upcoming ARTP Annual Conference in Harrogate. Talking of the Conference, I cannot tell you how excited I am by the fantastic program that has been carefully crafted by the ARTP Events Committee under the careful watch of Laura Jess.

Everyone on the committee has worked incredibly hard to ensure the Conference will have something for everyone working in Respiratory and Sleep Science. We received a record number of abstracts for our scientific program and reviewing of these definitely kept the Research Committee on their toes! The quality of the submissions has been exceptionally high this year, so huge congratulations to everyone that has had their abstract accepted, and we look forward to seeing you share your work with us in a few weeks. We have specialist tracks for paediatrics, sleep and ventilation, and we are delighted to be hosting our first joint symposia with The Association of Chartered Physiotherapists in Respiratory Care. You should start seeing communications about the program highlights over the coming weeks, so make sure you have booked your place!

Whilst the weather in the UK has been pretty awful over recent weeks (so-called Spring begins on 20th March, but I'm not convinced!) I was fortunate enough to travel to Nepal with a number of colleagues to deliver spirometry training to healthcare professionals in Kathmandu. We were also able to take some ARTP Spirometry handbooks with us and I think this picture really demonstrates how appreciative everyone was who was lucky enough to receive one.

Whilst the hustle and bustle and constant beeping of car and motorbike horns of Kathmandu is an experience, we were lucky enough to spend time trekking in some of the more rural areas of Nepal including Amppipal, Thalajung and Choprak. During our time there, it became abundantly clear why respiratory health in Nepal is so challenging when you see how females and children are almost constantly exposed to poor air quality.

Nepal is a country of great contrasts, breath-taking beauty and the warmest and gracious people I have ever encountered. Anyone considering a sabbatical or an STP elective should definitely consider the opportunity to spend some time there, sharing their skills, knowledge, and expertise.

However, enough of Nepal for now and back to matters in hand. As I come to the end of my term as Chair, this will be a change for me personally and there will, of course, be change for ARTP as the new Chair takes the helm – bringing their own vision, energy, and direction for the organisation. The role of Chair has not always been easy (especially when faced with a global pandemic!), but the best challenges always have their ups as well as downs. I have enjoyed every minute that I have been your Chair, and I know that the incoming Chair will take ARTP onto even greater heights.

Before I bring my final 'Word from the Chair' to a close, I would like to take this opportunity to thank all of my colleagues on the various ARTP Committees who work so incredibly hard for their professional body. All of this is in addition to the huge demands we all face in our day-to-day clinical roles. It has been an honour and a privilege to work with each of you. It has truly been the greatest honour of my career as a healthcare scientist to serve as your Chair and I thank each of you for your support.

I look forward to seeing many of you in Harrogate and until then, I remain your Chair, so please do not hesitate to contact me via chair@artp.org.uk with any ideas, suggestions, or feedback for ARTP.

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A Thank You to Tracey Fleming

Tracey Fleming, previous ARTP Secretary will be retiring this year from her role as Head of Respiratory Physiology at King's College Hospital in London. Tracey has contributed to the field of respiratory and sleep physiology in so many ways. Her enthusiasm, openness and dedication to improving standards will be greatly missed. A number of colleagues provide some of their anecdotes of Tracey's career.

Tracey Fleming
Head of Respiratory Physiology – King's College Hospital, London

Tracey started in the Chest Unit as a trainee in 1987. Back then we had a pair of wedge bellows, two physiologists, and a PK Morgan gas transfer.

Fast forward thirty five years (give or take a few) and Tracey is the head of Respiratory Physiology for lung function and sleep, runs the community spirometry diagnostics, as well as the bronchoscopy and pleural service which has nearly 25,000 attendances a year.

Two physiologists have become sixteen. The wedge bellows have gone (no more tipping them upside down to get the accumulation of spit out!) and we have been upgraded to be housed in a new dedicated lung function department with nine individual lung function testing rooms each fully equipped with new full lung function testing equipment and air handling. The original Chest Unit is now dedicated to the sleep service, paediatric lung function, as well as the bronchoscopy and pleural service. All of these improvements have been down to Tracey's determination to have a department to be proud of and fit for purpose.

Tracey tackling the old PK Morgan PFT

She has worked with some amazing physiologists and doctors over the years including the great Karl Sylvester (laughing face emoji) as well as current ARTP President Professor William Man and has always been a passionate advocate of training and education. She has been involved in the PTP training with St George's University as well as the STP training programmes and the National school of Healthcare Science. She has worked hard to promote quality assured spirometry in the community and is known by the local GPs as the 'Queen of Spirometry'.

It's down to Tracey's commitment, leadership and dedication to her staff that King's has become one of the busiest and most respected respiratory physiology services in the UK. She has been working tirelessly over the years and this year has led the team to achieve IQIPs accreditation.

Along with all the commitments to providing quality services at King's, there have also been some fun times away from the department. She has been responsible for some unforgettable department day trips and Christmas Do's. Tracey has encouraged a family 'feel' work environment and this has helped create many lifelong friends.

In addition to all of this, she is a great mentor and colleague, amazing fun to be around and a true friend.

Claire Wood & Lynne Morgan

Tracey was our clinical examiner for the IQIPS accreditation process for several years. She was the favourite assessor for many of the staff, always making them feel at ease and treating them with a kind and empathic manner. It was a delight working with Tracey in this role as she was very knowledgeable of the IQIPS process and requirements but also understood what it was like to manage a busy physiology service in the NHS. She has dedicated a large part of her life to respiratory physiology in both her role as a head of service but also professionally in her roles for ARTP. The team at UHCW would like to wish her a very happy and healthy retirement and hope that she spends lots of time with dogs and horses!

Dr Joanna Shakespeare

When I met Tracey, I was a naive 19-year-old with limited knowledge on respiratory physiology or the working world. In my interview with Tracey I said I was eager to learn and proceeded to tell her hobbies which included "being social, and going to the pub". Job secured; friend for life secured. Tracey taught me everything I needed to know and also became a wonderful mentor and friend that I could turn to in years to come. I wish her the best in her retirement, and hope to still catch up for a drink and chat in the coming years.

Congratulations Tracey for all your hard work in our profession. I am just one of many who will be forever grateful for the training and guidance you gave me.

Dr Jane Kirkby

Tracey with colleague and friend, Claire Wood.

I had the pleasure of working with Tracey for one year at King's in her department and also through ARTP. She made a striking impression on me as a junior physiologist in how she skilfully managed her team and how loyal she was to them, always dealing with any issues with a great sense of humour. She helped me navigate the world of ARTP business without making me feel like the naive idiot that I was! It's always great to see her and catch up at meetings and hopefully we will do so more in the future. Congratulations on retirement Tracey, you have made a huge impression on me and others, and we will always have the stripey cows! Happy retirement.

Dr Laurie Smith

Tracey has had a long and distinguished career in respiratory physiology, managing the respiratory and sleep service at Kings College Hospital, a very busy tertiary centre, which has just been granted IQIPS accreditation under her leadership.

I first got to know Tracey, when I set up and organised the ARTP Southeast regional group, when I worked at the old and no longer, Bromley Hospital. Tracey was a regular attendee and contributed to local discussions and case studies. Many reading this will hopefully and fondly remember those meetings and the opportunity for us to meet to discuss and debate local issues and of course develop friendships and support across the region.

As well as sitting on ARTP committees, Tracey held the esteemed position of ARTP secretary. It was an honour to work with her in this role, and I was always grateful for the time that is put into ARTP roles for the good of our profession and to drive standards continuously forward.

Tracey and the team at Kings have always been incredibly supportive, for which I am grateful, in offering high quality clinical placements and learning opportunities to students on the PTP Healthcare Science degree programme from St George University of London. This has led to many students choosing to specialise in respiratory/sleep physiology (rather than cardiac physiology!) and many students going on to graduate and work as highly skilled respiratory/sleep physiologists, progressing to higher bands and/or moving on to further studies including STP.
I wish Tracey all the best for her retirement, and I hope she reflects on her long and distinguished career, the thousands of patients (and families) who have benefitted from high quality diagnostics and therapeutics under her leadership, and the contribution of her service to the development of the respiratory/sleep workforce of the future.

Martyn Bucknall, ***Senior Lecturer in Physiology, St Georges University of London***
Past Chair/President or ARTP

For my part, I first met Tracey when I started my PhD at King's. It was clear from the start that she would not suffer fools gladly. Thankfully for me, she made an exception. Tracey was continually supportive during my time at King's, especially when I was tasked with setting up the paediatric laboratory. Working at King's were some of my happiest memories, especially many a leaving do for other colleagues. The Chinese Elvis night is legendary and goes down in King's folklore. If you want to hear more, this requires a conversation on one of the ARTP conference evenings. Tracey plays a big part in those happy memories.

Skip on a few years, Tracey and I then worked together pushing ARTP to new heights, with Tracey in her role as ARTP Secretary. It was no enviable position, especially as the organisation went through the transition of a new constitution that everyone was finding their feet with. Tracey was always a calm and measured colleague and could be relied upon to provide pragmatic and realistic solutions to many problems that arose. Tracey almost got away once, but I was delighted when she decided to stay on longer than she had hoped to support me as ARTP Chair. I couldn't have completed the role without her.

You can then imagine my delight when I found out that Tracey was going to be our IQIPS technical assessor. As Jo has mentioned in her testimonial, Tracey was so lovely with everyone and put them immediately at ease. As always, she was pragmatic in her questioning and the answers she expected back, completely understanding the inner workings of a busy respiratory physiology service.

Respiratory Physiology, ARTP and the whole scientific community will be sad to see Tracey retire but I'm certain you will join me in wishing Tracey the happiest of retirements. I'm sure a lot of it will be spent at the races!

Dr Karl Sylvester

Bronchodilator response criteria for children and adults with asthma: can we reverse around a corner?

Samuel Wallbanks[1], Paul Burns[2], Prof. Adel Mansur[1], Max Thomas[1]
[1.] *Birmingham Heartlands Hospital, Birmingham, United Kingdom*
[2.] *The Royal Hospital for Children, Glasgow, United Kingdom*

Introduction

Reversibility assessment is the most common test employed in the diagnostic work-up for asthma. Numerous criteria have been utilised over the past several decades to quantify a meaningful response to this test, each with their merits and limitations. There remains controversy as to:

1) "*how much is enough*" to quantify an asthmatic response to bronchodilation?
2) whether "*enough*" means the same thing for adults and children; and
3) whether reversibility assessment is worthwhile for those without baseline airflow obstruction i.e. *"if there's no obstruction at baseline, what are we reversing?*"

Variation in approach to quantifying bronchodilator response across the UK is creating confusion, complexity and inconsistency in asthma diagnosis.

Study aims

- To determine how much change in FEV_1 is observed for adults and children following bronchodilator administration.
- To evaluate the impact of using different bronchodilator responsiveness criteria in detecting a significant response in adults and children.
- To determine the clinical value of performing reversibility testing in those without airflow obstruction at baseline.

Methods

Retrospective analysis of 222 adults and 312 children with severe asthma was performed in a collaboration between Birmingham Regional Severe Asthma Service and The Royal Hospital for Children, Glasgow. Severe asthma was diagnosed based on clinical judgement in these specialist centres. Both sites performed reversibility assessment following similar approaches, performing spirometry before and after 2.5 mg nebulised salbutamol or 400 micrograms of Salbutamol via metered-dose inhaler and spacer. Seven bronchodilator response criteria were selected based on most utilised criteria employed in the UK (Table 1). Absolute and relative (% change, % change from predicted and Z score) changes in lung function were calculated as described in a previous publication (Sylvester *et al.*, 2020). The proportion of positive tests was determined as the number of patients who would have a significant bronchodilator response outcome based on each of the criteria. Airflow obstruction was defined as FEV_1/FVC ratio < lower limit of normal, using Global Lung Initiative reference values (Quanjer *et al.*, 2012). The Chi-squared test was used to assess for differences in the proportion of positive tests between adults and children across each criterion.

Table 1. Bronchodilator response criteria evaluated.

Criterion number	Criteria*	Organisation	Year
1	200 mL and 12%	ERS/ATS	2005 (Pellegrino *et al.*, 2005)
2	8% of predicted	ARTP	2020 (Ward *et al.*, 2015)
3	10% of predicted	ERS	2021 (Stanojevic *et al.*, 2022)
4	FEV_1 by 160 mL or VC by 330 mL	BTS/ARTP	1994 (BTS/ARTP., 1994)
5	Change in Z score by 0.7	ARTP	2020 (Quanjer *et al.*, 2017)
6	12% change from baseline only	BTS/SIGN/NICE	2019 (BTS/SIGN., 2014)
7	20% and 400 mL	BTS/SIGN/NICE	2019 (GINA., 2017)

*The criteria refer to change in FEV_1 and/or FVC unless stated

Results

Descriptive features of adult and child groups

Adult severe asthmatics showed a female predominance, more severe airflow obstruction and higher levels of obesity at baseline.

Table 2. Descriptive features of adult and child population at baseline.*

Variable	Adults (n=222)	Children (n=312)
Age, years	44.7 ± 13.7	11.3 ± 3.2
Males, n (%)	69 (31)	162 (52)
BMI, kg·m^2	33.4 ± 8.7	20.3 ± 5.3
FEV_1/FVC (%)	60.4 ± 14.6	75.9 ± 11.4
Obstruction at baseline, n (%)	167 (75)	162 (52)
FEV_1 (Litres)	1.9 ± 0.7	2.0 ± 0.8
FVC (Litres)	3.1 ± 0.9	2.6 ± 2.0
FEV_1 z-Score	-2.8 ± 1.4	-1.3 ± 1.6
FVC z-Score	-1.4 ±1.4	-0.3 ± 1.7
Persistent airflow obstruction, n (%)	140 (63)	59 (19

*Presented as mean ± SD, unless otherwise stated.

Levels of bronchodilator response

Median (IQR) change in FEV_1 was 290 mL (160-497) for adults and 150 mL (40-340) for children. Percentage change compared to baselines was 15.9% (7.8-30.7) for adults and 8.7% (2.1-19.2) for children. Change in percent predicted 10.0% (5.3-15.9) for adults and 17.5% (4.5-38.5) for children. Change in Z score was 0.7 (0.4-1.1) for adults and 0.6 (0.2-1.3) for children (Figure 1).

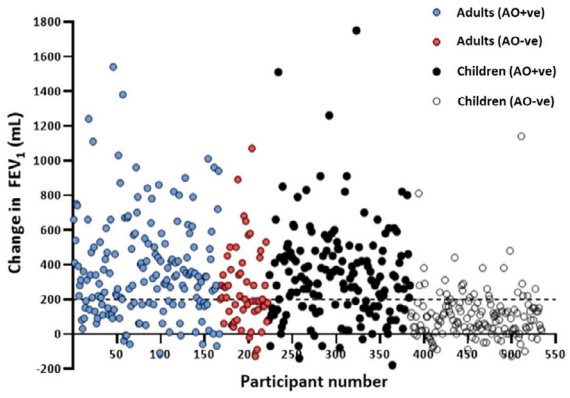

Figure 1. FEV_1 volume response to bronchodilator for adults and children with and without airflow obstruction (AO).

Median (IQR) change in FVC post-bronchodilator was 325 mL (110-540) for adults and 50 mL (-30 – 160) for children. Percentage change from baseline was 9.9% (3.4-19.2) for adults and 2.1% (-1.1-7.5) for children. Percentage change from predicted was 8.5% (3.0-13.8) for adults and 2.2% (-1.2 – 7.9) for children. Change in Z score was 0.67 (0.3-1.1) for adults and 0.16 (-0.1-0.6) for children.

Sensitivity of bronchodilator response criteria

Significant differences ($p<0.05$) in the proportions meeting each criterion were shown between adults and children for all criteria except change in Z score of 0.7 (Figure 2).

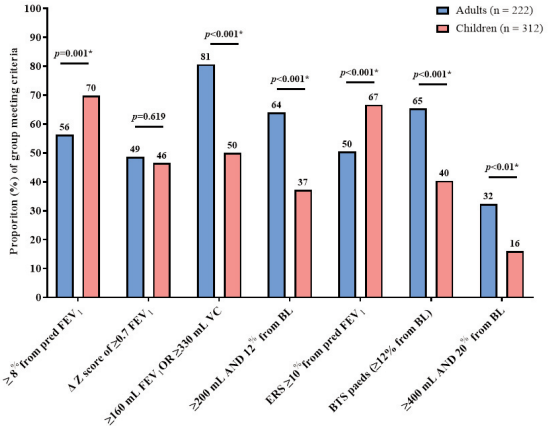

Figure 2. The proportion of patients with severe asthma meeting each bronchodilator response criteria.

The ARTP/BTS 1994 criteria of 160 mL change in FEV_1 resulted in the highest number of bronchodilator responses for adults. For children, ERS 10% and ARTP 8% change from predicted criteria showed the highest number of responses.

How many patients without baseline airflow obstruction show a meaningful change in FEV_1 post-bronchodilator, based on 12% and 200mL criteria?

Of all patients in the cohort, 205 patients had non-obstructive spirometry (FEV_1/FVC > LLN) at baseline. Of these, 35 (17.1%) experienced 200 mL and 12% change in FEV_1 during reversibility assessment. Fifteen of 150 (10%) non-obstructive children showed a positive bronchodilator response based on them meeting the 12% and 200ml criteria that we analysed compared with 20 of 55 adults (36%).

Discussion

This study is the first to evaluate the differences observed in detecting a significant bronchodilator response utilising the most up-to-date and commonly used criteria in clinical practice. This discussion briefly discusses and responds to the study aims.

Question 1: "How much change is enough?"

Lowering of the threshold from 200 mL to 160 mL change in FEV_1 increased the number of positive bronchodilator responses in adults from 64% to 81% in this study. However, this is likely to diminish the specificity of the test to reversible airway disease

based on: 1) the large proportion of patients with close to 200 mL change in FEV_1 (see Figure 1); and 2) the fact that 95% of the healthy population will have a bronchodilator response of up to 240-320 mL and up to a 6-13% change in baseline FEV_1 (Tuomisto *et al.*, 2019). Dropping the threshold below 200mL or 12% change from baseline is therefore likely to cause an increase in false-positive rate, especially given the similar prevalence of bronchodilator response in non-asthma airway diseases (Janson *et al.*, 2019). Interestingly, the choice of "200 mL AND 12%" or "200 mL OR 12%" was not meaningful to change the number of positive responses in this study, with similar levels of positive responses in both adults and children.

Question 2: "Is enough the same for adults and children?"

In children with airflow obstruction, the volumetric response for FEV_1 was broadly similar to adults in response to a bronchodilator (see Figure 1). The lower median value for change in FEV_1 in children may be related more to the lower level of obstructive spirometry defects seen in this group at baseline. Additionally the lower lung volumes seen in younger smaller children may also contribute to this. The predictive value of reversibility testing is likely to be lower in children as a result of this, independent of any inadequacies in the thresholds to define a bronchodilator response. The present study finds that bronchodilator response criteria incorporating absolute values result in a significantly lower number of children having a positive response compared to that in adults (37% vs. 64%, respectively, for 200 mL and 12% change), with a greater number showing a positive response when using change from predicted approaches which account for age, height, sex and ethnicity biases.

Question 3: "if there is no obstruction at baseline, what are we reversing?"

Assessment of reversible airflow obstruction first requires an obstructive-based process to be present at baseline. Healthy and non-asthmatic populations can show benign changes in airway function following bronchodilator that do not necessarily imply pathological processes (Tuomisto *et al.*, 2019). A major limitation of the present study was the absence of lung volume assessment to assess for mixed obstructive-restrictive defects. These may contribute to meaningful bronchodilation while FEV_1/FVC ratio remains above the lower limit of normal. In severe asthma, obesity is a common side-effect of prolonged steroid use (see Table 2), which contributes to a higher prevalence of mixed obstructive defects in adults. Reductions in FVC may also occur secondary to severe airflow obstruction and air trapping (Quanjer et al., 2017), indicating FEV_1/FVC ratio should not guide decision-making regarding completion of post-bronchodilator spirometry in this group.

Further limitations and considerations

- The quality of spirometry was not independently scrutinised for each test. This represents a source of potential error in bronchodilator response measurements.
- The population utilised in this study possibly have different characteristics to the asthmatics that would be identified at the diagnostic stage. They were all classed as "severe asthmatics" from their clinical diagnosis therefore many were on steroids and SABAs for long periods which affects responsiveness to bronchodilators.
- We did not have a control group of non-asthmatics to make comparisons with and allow us to actually look at sensitivity and specificity of the different criteria.

Conclusion

The choice of criteria to classify a significant bronchodilator response will have a significant impact on who is classed as having a positive response. Switching from the commonly used change in absolute values plus a change in % from the baseline to the newly recommended change in % predicted causes fewer adults to have a positive response. Alternatively it causes a larger proportion of children to be classified as a positive response.

Recommended future research directions

- Investigate the real-world impact of repeat reversibility testing on diagnostic yield.
- Investigate the additional value of changes in FVC or SVC.
- Investigate remote reversibility approaches which account for diurnal variation e.g. pre- and post-inhaler blows (AM and PM) using remote spirometry/PEFs for two weeks. The principles of reversibility testing stem from diurnal variations in airway function, however, relatively little research has drawn links between reversibility testing and diurnal variations in airway function.

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[1] Laube et al 1992, J Allergy Clin Immunol. 89(2): 510-8

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Physiologist life Stories

For the first in this series, I spent some time with our former ARTP chair and head of respiratory physiology services at Cambridge University Hospitals and Royal Papworth – Dr Karl Sylvester. Karl will be a familiar (he'd say famous) figure to most ARTP members through his prominent roles in the organisation. He is our former chair and fortunately still actively involved in most committees, as well as the lead for the ever-popular ARTP CPET course. Others might know him for his vocal abilities as displayed on stage with the band at conference in Blackpool, 2015.

I first properly met Karl at the ERS conference in Vienna in 2012. He soon became ARTP chair and he was part of the reason why I got involved in volunteering within the organisation. He has a wealth of experience in research and leading a respiratory department and is also very active within the European Respiratory Society, recently finishing a spell as chair of the respiratory function technologists/scientists' group.

I want to thank Karl for giving up his time. It was a very enjoyable couple of hours chatting with him in Bristol after day one of the recent CPET course. We found a quiet spot in the nearby Wetherspoons to go over his life and career so far.

Tell me how you ended up working in respiratory physiology?

It was all a bit of a mistake really! I did a biomedical science degree and in my honours year I had to choose a project. There were several to choose from but I left it to the last minute to choose and the two remaining were neuroscience or respiratory physiology. Call it fate and I chose respiratory. I found that it really suited me in terms of how my brain works.

What did the project involve?

It was looking at developing an end tidal device that would work like a 24 hour Holter monitor to help diagnose hyperventilation syndrome. The work was based at King's College Hospital in London.

How did you get your first job in respiratory and where was it?

First job was at the Brompton in 1998. Saw it advertised and applied. It was before Agenda for Change so it was an old Medical Technical officer grade 2.

Tell me about your time at the Brompton

At that time, the Brompton was the pinnacle of respiratory physiology so people getting trained there went on to do great things. Derek Cramer was the lead physiologist at the time and he was an amazing mentor so to be trained by him was terrific. As an aside, I remember lots of conversations going backwards and forwards between people on the ARTP forum and Derek would often bide his time and then come in with a response or answer and that was the conversation over. I spent two years at the Brompton and I saw how to run a quality-assured lab to the best standard it could be. For example, we would do syringe calibrations in between testing every patient, and finger prick haemoglobins on everyone. It really stood me in good stead for the rest of my career.

After this you completed your PhD. How did you get the chance to do this and how difficult was it?

After two years at the Brompton, I felt it wasn't enough for me as it became a bit of a conveyor belt. I still enjoyed the clinical testing but wanted more of a challenge. This is why I try and give my teams opportunities to do other things and get involved in research. I was looking in the 'New Scientist' and applying for PhD opportunities and one came up based in King's College Hospital in London. It was looking at respiratory complications in children with sickle cell disease. I applied, interviewed, and was offered the position. It was a part-time PhD as they also wanted the person to set up a paediatric lab. So I set up the paediatric respiratory physiology lab at King's known as The Amanda Smith Unit. The actual project was hard work as we had to recruit 150 children with sickle cell disease and 300 healthy controls so we went all over the place to attend sickle cell clinics and various schools – but we managed it.

Did you work with Tracey Fleming when you were there?

Yes, I met Tracey as my boss had convinced her boss that we needed to use a section of her lab to set up the paediatric lab so I had to tread carefully and make some good relations. Tracey was great to work with.

Going through your career, was Addenbrooke's the next stage after the PhD and how did this transpire?

I wasn't sure if there was to be any funding once I had finished my PhD and this is one of the problems working in academia: you are always, to some extent, working on when the next grant is going to come and if there is no grant you don't have a job. So I was looking for some more job stability and I had realised I didn't like doing 100% clinical or 100% research so ideally I wanted something where I could do both. Leading a department at a teaching hospital would give me this opportunity. I feel like a lot of things that have happened in my career have been through good luck! Darren Murray, who works for Vyaire, was the previous lead. After my interview at Addenbrooke's, Dr Nick Morell (now Professor) was walking me around the hospital and we bumped into two workers from clinical engineering. Bearing in mind I had not yet been told the outcome of the interview, he introduced me to the two workers and said "this is Karl, he's going to be our new head of respiratory, eh I mean if he's successful". I started the role and joined up with a young Mr Rutter (Matt) who was undertaking his undergraduate clinical physiology degree.

Tell me about your experiences of running such a big service and how it has developed.

When I started at Addenbrooke's, there were me and two physiologists but now across the two sites we have eight at Addenbrooke's, eighteen at Papworth and another eight coming through in the community diagnostic hubs.

I have found that you cannot successfully run a big department on your own, so recruitment and retention of high quality staff is essential. When you have the right people in the posts, identifying their strengths and playing to these strengths is key. I certainly couldn't do the job if I didn't have excellent physiologists like Matt helping lead the services. One of the frustrating things is struggling with staff retention. We train good physiologists and often lose them to other hospitals and private practice. It is a challenge I am trying to tackle so have some upcoming meetings with my lead consultant and management. I like to build strong relationships with colleagues as I am a people person and this definitely helps with running the service. To give an example, I emailed last week saying that we can't sustain losing as many staff and within minutes my consultant was on the phone looking for solutions.

What are some of the negatives and positives of running a service?

I find it difficult when you have expectations of some staff and they don't meet them. I find that tough. You try and give them support but sometimes you have to have some difficult conversations when they perhaps are just not cut out for the job.

I enjoy having the opportunity to shape the service. You never stop thinking about what you need to do next. I think that if you settle and "think this is alright", that's when it goes wrong so I am always thinking of what I can do next. To give an example, I've had a vision for a number of years where I wanted to split the department into its separate entities e.g. PFT, CPET and research. So, now across the two sites I have leads in each of these areas. Longer-term vision is that the lead for research will bring in grants, MSc and PhD students and really raise the profile of respiratory physiology research coming out of Cambridge.

You were ARTP Chair for several years. I imagine it would have consumed a lot of your time. What did you enjoy and dislike about the role?

It was tough trying to balance everything and around the same time Matt had gone to do a MRes in London which made it even more difficult. It was about building relationships in that position. Coming onto the board as Chair, it could be difficult to instil your strategy and vision into people that already had their own. Bringing everybody on the journey along with you is important. Bringing in people that could see the same future vision was crucial. I tell people today that being ARTP Chair was the best thing that I did for my career. The people I met both inside and outside ARTP was advantageous. You become very well known. Although your name can be bandied about it's not until you attend the meetings, speak to the various people and prove your worth in the role that you become more respected in the position.

You made it a point as Chair to bring in young people to the committees and change the structure to give more people opportunities. Was this always a vision you had for ARTP?

Yes, but with the best intentions in the world, consistently there were a lot of the same people involved and to future-proof the organisation I knew it was important to expand it and bring younger people on board. I continued the work that Martyn Bucknall started as previous Chair.

Who has been inspirational/influential in your life and career?

Derek Cramer and Simon Ward, the head and deputy head at the Brompton were both a massive influence on me at the start of my career. Another person who I worked closely with was Richard Kamarasinha. He

was a good chap and a good laugh. I think he now leads a department in Warwickshire. He taught me to be very stringent with quality control and acceptability when doing spirometry. If you didn't have three flow volume loops dead on top of each other he wasn't interested. Stringent quality control and how to ensure validity of results was ingrained in me from my time at the Brompton. I've not seen Richard for many years now but I hope he's doing well. If he happens to read this and wants to respond, I would love to catch up with him.

People that know me know I am very proud of my Irish roots. My Nan used to tell me about an Irish revolutionary named Michael Collins. When I got older I read about him and researched what he did and what he did for Ireland. He is a very divisive figure amongst Irish and British establishments but his drive for what he wanted to achieve was very admirable. Some people may say the way he achieved it was not necessarily very admirable but having read his biography and read where he has come from and what he did for Ireland, he is one of my childhood heroes. It is a shame that he died so young as I think he could have done many more great things for the Island of Ireland.

Where does the Irish heritage come from in your family?

There is Irish on my dad's side but it mainly comes from my mum as she is from Dundalk, County Louth. I always believe you are a product of your environment and when I was younger I spent a lot of time with my Irish family. I spent most weekends with my Nan and every holiday I was over in Ireland with my cousins, aunts and uncles. I have such fond memories of those times: that is probably where the pride in being Irish came from. Frustratingly, when I used to go over my uncle and cousins would wind me up saying here comes the "English fella" and that used to really grate on me! I used to come back with more money than I went with and the people were all so welcoming, friendly and sociable - it was amazing.

I have some quick fire questions for you now Karl so just tell me what comes to your mind first.

QUICK FIRE QUESTIONS

Favourite food & drink?
Tough one. Indian/Chinese/Italian, they're all good, plus the odd cider here and there.

Celebrity crush?
When I was younger Catherine Zeta-Jones. Now Ana De Armas.

Favourite film?
Lord of the Rings / The Shawshank Redemption

Nicknames you've had?
Not a chance you're getting an answer to this one! Although I was playing cricket with an Aussie once and he asked me my name. When I said Karl he said "Well we can't shorten that, what's your last name?" I said Sylvester. He said "Gotcha. Right Sylvo".

Favourite pastime?
Cycling/Exercising in general. I know, it doesn't look like it!

Karaoke song?
You name it, I'll sing it!

Best holiday destination?
Maldives/Thailand/Malaysia/Italy...so many to choose from.

Favourite memory?
Ireland.

Biggest bugbear?
People that moan about how bad things are.

Favourite book?
Lord of the Rings/Michael Collins' Biography.

You will find a recent Inspire article from Karl in the August 2022 edition looking at pulmonary function abnormalities in children with sickle cell disease and a summary of a recent meta-analysis on this topic that Karl studied for his PhD.

Strengthening the CPAP Supply Chains

A Multi-Supplier Strategy to Mitigate for Shortages during a global recall of a major supplier

The Global recall of a major supplier of CPAP devices in the UK in June 2021 resulted in critical national shortages of CPAP devices that severely impacted the patient care pathway in many sleep medicine services. To address any possible future challenges, we propose a diversified sourcing strategy to improve resilience in potential future CPAP supply chain disruptions.

Sefam UK's response

We worked with national procurement in NHS England to source thousand of CPAP/ APAP devices to support sleep services and the supply chain to ensure that patients would be able to be commenced on therapy in a timely manner. We supported services in the NHS to quickly become familiar with our hardware and software remote monitoring solutions. We also were cognisant of scrutinising the risks associated with a single-supplier model.

What was our experience?

Our experience over the period of CPAP/ APAP device shortages is that the adoption of a multi-supplier strategy substantially lessens the impact of unexpected disruptions on device availability. Diversifying the supplier base can be instrumental in helping healthcare systems navigate supply chain challenges, ensuring a more dependable and robust distribution of CPAP devices during crisis scenarios. Taking proactive measures within NHS Sleep Medicine services is necessary to safeguard patient access to essential CPAP treatment in a timely manner.

Recommendations to build resilience in the supply chain.

We advocate for a transformative shift in CPAP supply chain management away from a sole supplier model. The implementation of a multi-supplier approach enhances supply chain resilience, diminishing the risk of shortages during a global product CPAP device recall. By strategically planning for diversified sourcing, healthcare systems can safeguard patient care and ensure continuous access to vital respiratory therapies. We have witnessed firsthand the impact of CPAP supply chain shortages in many sleep medicine services across the UK and gained crucial insights to the importance of building supply chain resilience within services. Is it time to spread the risk and not put all your eggs in one basket?

If you want to learn more about spreading the risk with Sefam, please visit our website www.sefam-uk.co.uk

ON THE BLOWER

Brendan Cooper
ARTP Chair Manufacturers Liaison Committee

WESTMINSTER HEALTH FORUM

At the Westminster Health Forum, the ARTP sustainability task force represented the organisations commitment to environmental sustainability, focusing on the critical role of respiratory and sleep physiology. The forum provided a vital platform for dialogue with industry leaders and experts, highlighting the NHS's significant contribution to carbon emissions and the pressing goal of achieving net zero by 2040.

Key discussions revolved around innovative practices to reduce the environmental impact, including the shift from high-GWP metered dose inhalers to more sustainable alternatives, the importance of reducing waste and embracing circular economy principles, and the crucial role of education in fostering a culture of sustainability within the healthcare sector. This event underscored the urgency of integrating sustainable practices into healthcare to mitigate climate change and ensure a healthier future.

Westminster Health Forum: Sustainability in the NHS
Danny Pender – The Royal Wolverhampton NHS Trust

The ARTP is deeply committed to driving sustainable change within respiratory and sleep physiology, which is why our sustainability task force attended the Westminster Health forum on sustainability in the NHS. This unique meeting presented the opportunity to engage with industry leaders, experts and politicians to foster meaningful dialogue and action towards greener healthcare practices. A summary of the pertinent points and topics are outlined below.

Sustainability within Respiratory and Sleep Physiology

Humankind is fast approaching a critical juncture of climate change, where surpassing >1.5°C above pre-industrial levels would result in catastrophic effects worldwide. The National Health Service (NHS) directly and indirectly contributes to climate change in a plethora of ways, with the NHS carbon footprint being estimated at 25,000,000 tonnes of CO_2 per year - accounting for approximately 4-5% of UK total carbon emissions and comparable to the entire carbon footprint of a number of European countries. To address this, the NHS has set ambitious sustainability targets aimed at reducing its impact on the environment with an overreaching aim of having net zero carbon emissions by 2040 for the carbon footprint it directly controls.

All professions, including respiratory and sleep physiology, must urgently shift to more sustainable working practices. Utilising the NHS strategy, four areas which are directly applicable to respiratory and sleep physiology are: (1) reducing air pollution; (2) reducing waste and single use items; (3) sustainable procurement; (4) and workforce sustainability education and leadership.

Minimising Greenhouse gases

Greenhouses gases (GHGs) are potent atmospheric gases that effectively absorb infrared

radiation which inhibits the release of heat, and thus, contribute to global warming. Anaesthetic gases and Metered Dose Inhalers (MDIs) are significant contributors of GHGs and account for approximately 5% of the NHS's total (figure 1). MDIs have significant environmental impacts primarily due to their use of hydrofluoroalkane (HFA) propellants which have a carbon dioxide equivalent (CO_2e - global warming potential [GWP] of a gas relative to CO_2) which is 1000 times higher than that of carbon dioxide (figure 2).

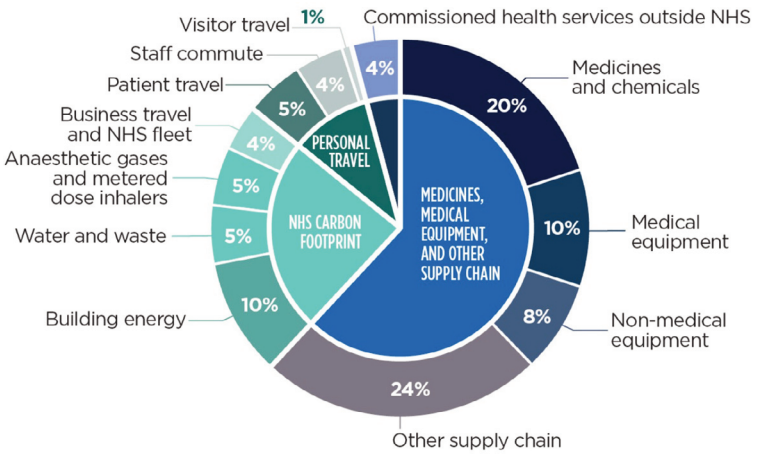

Figure 1. NHS carbon emissions divided into distinct categories depicting the percentage contribution to total carbon emissions.

Source – NHS England and NHS Improvement. (2020) *Delivering a net zero National Health Service,*

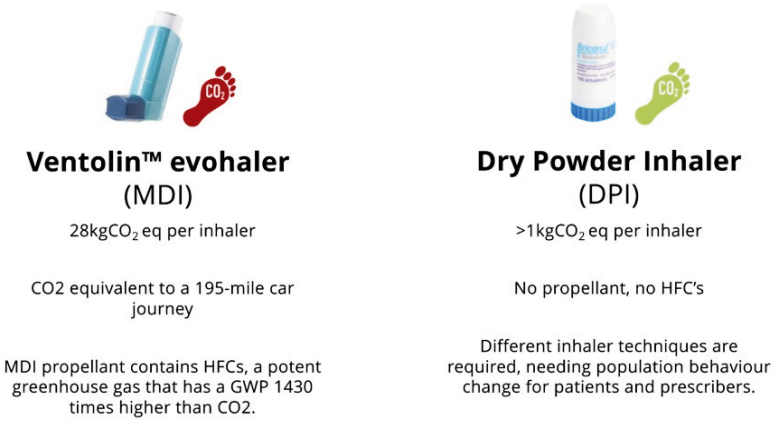

Figure 2: Comparative global warming potential of an MDI inhaler compared to a DPI

Source – NICE asthma inhalers and climate change (https://www.nice.org.uk/guidance/ng80/resources/inhalers-for-asthma-patient-decision-aid-pdf-6727144573)

Evidently, minimising the release of HFA into the atmosphere is of paramount importance. One way to reduce HFAs is via promoting the switch to dry powder inhalers (DPIs)/soft mist inhalers (SMIs). However, switching to DPI inhalers may not be clinically appropriate for all patients. Therefore, to avoid MDI inhalers accumulating in landfills releasing potent greenhouse gases, inhaler recycling should be made easy and convenient for all patients.

Patient and staff transport is a significant contributor to air pollution amounting to approximately 9% of total emissions (figure 1). While travel to a healthcare setting may often be warranted/ unavoidable, minimising unnecessary journeys via the reduction of 'low value appointments' (appointments which provide little or no benefit) adoption of telecommunications technologies, and integrated care systems will help reduce travel related emissions whilst enhancing healthcare accessibility, optimisation of resources and providing flexible working arrangements.

Reducing Waste and Single Use-Plastics

While patient safety remains paramount in healthcare, necessitating the use of single use items in certain scenarios to ensure sterility and prevent infections, it is essential to recognise that not all single use items are indispensable. Safe and appropriately sterilised/ decontaminated reusable items can often maintain high safety standards without compromising patient well-being, significantly enhancing the sustainability of our practices. Finding sustainable reusable alternatives to single use items is imperative for reducing our environmental impact, minimising waste and fostering a sustainable future. Feedback to suppliers about excessive non-recyclable packaging (particularly plastics) or poor sustainability practices will eventually reap benefits if many centres give similar feedback.

Sustainable Procurement

It is crucial to carefully consider the environmental credentials of suppliers, ensuring they are adhering to sustainable, transparent practices. All suppliers interacting with the NHS should have a 'Green Plan' and be able to demonstrate how they are operating sustainably. Notably, suppliers should focus on reducing packaging and utilising sustainable materials in order to shift from a linear supply chain to a circular supply chain. Our profession can stimulate this change via leveraging our collective behaviour, preferences, and voices. Furthermore, feedback and engagement should not be underestimated. We need to challenge suppliers and perhaps make colleagues aware of glaring poor sustainability (e.g. via ARTP Forum and social media).

Sustainability Education

Sustainability education within the NHS plays a pivotal role in reducing its carbon footprint, which is essential for addressing the pressing issue of climate change. By equipping healthcare professionals with knowledge and skills related to sustainable practices, the NHS can foster a culture of environmental responsibility. As staff become more aware of the environmental impacts of their actions and the practical steps they can take to mitigate these, the NHS as a whole can significantly reduce its carbon emissions. Moreover, sustainability education can encourage innovation and the adoption of green technologies, further diminishing the carbon footprint.

Summary

- The NHS aims to be Net Zero by 2040.
- Switching to DPI, or effectively recycling MDI inhalers, can significantly contribute to a reduction in the NHS carbon footprint.
- Effective and efficient working practices, such as eliminating low value appointments, utilising telecommunications, or engaging with integrated care systems will help reduce air pollution.
- Switching to sustainable and/or reusable items, as opposed to single use, can simultaneously maintain high standards of care and reduce the environmental impact.
- Shifting to a circular economy from a linear economy will help achieve net zero goals.
- Education and knowledge can empower the workforce to make positive changes.

We look forward to your feedback of **"On the Blower"** and the issues we have presented. We want the MLC to be your voice and to help us pursue projects and taskforces that affect your service and patients. We look forward to hearing your responses via our ARTP Watchdog link on the website.

Vyaire Medical: A History of Thinking Forward

As Vyaire Medical celebrates our 70th year in Respiratory Diagnostics, we want to express our gratitude to therespiratory physiologists and healthcare scientists who have been part of the journey. In this time, respiratory physiology has evolved and Vyaire solutions have developed along with it. Founded by Erich Jaeger in 1954 — two years prior to Dubois *et al* publishing research papers using body plethysmography measuring thoracic gas volume and airways resistance — our legacy brand Erich Jaeger GmbH laid the cornerstone of our legacy and set the stage for our commitment to redefining respiratory diagnostics for decades to come.

At Vyaire, we focus on providing healthcare professionals with cutting-edge tools and services to improve patient lives. Through collaboration and innovation, we aim for the highest precision, accuracy and linearity, often exceeding performance guidance limits. The Vyaire commitment to product quality is demonstrated through high performance in multicentre global validation studies (Quality Control of DLCO Instruments in Global Clinical Trials R. Jensen *et al* (2009); Accuracy of respiratory gas variables, substrate, and energy use from 15 CPET systems during simulated and human exercise, Bas Van Hooren *et al.* (2023)).

Our Vyntus™ range reflects our commitment to excellence, blending quality hardware with powerful and intuitive SentrySuite™ software. The systems not only provide accurate and precise measurements but also streamline patient management and data integration ensuring the most effective diagnostic care to patients.

Vyaire clearly thinks both inside and outside the box in our approach to streamlining workflows for our customers. Vyntus™ products are constantly evolving to meet the requirements and high standards set by the Association for Respiratory Technology & Physiology (ARTP) and its members. Working together, Vyaire is focused on effective patient diagnostic care by providing high quality and precise data.

The UK RDx team has grown significantly over the years with dedicated personnel and specialists committed to supporting our customers. From customer service, field engineering, connectivity and clinical application specialists, we take great pride in our knowledge base and ability to meet the evolving needs of the profession. We provide best-in-class clinical application support, online webinars and practical study days to support physiologists. In this digital age, Vyaire is proud to implement connectivity solutions to streamline reporting workflow and provide remote support. After 70 years of offering innovative and quality products, we hope you feel supported and know that you are in safe hands for the lifespan of your equipment. As we look to the future, we remain dedicated to providing unparalleled support.

On behalf of our global team, we extend 70 heartfelt thank-you's for your continued partnership and trust. Here's to many more years of collaboration and success together.

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Vitalograph Products and Services

We are proud to be able to offer a complete range of products and solutions to meet any need for respiratory diagnostics in Secondary Care and Community Diagnostic Hubs. This includes everything from peak flow meters, respiratory monitors & screeners, handheld/desktop/PC-based spirometers, portable and static PFT systems, CPET, FeNO and Oscillometry, to bacterial-viral filters and service/maintenance.

2024 Annual Conference

We are looking forward to catching up with everyone again at the ARTP annual conference in Harrogate. As part of our commitment to our community and providing our community with the latest in educational material, we have sponsored two workshops at the conference. We have two international experts flying in specifically for this event. Professor Carl D. Mottram, former Technical Director of the Mayo Clinic PFT Laboratory and Associate Professor of Medicine, will be discussing the ERS/ATS Technical Standard Lung Volumes 2023 Update as one of the authors. Gareth Morgan, President at Morgan Scientific, will be demonstrating how their Task Manager software module has revolutionised how PFT results are managed and interpreted. Food and refreshments will be provided, but spaces are limited, so do be sure to book!

Vitalograph Educational Resources

Did you know that the Vitalograph website has a full range of educational materials and resources, including the most recent standards and guidance for respiratory disease management?

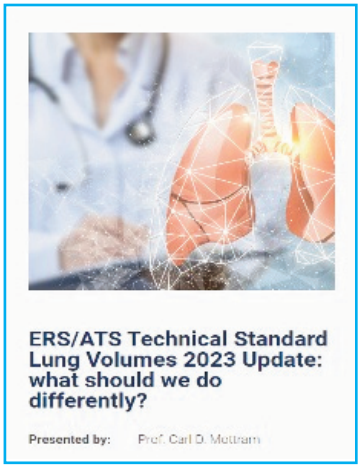
Vital Insights

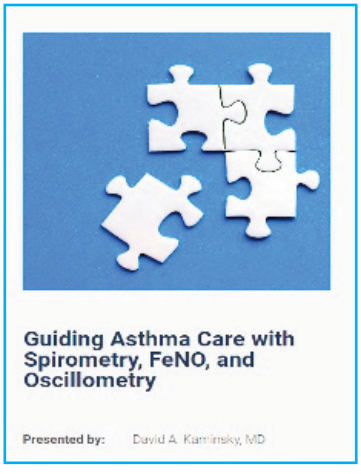
Respiratory News and Views

Welcome to Vital Insights where we keep you up to date with all the latest respiratory news including clinical research, articles on respiratory topics, patient information pieces, and episodes of our ever-popular Exhale podcast. We also give you a little insight into life at Vitalograph.

Vitalograph Webinars

Throughout the year, our Education & Training Team organise various webinars covering several topics relevant to respiratory healthcare. From spirometry training delivered by our Clinical Application Specialists to webinars with a specific Clinical Trials focus, they are delivered by experts in their chosen field and are free to attend.





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FRESH AIR

Edited by **Dr James Stockley** *ARTP Chair of Research and Innovation*

Dear Reader,

Welcome back to 'Fresh Air'. These articles are designed to communicate novel trends in research, innovation and clinical practice from both respiratory and sleep sciences. Our aim is to provoke thought and conversation within the ARTP community that we hope will benefit the future direction of physiological practice.

For this issue, Dr Samantha Irving has provided an article on the diagnosis and monitoring of bronchiectasis in children. She highlights the limitations of the current pathway and provides scope for how we as physiologists can help improve it. Sam is a Clinical Academic at the Royal Brompton and Harefield Hospitals, and the current Vice Chair of the ARTP Research and Innovation Committee.

Bronchiectasis in children – towards evidence-based monitoring

Bronchiectasis, the destruction of the fine structure of the airways by a vicious cycle of infection and inflammation, is rare in children, and there is a lack of evidence-based guidelines for monitoring the disease. In recent years, international guidelines have been produced (Chang, Fortescue, *et al.*, 2021) as well as a scoping document assessing the future research priorities as identified by patients, their families and the clinical teams caring for them (Chang, Boyd, *et al.*, 2021). This provides an opportunity for physiologist-led research to inform clinical practice.

Bronchiectasis that is not related to conditions such as cystic fibrosis (CF) or primary ciliary dyskinesia (PCD) is described in both children and adults as a chronic, wet cough and a persistent cycle of inflammation and infection leading to bronchial dilatation on high resolution computed tomography (HRCT) scan (Chang *et al.*, 2018) (see Figure 1). It can have a wide range of aetiologies (potentially being idiopathic or linked to a primary immunodeficiency) but, in children it is often post-infective, seen after measles, pneumonia, adenovirus infection, or other similar conditions. In these children, bronchiectasis can co-exist with obliterative bronchiolitis (OB) and may remain even after OB has been stabilised.

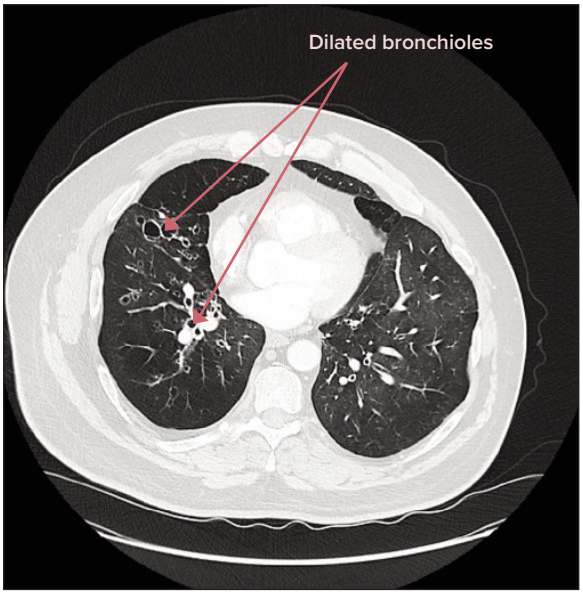

Figure 1. HRCT demonstrating the bronchial dilation diagnostic of bronchiectasis (Quint, Smith, *et al.*, 2019).

Although more common in indigenous populations, bronchiectasis is seen across all ethnicities. It is seen in urban and rural populations, and is more common in areas of deprivation) (Collaro, Chang, Marchant, Masters, *et al.*, 2020; Goyal *et al.*, 2016; Haidopoulou *et al.*, 2009; Kinghorn *et al*, 2018; McCallum *et al*, 2020; McCallum & Binks, 2017; Prentice *et al.*, 2019). Previously, much of the management of

childhood bronchiectasis was extrapolated from the care standards for other conditions, including CF, and could vary between centres. There is also evidence that even children managed in tertiary centres may not receive the same level of care as children with CF, despite having similar lung disease (Prentice *et al*., 2019). Overall, there are still unanswered questions surrounding the most appropriate care and monitoring strategies in these children.

The international roadmap produced in 2021 highlighted research priorities for children and young people with bronchiectasis and the physicians involved in their care (Chang, Boyd, *et al*., 2021). One of the priorities identified was the utility of lung function tests other than spirometry in monitoring lung disease in this condition. Currently, the literature on lung function in bronchiectasis is limited and almost exclusively focuses on spirometry, with the forced expiratory volume in 1 second (FEV_1) as the key outcome measure (Bastardo et al., 2009; Collaro, Chang, Marchant, Masters, *et al*., 2020; Collaro, Chang, Marchant, Rodwell, *et al*., 2020; Haidopoulou *et al*., 2009; Kapur *et al*., 2010, 2012).

It is known that a poor FEV_1 is a good predictor of mortality in adults with bronchiectasis (Loebinger *et al*, 2009). However, multiple studies show spirometry stabilising or even improving in children with bronchiectasis who are receiving appropriate management (Bastardo *et al*., 2009; Collaro, Chang, Marchant, Masters, *et al*., 2020; Collaro, Chang, Marchant, Rodwell, *et al*., 2020; Haidopoulou *et al*., 2009; Kapur *et al*., 2010; Marchant *et al*, 2006), often in tertiary care centres or specially designed outreach programmes, although many of these studies are small and retrospectively examine clinical records. The largest study looking at children with bronchiectasis in Alaska, New Zealand and Australia (McCallum *et al*., 2020) did not have spirometry available for its full cohort, and instead relied on symptom reporting, including recall of previous symptoms to assess improvement, which is of limited utility when designing care and management standards.

Chang *et al.* offered some suggestions for which physiological tests may be useful, with the multiple breath washout (MBW) being proposed as a possible outcome measure. There are some published data on MBW in adults with bronchiectasis (primarily from feasibility studies) that demonstrate abnormality in lung clearance index (LCI) in these patients (Bergin *et al*, 2013; Grillo *et al*., 2015; O'Neill *et al*., 2018, 2020, 2022). LCI is an assessment of ventilation heterogeneity and, consequently, increases with the severity of airflow obstruction. In 2014, we published a small amount of pilot data on LCI in children with bronchiectasis (Irving *et al*., 2013, 2014). In this cross-sectional sample of patients managed in our tertiary centre, we showed that children with bronchiectasis could have an abnormally high LCI, and the relationship between HRCT, FEV_1 and LCI appeared to be similar to that seen in CF. This suggests that airway disease as measured by LCI could potentially be an alternative marker to FEV_1. However, this sample size is extremely small and larger replication studies are required to draw more definitive conclusions.

There are no publications on gas transfer or lung volume measurements in children with bronchiectasis, but there is a small amount of data looking at exercise performance. Children with bronchiectasis were found to have abnormally high heart rate (HR) and oxygen consumption (VO_2) (Edwards *et al*., 2004), and reduced values for both 30 second sit-to-stand and six minute walk test (Zeren *et al*., 2020) with evidence of dynamic hyperinflation (Caglar Tosun *et al*, 2022). Other work in adults (Bar-Yoseph *et al*., 2019) showed exercise limitation, but this study included a large number of patients with PCD as part of this group; it is also unclear in other studies whether or not patients with PCD were included. As a diagnostically distinct group, their inclusion may not be useful due to the heterogeneity of their lung disease, and indeed lung function (Irving *et al*., 2013; Nyilas *et al*., 2018).

Although HRCT is required to diagnose bronchiectasis, repeat radiation exposure in children is generally undesirable, hence this

modality is not an appropriate monitoring tool. Therefore, there is a need for the development of new, patient-led roadmaps for bronchiectasis diagnosis and monitoring. This requires more research, particularly into the most appropriate and informative lung function tests. There is a clear opportunity for physiologists interested in this area to fill the gaps in the knowledge and, where patient-led scoping is available, the project becomes a more attractive prospect to funders. As healthcare scientists with the relevant expertise, it is only logical that respiratory physiologists are best placed to undertake this work.

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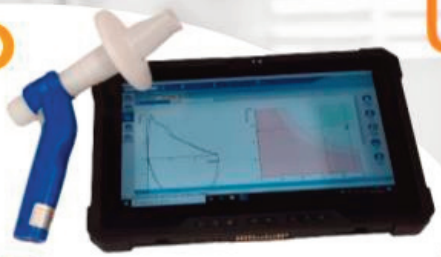

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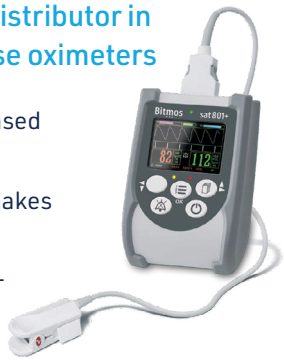

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Lab in the Limelight

Phil Lawrence
Lead Physiologist

Lung Function Lab, Alder Hey Children's Foundation Trust Liverpool

Alder Hey Children's Foundation Trust is located in Liverpool and is one of the largest and busiest children's hospitals in Europe. The hospital was originally a mansion house and was purchased in 1910 to be used as a workhouse for the city's poor, with dedicated plans for caring for the paupers' sick children. By the end of the First World War, the building had been firmly established as a children's hospital and became known as Alder Hey Children's Hospital in 1914.

Alder Hey has a long history of firsts. The hospital was the first to trial penicillin in a child, saving them from pneumonia. The world's first neonatal surgical ICU was opened at Alder Hey in 1953, and cardiac surgery was pioneered here in the 1950's. In 2014, Alder Hey celebrated 100 years and was given the freedom of the city of Liverpool in recognition of its treatment and care for children and young people.

In 2013, construction began on a new hospital on the grounds of Springfield Park, which is adjacent to the old hospital. On 1st October 2015, Alder Hey opened their new state of the art hospital, "Alder Hey in the Park". The new hospital has 270 beds, including 48 critical care beds. It has 6 standard wards, each with two four-bed bays, plus 24 single rooms, each with an ensuite bathroom and views of the park.

The physiology lab sits under the umbrella of the Respiratory Unit, which has existed for 39 years. In 2016, the Lung Function Lab was opened after plans and visions set by Dr Jon Couriel were brought to life by Dr Rebecca Thursfield. The vision of the lab was: "To provide a high quality, child focused respiratory service, with a skilled motivated team, to become a leader in paediatric care and research".

The Lung Function Lab offers a full set of simple and complex investigations to children and young people both locally and in the wider network. This includes spirometry and reversibility, full lung function, multiple breath washout, exercise challenges, CPET and overnight oxygen and transcutaneous CO_2 monitoring, both as inpatients and at home. We have a well subscribed GP Choose and Book Service along with a strong involvement in clinical trials. The team is currently made up of one Senior Respiratory Clinical Scientist, two Respiratory physiologists and one Assistant physiologist, supporting a respiratory team of ten consultants and eight nurses. We also serve the wider hospital including surgery, cardiology, rheumatology, and oncology and accept referrals from our network hospitals in our region.

Lab in the Limelight continued

Lead Physiologist background and career

My name is Phil Lawrence and I am the Senior Respiratory Clinical Scientist at Alder Hey and I have been in this role for nearly eight years. Upon leaving school, I studied BSc Sport and Exercise Science at Liverpool John Moores University and although I loved sport, I felt that the difference being made by sports scientists was small and often insignificant. So, I went on to complete my Masters in Clinical Exercise Physiology at Liverpool John Moores, which allowed me to apply my learning into a clinical setting.

My first career step was as a Research Technician at a medical trials facility located at Wythenshawe Hospital in Manchester, called the Medicines Evaluation Unit. After three years of working on trials in COPD and Asthma, I applied to become the physiologist at Alder Hey, not knowing that the lab needed to be set up!

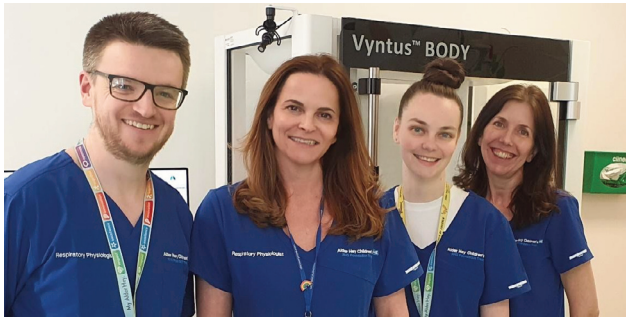
Over the last eight years, it's been a great opportunity and challenge to set up, develop and grow the paediatric respiratory physiology service. I have seen the lab evolve into a service I am proud of, that serves both the patients and the clinical teams well. Working with children and young people is such a pleasure, and, in my experience, I've found they make much better patients than adults and make the job enjoyable!

I've always looked to develop myself both to benefit my career but also strengthen the lab. The ARTP, and more importantly the people who make up the ARTP, have been a great support to me. I have attended many courses run by the ARTP and now sit on the paediatric and spirometry committees. At Alder Hey, I now deliver a spirometry course that aims to help local nurses, physios and doctors pass their ARTP Spirometry competence. In 2021 I undertook the equivalence program with the Academy of Healthcare Science to attain the Clinical Scientist status.

I am married to Ela, who works as a solicitor, and we have two boys, Elijah (3) and Andrew (1). I am a Christian and lead at my local church and enjoy sport (big Liverpool fan!) and music.

The Team

We have a small dedicated team (Debbie, Nicki and Laurie) who have helped develop and run the service. The team have been recognised individually and collectively by patients and clinical teams for their dedication. All of the team are registered competent in spirometry and three of the team are registered competent in MBW testing (school age and preschool age).



From left to right: Phil, Nicki, Laurie & Debbie

Future departmental aspirations

We have plans to host an STP student in September 2024, between ourselves and the sleep lab at Alder Hey, along with developing our links with our network hospitals. We are also involved in some upcoming trials including spirometry-controlled CT scanning, CPET testing for pectus surgery and new modulator therapies in Cystic Fibrosis.

Respiratory & Sleep Healthcare Science Apprenticeships

With national apprenticeship week taking place recently, we thought this would be a good opportunity to speak to some of our respiratory and sleep apprentices to get an insight into the role. Four trainees have given us some of their thoughts and experiences of the HealthCare Science apprenticeship scheme.

The apprentices who contributed to this article are:

Abbi Steele (AS) – *Level 4 Apprentice, Sandwell and West Birmingham Hospitals NHS Trust*
Faiza Khan (FK) – *Level 4 Apprentice, Barts Health NHS trust*
Ryan Evans (RE) – *Level 4 Apprentice, George Elliot NHS trust*
Benedicta Andruskevicius (BA) – *Level 4 Apprentice, Mid Cheshire NHS trust*

What made you apply?

I applied for the level 4 healthcare science apprenticeship in respiratory and sleep sciences due to my exposure to the service over many years working as a coordinator. I was also encouraged by my team to go for this. (FK)

I applied for the role of Associate Respiratory Physiologist because at the time this role was being advertised, I was working in Heartlands Hospital on the Infectious Diseases ward, dealing with Oxygen on a daily basis whilst working as a TNA. I felt that the knowledge and skill set that I had acquired in this role would serve me well. (AS)

I'd always wanted to use my qualifications in Biology or Psychology to find a career. I came across Respiratory Physiology while hunting for further education opportunities after I'd left college. I quickly realised that the Level 4 HCS course was a great opportunity, with benefits such as interacting with and building positive relationships with patients and having an employer willing to provide high levels of investment into my skills. (RE)

I've always wanted to work within a healthcare setting, and had a particular interest in science. When I saw the advertisement for an 'Apprentice Respiratory and Sleep Physiologist', I knew that this was something I would like to investigate further. Knowing that I could go to university and gain important on-the-job experience at the same time, I was keen to apply for this opportunity. (BA)

How was the application process including the interview?

The application process was very new to me and it required several different assessments to enable the training provider to know what level I am working at. This was challenging, however the support from my line manager made it easier. (FK)

It was a very in-depth interview but the research I had done prior was enough for me to have a basic understanding of the role and what would be expected of me. I was allowed time to ask any questions I had about the role. The interview process for college was frustrating at times, because there was a little bit of confusion with what level I would be starting at. It took a really long time from when I was told I had been successful in the role to me finding out my start date. Once I started working within my department, I quickly found that it was all worth it. (AS)

The application process was thorough with the interview being very professional and well suited to this role. My interviewers were rigorous with their questioning, however were also kind and welcoming. I was nervous as I'd previously experienced being unsuccessful in a radiology interview and was determined to prepare and succeed this time around. Once I'd been accepted my manager Joanna was very supportive. (RE)

The interview process was less daunting than I thought it was going to be, which I think was helped by me visiting the hospital beforehand and meeting the team. During the interview, I was tested on my knowledge of the respiratory system and its anatomy, whilst also having a discussion with the interview panel on my suitability for the role and my understanding of what it entailed. (BA)

Tell me about your first few weeks in the job?

It took a while to adjust to the needs of my role as an apprentice as well as getting used to the learning on the job aspect. I was constantly reassured that I could reach out for support when needed. I had a timetable that was catered to work for me and the department to ease myself into the role. (FK)

The first few weeks on the job were mainly shadowing competent staff as to be expected. My colleagues made me feel very welcome and part of the team,

therefore I was able to settle in very quickly. I was never afraid to ask questions, because everyone was more than happy to help with anything I needed. I completed my mandatory training prior to starting my first shift in my department, ensuring that I was up to date and working within the remit of the legislation of the NHS. (AS)

The first weeks were difficult. As an apprentice and the youngest member of my department I felt like I had to prove myself to my peers. On top of this, my college put a lot of pressure on me that I really had to adjust to cope with. As time went on I became more comfortable with what was being asked of me and I was able to appreciate the profession for what it is: a deeply compassionate service that strives to better the lives of patients. From observing my first CPET to performing my first PFT this was clear, and I was consistently awe-struck by my senior colleagues who would go above and beyond for their patients. (RE)

At first, I observed senior members of the team completing diagnostic tests. This enabled me to have a first-hand view of the day-to-day workings of the department. I was able to observe multiple clinics, from general respiratory to lung cancer clinics, allowing me to see the broader perspective on how the hospital operates as one to provide the best patient care. In October 2023, my studies at the University of Wolverhampton began. I spend two days a week at University, and three days a week at work. I started by learning about the general anatomy and functioning of the human body, exploring how each organ was interlinked. (BA)

How is it now compared to the start?

Compared to the start, everything gets much easier and you start getting used to logging your hours, meeting deadlines as well as gathering competencies. (FK)

I feel like an invaluable part of the team now that my training is almost complete. I am able to make suggestions which are innovative and beneficial to the department. I can really see how far I have come since the beginning of my employment. I am now able to train more junior staff with confidence. I have come so far and I have enjoyed every second of it. (AS)

The intensity has picked up massively, I now run independent Limited Polysomnography, Spirometry and full PFT clinics. This independence has given me a sense of responsibility and direction that I haven't experienced in my nearly 20 years of life. (RE)

In February 2024, six months into my apprenticeship I am doing well at juggling a work-university-life balance. University and Leighton Hospital have guided me out of my comfort zone. I have gained so much confidence in my abilities, both academically and in a skills aspect as well. University allows me to fully understand the testing pathway and why certain diseases present the way they do on the tests. The Lung Function team at the hospital have allowed me to put the new knowledge into action. (BA)

Can you share some positive and negative experiences during your training?

The team I work with are excellent in delivering training, I have not had any bad training experiences. (FK)

As part of my college course, I have been required to take part in an audit. Instead of using a template, I was encouraged to conduct my own audit, which would be beneficial to the department and innovative enough to make changes to the way we see our patients and our waiting lists. This has helped prepare me for the future, where taking part in an audit is mandatory, because now I have the skills and knowledge of how to do it. I feel that being trained by numerous people at once was challenging because everyone has their own ways of working, none of which are incorrect, however I found this to be a little confusing at times. (AS)

From the start I was gaining experience in clinics, primarily shadowing Spirometry and PFTs. Within one month, I was performing these tests with the supervision of my seniors. This fast-paced approach to learning is a style that I appreciate as I struggle to retain information when I feel like I'm learning too slowly. Learning something new every day meant I was gaining new skills that I'll carry forward for the rest of my career. (RE)

What are some experiences of interesting days in the job?

It is interesting getting involved in clinical research which always makes it more exciting! (FK)

I have been allocated some time off the department to spend time with the nurses over at asthma clinic, as well as pleural clinic in order for me to gain an all-round understanding of what respiratory medicine entails. (AS)

What have you liked/disliked?

I like working in different environments and the challenges set for me make me want to work harder to complete my apprenticeship the best way I can. I do not enjoy some of the mandatory assignments from the apprenticeship programme. (FK)

I have honestly loved every second of my time in my department. I feel like I have learned more than I ever imagined that I would in such a short space of time. The team that I work with are such lovely people, who are very approachable and I cannot wait to further develop my skills within my department. (AS)

Respiratory and Sleep Physiology is an interesting profession and as I learn more about sleep, the workings of human anatomy and the unique and

interesting lives of patients themselves I frequently find myself facing the complexity of life and am equally astonished by the privileged position we hold within this profession. My department at the moment is around twelve strong and comradery flows through everything we do; no matter the issue our ethos is that of a close-knit team. As I'm sure all of my peers are aware, the days can be long and taxing and it's not uncommon to get home and spend a minute to yourself just recuperating after a busy day. Overall however, I'd say the fatigue and stress that comes with these positions within the NHS is worth it. (RE)

Aspirations and what the future holds for you?

I hope to progress into roles within respiratory physiology and work my way into advances of new services for the department as well as looking at many other ways to develop myself as a healthcare scientist. (FK)

The next steps for me once finishing level 4 are to be enrolled on to my level 6 at Wolverhampton University. From there I hope to complete the STP course and continue to learn and grow within my department as a Respiratory Physiologist. (AS)

I would like to complete the ARTP practitioner training to become registered under the AHCS. I'm interested in the Level 6 HCS course within the next five years. Ultimately, I want this to be my career. The love I have for the clinical work and the admiration I have for both patient and peer is something I wish to maintain into later life. (RE)

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