**P1124**

**Rate of change of FEV₁ and VC in adults with chronic airflow obstruction**

Andrew Robson¹², Alastair Innes¹², Respiratory Function Service, Western General Hospital, Edinburgh, United Kingdom; Respiratory Function Service, Royal Infirmary of Edinburgh, United Kingdom

We have investigated the rate of change in post-bronchodilator FEV₁ and VC in patients with chronic airflow obstruction by retrospective analysis of data in our clinical database. One thousand and forty-four patients (633 females) fulfilled the study criteria, namely two sets of measurements with a minimum of six calendar months between measurements. Measurements of FEV₁ and VC were made before and 20 minutes after administration of 2.5 mg nebulised salbutamol. Only patients with an FEV₁/VC ratio below the lower limit of normal after administration of 2.5 mg nebulised salbutamol were included in the study. Rate of change in FEV₁ was calculated in litres/year. Smoking status (smoker, ex-smoker or non-smoker) was recorded at each visit, but the number of cigarettes smoked was not recorded. Patients were only identified as smokers if the same status was recorded at both measurements. The rate of change in post salbutamol FEV₁ and VC in all patients and in the subgroup of smokers are shown in Table 1. Values shown are mean ± SD.

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**P1125**

**Economic impact analysis of a tele-medicine program to improve the quality of spirometry in primary care**

Nuria Marina¹, Elena Lopez de Santa Maria¹, Asuncion Gutiérrez², Juan Carlos Bayon², Larraitz García¹, Juan B. Galdiz¹, Respiratory Function Laboratory, Cruces Hospital, Barakaldo, Spain; Health Technology Evaluation Service, Basque Government, Vitoria, Spain; Respiratory Function Laboratory, CIBERES, Cruces Hospital, Barakaldo, Spain

**Introduction:** The tele-spirometry (TS) procedure consists in a computer application (espiron.oasasunet) which allows the control and improvement of the quality of the spirometry (S) carried out in primary care centers (PCC), leading a continuous training of professionals that perform the technique.

**Aim:** To calculate the economic impact of a procedure of TS in the Basque Health Service.

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The rate of change in FEV₁ and VC in patients is significantly higher in males when compared to females. Males who continue to smoke have a greater rate of change in both FEV₁ and VC than females who smoke. Further investigation into these gender differences is warranted.

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The rate of change in FEV₁ and VC in patients is significantly higher in males when compared to females. Males who continue to smoke have a greater rate of change in both FEV₁ and VC than females who smoke. Further investigation into these gender differences is warranted.
Methods: The study was based on the impact in the funder of the Public Health System and a time horizon of 5years: 2010-2014. We compared the TS with the usual procedure and calculated the direct costs of the test, the computer platform, training sessions and retesting for their handling. The population size was calculated using the prevalence of COPD in Spain (Soriano ERIJ 2009). Effectiveness was measured as the average of $S$ with quality A+B (ATS).

Results: COPD population who will perform a $S$ goes from 32,850 to 35,207 (2010-2014). At present (2011) 53 PCC have been involved and 1500 S have been done. At the end of 2014, 275 will be included and, with initial data (2011 ERS Congress) 3500 S will be done yearly. The cost of one $S$ for the procedure of TS, in 2010, was 48,1€ with an effectiveness of 83%; while for the usual procedure was 37,9€ and 57%. The budget impact analysis, at the end of the year 2014, reflected a decrease of 132,438€, with the assumption that the $S$ of poor quality should be repeated.

Conclusions: The TS procedure involves an increase in the initial budget but produces a saving of the 6.3% (€132.438) in the medium term. For subsequent studies we will have to know the economic impact that this improvement in the quality of the $S$ may have on the diagnosis and prognosis of COPD patients.

P1126
Telemedical care concept for patients with advanced chronic obstructive pulmonary disease (COPD)

Kewun Ali Solfrah1, Andreas Weissflog1, Michael Scholtes1, Lothar Leiche1, Henning Schneider1, Ulrich Koehler1, Volker Gross1, JTH Mittelhessen University of Applied Sciences, Biomedical Engineering, Giessen, Germany; 2JTH Mittelhessen University of Applied Sciences, Medical Informatics, Giessen, Germany; 3ThoraTech GmbH, Research, Giessen, Germany; 4Philippus University of Marburg, Interdisciplinary Sleep Disorders Centre Hessen, Marburg, Germany; 5Ingenieurbuero fuer Medizintechnik GmbH, Research, Wetterenberg, Germany

Providing health care services via telemedicine opens new possibilities and offering cost efficient solutions for monitoring, assistance, and even training for COPD patients. An acute exacerbation is a sudden worsening of COPD symptoms. As the disease progresses, exacerbations tend to become more frequent. For the successful long-term treatment of COPD, it is necessary to optimize the management of acute exacerbation.

Patients with severe COPD benefit physical and physiological benefits. The best examples are shown in our rehabilitation program for COPD patients in Marburg. A good understanding of their disease and communication from and to the therapist will improve therapy compliance and patients self-management abilities. Finally patients get more sensitive for symptoms of early stages of exacerbations. The new telemedicine concept and system, referred to as Tele-Therapist, is taking these examples into account. The conception comprises automatic examination of explicit COPD vital signs by a mobile device, which can measure and transmit appropriate vital data securely from patients home to a clinic or another location. Data sets can be studied online and compared with e.g. patients fitness data by specialists. An innovative locomotion recognition system will be a part of the Tele-Therapist and allow the monitoring of the rehabilitation & training@home, and furthermore it allows the monitoring of the rehabilitation & training@home, and furthermore it will also provide the feedback & education system@home for patients. By using the platform of the Tele-Therapist, the specialists can give therapy recommendations and can even communicate with the patients. The concept of the Tele-Therapist has good chances to improve the care of severe COPD patients at home.

P1127
Inspiratory capacity measurement in primary care centers to evaluate bronchodilation response in COPD patients

Elena Lopez Santa Maria1, Nuria Narina1, Ruth Diez1, Grupo Atencion Primaria, UrbeCosta, Ezkerkultura, Juan Galdiz1, 2Pneumology, Cruces Hospital, Barakaldo, Bizkia, Spain; 3Pneumology, Cruces Hospital Ciberes, Barakaldo, Bizkia, Spain

Spirometry can be considered a key element in the assessment of COPD patients in primary care centers (PCC). The slow maneuver is not a common practice in such environment. Bronchodilator response (BD) could be underestimated if IC is not evaluated.

Aim: Assessing the usefulness of the measurement of inspiratory capacity (IC) in the evaluation of response bronchodilator in COPD patients in primary care centers.

Material and methods: Transversal, multicenter, descriptive study performed in eight PCC. 113 COPD patients were included. Spirometries were carried out by eight respiratory technicians who performed a two days training program in the slow maneuver (IC). We considered as acceptable maneuvers a coefficient of variation in the CI lower 10% and 150 ml in two maximum values of 3 with a maximum of eight maneuvers. The slow maneuver was performed prior to the forced maneuver.

Results: 113 patients, 99 H and 14 M, 65±9.6 with a FEV1 146±60.53 (49% ±14) and FVC 2910±85, 83% (27% ±17). Globally we observed an increase post BD of 13% CI 8.1 FEV1 and 8.3% FVC. In 56% (66/113) of patients the increase was > 250 ml in the IC. Evaluating patients according to severity, severe patients (FEV1 37% ±7.4) BD response was 13.3% CI 9.1% 1 and 10.7% FVC. In59% (37/60) the increase was > 250 ml in the IC. In the group of not severe patients (FEV1 61% ±7.7) the increase post BD was 10.8% CI 7.4% FEV1 and 6.8% FVC. In 49% (24/53) increase > 250 ml in the IC.

Conclusions: The IC is a parameter that can be obtained in patients studied in primary care and that allows identifying the BD response in COPD patients improving the evaluation of BD response performed by the forced maneuver.

P1128
Quality of forced spirometry in primary care practice – Are start of test, end of test and repeatability goals met?

Mais Arns1, Hans Carlsson2, 1County Council of Värmland, Primary Care Research Unit, Karlstad, Sweden; 2Department of Medical Sciences, Respiratory Medicine and Allergology, Upplands, Sweden; 3Department of Health and Medical Care, County Council of Värmland, Karlstad, Sweden

Optimal performance of spirometry is essential and quality indicators are established in guidelines. In the present study 22 primary care centres in a region in Sweden were investigated. Identical spirometry software has been implemented in all the examined centres.

Subjects and methods: All forced spirometry tests in patients >18 years were collected for a period of two years during the years 2009-2011. Available indicators of performance quality in the spirometry databases were analysed. All indicators comply with the 2005 ATS/ERS recommendations. The indicators were back-extrapolated volume (BEV) <150 ml as start of test criterion, forced expiratory time (FET) ≥6 s as end of test criterion and in addition repeatability of the FEV1 and FVC (the highest value minus the second highest value) ≤150 ml.

Results: 4678 spirometry sessions were analysed. Mean age of the patients was 55.3 years (SD 17.5), and 43% were female. Mean BMI was 27.3 kg/m² (SD 6.3), 24% were smoking. Results are presented as the percentage of all tests meeting the goals per centre: Start of test; BEV <150 ml, varied from 74% to 95% (mean 86%), end of test; FET ≥6 s, from 33% to 90% (mean 66%); Repeatability of FEV1, pre bronchodilator (<150 ml) varied from 73% to 97% (mean 89%), and post bronchodilator from 79% to 98% (mean 91%). Repeatability of FVC pre bronchodilator varied from 53% to 96% (mean 77%) and post bronchodilator from 56% to 91% (mean 78%).

Conclusion: Achievement of quality goals varied considerably between the centres. These data will be further analysed and establish an initial status to compare quality of spirometry after a Spirometry Driving License training.

P1129
Spirometry training courses are not enough to achieve quality spirometry in the community

Maureen P. Swannay, Josh D. Stanton. Respiratory Physiology Laboratory, Christchurch Hospital, Canterbury District Health Board, Christchurch, New Zealand

Community diagnostic spirometry should be performed at the same standard as a respiratory laboratory. In 2008 our 10-year-old training course was altered to include a post-course quality review to qualify for spirometry certification.

Aim: To review the effectiveness of a quality review after spirometry training.

Methods: We audited attendees at our spirometry courses and portfolio submissions. The portfolio required 10 tests and technical comments; spirometry pattern; and quality control logs. We required 90% in all criteria and those who failed could re-submit.

Results: 2-day and refresher spirometry courses were reviewed including 107 practice nurses, 59 occupational health nurses and 27 regional hospital technicians. We found similar trends for the three groups. The portfolio first submission (22%, 30%) and pass rate (33%, 62%) for the 2- and 1-day courses respectively were low.

Discussion: The number seeking feedback on spirometry practice was low with 24% submitting portfolios. Poor compliance was probably because spirometry certification is not compulsory in New Zealand. This review suggests a spirometry course alone is insufficient to achieve quality spirometry, or there are deficiencies in our course content or delivery. A failed portfolio provided additional learning because some resubmissions were successful. The low submissions and pass rates for the portfolios are a concern. We need to encourage excellence in community spirometry and maybe legislation to make spirometry certification compulsory is the way forward.

P1130
Spirrometric data quality as assessed by repeatability in COPD exacerbations

Alek Harrison1, Hardip Kaur Nagra2, Grant Sowman2, Deirdre Price1, Matthew Brown3, Paul Feed1. 1Clinical Research, AJH Partners, Wallingham, Oxn, United Kingdom; 2Clinical Trials, Vitalograph Ltd, Maids Moreton, Buckingham, United Kingdom; 3Translational Sciences, Novartis International AG, Horzum, West Sussex, United Kingdom

Pharmaceutical trials are reliant on accurate data to meet endpoints and eventual registration. Using standardised equipment, well trained technicians [1] and other...
Physician’s mistakes in the interpretation of spirometry

Claudio Sorino, 1 Nicola Scichilone, 1 Annarosa Maggino, 1 Vincenzo Bellia 1
1 PRE DI C A RE, Associazione per la Prevenzione, Diagnosi e Cura delle Affezioni Respiratorie ONLUS, Palermo, Italy; 2 DI BI M I S, Università degli Studi di Palermo, Italy; 3 U.O. Pneumologia, A.O. Sant’Anna, Como, Italy

Background: The most recent ATS/ERS recommendations on lung function testing include a definition of airflow obstruction based on lower limit of normal (LLN) of FEV1/FVC and suggest to measure total lung capacity (TLC) in suspected cases of “pseudo-restriction” (normal FEV1/FVC ratio because of concomitant reductions in FEV1 and FVC), that can conceal airflow obstruction if the subject does not exhale long enough.

Aims: To evaluate the skill of physicians in the interpretation of spirometry.

Methods: A questionnaire focusing on the interpretation of five spiromograms was administered to 127 physicians (aged 25-67 yrs; 39% pulmonologists, 20% geriatrics). A questionnaire focusing on the interpretation of five spirograms was administered to 127 physicians (aged 25-67 yrs; 39% pulmonologists, 20% geriatrics). With standardised equipment, well trained technicians and independent over-readers, patients with COPD exacerbations and low volume manoeuvres were able to provide accurate and reliable data in this clinical trial.

Overall the majority of the manoeuvres met the ATS/ERS 150 ml criteria FVC (96%) and FEV1 (99%) with just 4% FVC and 1% FEV1 of the manoeuvres outside the limit.

Conclusions: Inappropriate spirometric interpretation is not rare among physicians and many of the therapeutic management strategies for COPD are based on the degree of airway obstruction. We have shown that a proportion of patients with irreversible airflow obstruction have bronchiectasis. Hence any patients with ir-reversible airways diseases who are refractory to maximised COPD management should prompt a review of the diagnosis.

References:

P1131

Irreversible airways obstruction on spirometry, does it equate to a diagnosis of COPD?

Dennis Wait, Sarah Hayes, Linda Lukehirst, Joan McWean, Onnor Hampson, Kamlesh Mohan. Community COPD Service, Liverpool Heart and Chest Hospital, Liverpool, United Kingdom

Introduction: Irreversible airways obstruction and a post-bronchodilator FEV1/FVC ratio of <70% on spirometry is diagnostic of chronic obstructive airways disease (COPD). Using the above criteria to make clinical diagnosis may potentially overlook other obstructive lung diseases.

Aims: To study the prevalence and characteristics of lung diseases in patients with irreversible airways obstruction.

Methods: The diagnosis of all patients with irreversible airways obstruction seen in our service between August 2011 and January 2012 was retrospectively reviewed. Respiratory diagnosis was made based on clinical history, physiology testing and radiology.

Results: There were a total of 486 referrals; 446 (92%) have COPD and 40 (8%) have bronchiectasis. No other obstructive lung diseases were diagnosed.

There are no significant differences between the demographics of the COPD and bronchiectasis groups.

Baseline characteristics of patients with COPD and bronchiectasis

<table>
<thead>
<tr>
<th>COPD</th>
<th>Bronchiectasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>446</td>
</tr>
<tr>
<td>M:F ratio</td>
<td>1.16</td>
</tr>
<tr>
<td>Age, years (range)</td>
<td>65.5 (39-49)</td>
</tr>
<tr>
<td>FEV1 % predicted</td>
<td>64.3</td>
</tr>
<tr>
<td>FEV1/FVC ratio</td>
<td>56.4</td>
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<tr>
<td>MRC dyspnoea score</td>
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<tr>
<td>Pack years of smoking</td>
<td>48.2</td>
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All data expressed as means.

Conclusions: Current guidelines define irreversible airways obstruction as COPD and many of the therapeutic management strategies for COPD are based on the degree of airflow obstruction. We have shown that a proportion of patients with irreversible airways obstruction have bronchiectasis. Hence any patients with ir-reversible airways diseases who are refractory to maximised COPD management should prompt a review of the diagnosis.

P1132

Finding the missing millions with COPD – Does it work?

Rehan Mustafa, Fiona Bates, Angela Charlesworth, Tina Stallard, Rosie Watts, Joan Summersgill, Cindy Lightowler. COPD Outreach Service, JamesCook University Hospital, Middlesbrough, Cleveland, United Kingdom

Introduction: Many COPD patients do not receive a diagnosis until it is relatively advanced. It is estimated that for every one patient that has been diagnosed there are four that are not known to the health service. In conjunction with World COPD Day in 2011, our COPD Outreach team promoted this event by performing spirometry on patients, staff and visitors at the main hospital entrance, to raise public awareness and to find the ‘missing millions’.

Aims and objectives: To raise public awareness of COPD and to detect people with undiagnosed COPD.

Method: The day was advertised in the Trust Talking Point and the Trust Press release. Flyers were posted around the hospital. 4 stands were set up in the main atrium of the JUCU, with spirometers and COPD nurse specialists to perform spirometry. Volunteers completed a questionnaire focusing on their smoking history, symptoms of COPD, history of comorbidities and contraindications to performing spirometry. Individuals with abnormal spirometry were provided a letter for their primary care physicians, to undergo repeat testing or further investigations if appropriate.

Results: Out of the 75 volunteers tested, only 9% (n=7) were noted to have abnormal spirometry results. 5% (n=4) of the volunteers had a prior history of airflow obstruction. Therefore only 4% (n=3) of the volunteers screened were found to have abnormal recordings.

Conclusion: Random screening doesn’t capture a large population of people with abnormal spirometry. Screening needs to be more selective e.g.individuals over the age of 35 with a smoking history or symptoms suggestive of COPD. Where our screening did raise awareness of COPD within the general public, it didn’t diagnose a large number of people with COPD.
nitric oxide (FeNO) was measured. A priori, a diagnostic yield of ≥20% was considered as valuable. The study was approved by the local ethics committee (NL37979.075.11).

Results: 160 patients were eligible and 51 were included. Eventually, 36 subjects underwent the research protocol. Three participants had a positive mannitol provocation test (8.3%), only one (2.8%) subject had a FeNO-value of >30 ppb. Mean sum scores for the BPH were 30.0 (±10.0) in the positive group versus 20.0 (±8.6) in the negative group. Mean ACQ sum scores were respectively 4.7 (±2.5) and 4.0 (±3.6). A significant correlation was found between the ACQ and BPH (r=0.80).

Conclusion: After assessment of the results, three participants received the diagnosis of asthma.

In view of the low diagnostic yield found in this study, additional tests did not seem to have significant impact on the diagnosis of asthma.

P1135

Bronchial asthma: New approach to airways functional diagnostics

Vitaliy Mishlanov, Andrey Zuev. Propedeutic of Internal Diseases Department, Perm State Medical Academy, Perm, Russian Federation Laboratory of Hydrodynamics, Institute of Continuous Medium Mechanics of Ural Branch of Russian Academy of Science, Perm, Russian Federation

It’s known that bioelectrical impedance value depends on electrical current path length and diameter. The aim of the study was to investigate electrical impedance of airways and lung by new technique of polyfrequent electrical impedance analysis using “BIA-lab” software. 39 asthmatics and 20 healthy people at the age of 10-14 years old were examined. There were 24 females in asthma group and 11 ones among healthy people. Of the asthmatic patients 10 had a severe asthma, 15 suffer from moderate and 9 ones were with mild form of disease. All patients were examined with physical methods and spirometry tests performed. The polyfrequent electrical impedance technique demanded of 0.9% NaCl airsole inhalation for 1-2 minit to load the airways. The results revealed elevated electrical impedance module values on diapasons of frequencies: 20, 98, 1000, 5000, 10000 Hz in asthmatic patients. But we didn’t registered angle φ changes. There was a significant correlation between FEV1 and electrical impedance module (Z) of airways (r=-0.57; p=0.032). Patients of Gr1 (n=14) - atopic children and Gr2 (n=10) - non-atopic children. The control group (C) included 27 healthy non-atopic children (2 month - 3 years of age). Computerized BPG by computer diagnostic analysis using “BIA-lab” software.

Results: The sample was divided in accordance with the presence or absence of pulmonary hyperinflation (PL). Results: All parameters increased or reduced after administration of the bronchodilator; to characterize the response to bronchodilator according to different criteria.

Conclusion: These preliminary results showed that the infants after the disappear-

ance of wheezing still demonstrate the significant functional acoustic disorders. It was more expressed at atopic children then non-atopic. It can be important in relation of early debut of bronchial asthma.

P1136

Acoustic analysis of respiratory sounds in infants with wheezing

Irina Melchkova, Vassilina Grigoreva, Yuri Mizernitski. Dep. of Pediatrics, Yaroslavl State Medical Academy, Yaroslavl, Russian Federation Dep. of Pediatrics, Yaroslavl State Medical Academy, Yaroslavl, Russian Federation Dep. of Pulmonology, Institute of Pediatrics & Child Surgery, Moscow, Russian Federation

The aim of the study was to determine functional acoustic characteristics of breath by bronchophonographic method (BPG) in infants with wheezing.

Methods: We observed 24 children (2 months-3 years) with wheezing. The pa-
tients were divided into two groups (Gr), the Gr1 (n=14) - atopic children and Gr2 (n=10) - non-atopic children. The control group (C) included 27 healthy non-atopic children (2 month - 3 years of age). Computerized BPG by computer diagnostic complex “Pattern” (MEI, Russia) (0.2-12.6 kHz) before and after inhalation of salbutamol (BTS) was provided all patients after the disappearance of wheezing. It was used coefficients of the general acoustic breath work (ABW) – ϕ (0.2-1.2 kHz), ϕ (1.2-5.0 kHz), ϕ (5.0-12.6 kHz), representing relation of level ABW in a given frequency range of the level general ABW.

Results: There were significantly more high parameters of general ABW, ϕ, ϕ in the patients of Gr1 and Gr2 in comparison with Gr3 (p<0.05). Patients of Gr1 showed much higher general ABW then Gr2 (ϕ 2 <0.01). The patients of Gr1 and Gr2 also showed the most high amplitude of sounds in high frequency zone (5.0-12.6 kHz) in comparison with Gr3 (p<0.05). After BTS for the most part of children of the Gr1 (ϕ 2/3) and 1/2 of the Gr2 showed significant decreasing ϕ3; the level of ϕ3 in the Gr1 decreased significantly more in comparison with Gr2 (accordingly 64.4±7.7%; 40.0±10.3%; p<0.05).

Conclusion: These preliminary results showed that the infants after the disappear-

P1137

Effect of patient age on response to nebulised salbutamol or ipratropium bromide

Andrew Robson1,2, Alastair Innes1,2. 1Respiratory Function Service, Western General Hospital, Edinburgh, United Kingdom; 2Respiratory Function Service, Royal Infirmary of Edinburgh, United Kingdom

In order to investigate the effects of a patient’s age on their response to nebulised bronchodilators we have carried out a retrospective analysis of our clinical results database. Inclusion criteria for the study were: Age >20 at time of measurement and the presence of airflow obstruction (FEV1/VC ratio below the lower limit of normal) at baseline measurements. Patients were excluded from the analysis if they were hospital inpatients at the time of measurement, or if they were on oral steroid treatment. After baseline spirometry had been measured, patients received either 2.5mg of salbutamol (SALB) or 0.25mg ipratropium bromide (IPB) via a nebuliser. Spirometry measurements were repeated at 20 minutes (SALB) or 60 minutes (IPB) post administration of bronchodilator. A patient was considered to have shown a positive response to a bronchodilator of there was an increase in FEV1 >200ml above baseline which was also an increase of >12%. Patients were divided into four age groups, shown below. A total of 11560 patients fulfilled the entry criteria. Of these, 3759 (33%) showed a positive response to a bronchodilator (Table 1).

Table 1. Change in FEV1, expressed as a percentage of the patient's predicted FEV1

<table>
<thead>
<tr>
<th>Age range</th>
<th>Salbutamol</th>
<th>Ipratropium-bromide</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Change in FEV1</td>
<td>N</td>
</tr>
<tr>
<td>20-40</td>
<td>182</td>
<td>16.4 (7.97)</td>
</tr>
<tr>
<td>40-60</td>
<td>191</td>
<td>13.6 (6.19)</td>
</tr>
<tr>
<td>60-80</td>
<td>191</td>
<td>13.5 (5.49)</td>
</tr>
<tr>
<td>80+</td>
<td>106</td>
<td>15.5 (6.17)</td>
</tr>
</tbody>
</table>

Results expressed as mean (±SD).

There were no statistically significant differences between responses to SALB or IPB in any age group. These results demonstrate that increasing patient age does not diminish the magnitude of a patient’s response to nebulised SALB or IPB.

P1138

Characterization of bronchodilator response by spirometry and plethysmography

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Background: The bronchodilator response criterion is defined by ATS/ERS as an increase of FEV1 and FVC ≥12% and 200 mL. However, there are other criteria that should be evaluated in order to better characterize the bronchodilator response.

Objectives: To determine lung function (LF) parameters obtained by spirometry and plethysmography, that have significant changes with the administration of bronchodilator; to quantify changes of LF parameters between pre and post bronchodilator; to characterize the response to bronchodilator according to different criteria.

Methods: We studied 52 consecutive subjects who performed LF tests, in which was detected airway obstruction with subsequent administration of bronchodilator. The sample was divided in accordance with the presence or absence of pulmonary hyperinflation (PL).

Results: All parameters increased or reduced after administration of the bronchodilator (p<0.05). Raw and the FEV1 had the largest percentage of differences between the pre and post bronchodilator. For the totality of the sample, the criteria which were able to detect the largest number of subjects with a positive response to the bronchodilator were the increase of FEF25-75% ≥10% (63.5%), FEF25-75% ≥20% (46.1%), FE25-75% ≥30% (34.6%) and the reduction of Raw ≥10% (32.7%). For the group without PL the best criterion was the increase of FEF25-75% ≥10% (62.2%) and in the group with PL, the increase was in FEF25-75% ≥10% (66.7%) and the reduction of RV ≥10% (66.7%).

Conclusion: This study couldn’t define a single parameter that was considered “the best” to characterize a positive bronchodilator response, but suggested a combination of several parameters for a correct characterization of airway reversibility.

Abstract P1135 – Table 1. The estimation of Z. Otmi in asthmatic patients by polyfrequent electrical impedance analysis

<table>
<thead>
<tr>
<th>Age range</th>
<th>Salbutamol</th>
<th>Ipratropium-bromide</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
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Results expressed as mean (±SD).

There were no statistically significant differences between responses to SALB or IPB in any age group. These results demonstrate that increasing patient age does not diminish the magnitude of a patient’s response to nebulised SALB or IPB.
P1139 Pressure supported nasal inhalation improving penetration of particles into the human lung
Kyewhan Sohрабi1, Damiano Librizzi1, Abas Sohрабi2, Michael Scholtes1, Helmut Hoeffer1, 1Ulnich Koehler1, Volker Gross1, 1Dept. Biomedical Engineering, TH Mittelhessen University of Applied Sciences, Giessen; 1Interdisciplinary Sleep Disorders Centre Hessen, Philipps University of Marburg; 1Dept. Nuclear Medicine, Philipps University of Marburg, Germany

We here report on a new method to facilitate the pressure supported nasal long-term inhalation. The method is developed and technically realized by company NLI GmbH, Germany.

We examined the efficacy of the method by measuring the deposition in nasal and thoracic airways. We used 99mTc-nanocoll to identify the activity scintigraphically in various respiratory sections. This study included 10 patients (f = 5, m = 5), age range 49 to 75 years, presenting several COPD stages (GOLD I-III). The NLI system generated particle sizes from 1-2 μm. The pressure support was adjusted to 10 mbar.

We could show that deposition in the lung periphery by using the pressure supported transnasal application will increase significantly compared with conventional methods. The usual method produced an average nasal deposition of 5.9 MBq and a periphery deposition of 9.6 MBq, whereas NLI method results in an average nasal deposition of 4.2 MBq and a periphery deposition of 12.9 MBq, respectively.

Our study showed that it was possible to penetrate even in periphery pulmonary tissue in COPD patients by using the NLI system. In addition, we achieved an enhancement of the thoracic deposition of 99mTc-nanocoll, when recorded a reduction of activity in the nasopharyngeal zone. Further clinical trials with drug supported applications will be necessary to confirm the clinical relevance.

P1140 Is the portable NOX MINO reliable for screening nasal nitric oxide levels in primary ciliary dyskinesia?
Amanda Harris1, Esther Bhullar1, Rhiannon Joslin1, Kerry Gove2, Jane Lucas1, 1Primary Ciliary Dyskinesia Diagnostic Service, University Hospital Southampton Foundation Trust, Southampton, United Kingdom; 2NIHR Respiratory Biomedical Research Unit, University Hospital Southampton Foundation Trust, Southampton, United Kingdom; 3Primary Ciliary Dyskinesia Research Group, Faculty of Medicine, Clinical and Experimental Sciences, University of Southampton, United Kingdom

Background: Nasal nitric oxide (nNO) levels are very low in patients with PCD. nNO is used as a screening test for PCD. The portable NIOX MINO (Aerocrine, Sweden), is now able to make nasal measurements. This study aimed to assess the usability and reproducibility of the NIOX MINO measurements and comparison of nNO levels with the ‘standard’ NIOX Flex.

Methods: Paired MINO and Flex readings were taken from 22 participants (3 PCD, 5 asthma/sinusitis, 12 healthy, 1 CF, 1 nonCF/nonPCD lung disease; age 5-69years) nNO was measured using Flex during breath holding, and using the Niox MINO using nasal aspiration at 2 and 5 ml during mouth breathing, three times for each measurement.

Results: One participant was unable to use Flex or MINO, one participant was able to obtain acceptable readings using the MINO at 5ml/sec but not at 2ml/sec nor Flex. Younger children were able to obtain measurements at 5ml/sec but not 2ml/sec. Within-method there was good inter-patient reproducibility using the Flex and MINO. Between method, nNO levels using the MINO at 2ml/sec were comparable with Flex (p=0.098) readings using the MINO at 5ml/sec were significantly lower than Flex (p<0.001). nNO levels were extremely low in patients with PCD and were significant differences in LCI and Sacin with BP (p<0.001), but no significant differences in Scond and Sacin. We confirmed an earlier report on 4 adults that increasing Vt reduces ventilation inhomogeneity (Scond and Sacin).

Conclusions: Patients who were able to use Flex could also provide nNO measurements using the MINO at 5ml/sec; younger children were unable to use it at 2ml/sec. Reproducibility of nNO within method was acceptable. Measurements using the MINO at 5ml/sec were low in comparison to Flex, but would still differentiate patients with PCD from healthy controls.

P1141 Effect of airflow obstruction on the measurement of lung volumes
Tara Goddard, Department of Respiratory Medicine, University Hospitals, Bristol, United Kingdom

Effective alveolar volume (Vₐ) is considered as a representative of Total Lung Capacity (TLC) in subjects without airflow obstruction. In the presence of airflow obstruction, physiological changes can give rise to discrepancies between TLC and Vₐ.

Aim: To assess whether Vₐ correlates with TLC and ascertain whether these differences are amplified in relation to the increase in severity of airflow obstruction.

Method: Data was analysed retrospectively and divided into 2 groups based on TLC measured by either body plethysmography (pleth) or helium dilution (He). Results were classified by FEV₁, using the NICE COPD guidelines 2010. Data was analysed using regression, Bland-Altman and ANOVA.

Results: The magnitude of TLC - Vₐ increased significantly (p < 0.001) in relation to the severity of airflow obstruction. Bland-Altman gave a bias of 1.38 and 1.39 for helium and plethysmography respectively. A single equation was derived to predict the differences between TLC and Vₐ: (TLCᵥₐ = Vₐ) = 2.98 – 0.024 FEV₁ %Pred

Table 1: TLC and Vₐ difference in relation to severity of airflow obstruction as classified by the COPD guidelines

<table>
<thead>
<tr>
<th>N</th>
<th>5</th>
<th>23</th>
<th>28</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLCpleth-Vₐ (L)</td>
<td>0.8±0.3</td>
<td>1.3±1.1</td>
<td>1.4±1.1</td>
<td>3.1±1.6</td>
</tr>
<tr>
<td>N</td>
<td>20</td>
<td>46</td>
<td>47</td>
<td>26</td>
</tr>
<tr>
<td>TLCHe-Vₐ (L)</td>
<td>0.9±0.4</td>
<td>1.5±0.9</td>
<td>1.6±1.1</td>
<td>2.9±1.3</td>
</tr>
</tbody>
</table>

Conclusion: 1. Vₐ underestimates TLC.
2. As severity of airflow obstruction increases, the magnitude of discrepancy between TLCpleth and Vₐ and TLCHe and Vₐ increases.
3. Overall, Vₐ is unable to substitute TLC in subjects with COPD, particularly those with more severe airflow obstruction.


Introduction: MBNW requires little cooperation beyond steady breathing, but some subjects (eg, children) may breathe irregularly. Historically studies examining the effect of changing respiratory rate and depth on ventilation distribution indices1,2 have contradictory findings. We aimed to examine the impact of rate and depth of breathing on Lung Clearance Index (LCI) and 2 indices of ventilation inhomogeneity (Scond and Sacin).

Methods: Each subject performed at least 3 MBNW tests at each of 3 breathing patterns (BP). A visual signal provided a frequency target and an auditory signal guided tidal volume (VT). We compared mean LCI, Scond and Sacin between the different BP using repeated measures ANOVA. Sensitivity analyses were performed with and without outliers for validation.

Results: We studied 19 healthy adults but excluded 2 for technical reasons. There were significant differences in LCI and Sacin with BP (p<0.01), but no significant differences in Scond (p=0.117). Increasing VT from 0.6 to 1.0L reduced LCI and Scond. Increasing frequency from 15 to 30 bpm increased LCI and Scond.

Table 1. Mean (SD) for indices of ventilatory inhomogeneity

<table>
<thead>
<tr>
<th>BP (VT, f (bpm))</th>
<th>LCI</th>
<th>Sacin</th>
<th>Scond</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0L, 15</td>
<td>7.29 (0.80)</td>
<td>0.011 (0.013)</td>
<td>0.088 (0.037)</td>
</tr>
<tr>
<td>1.0L, 30</td>
<td>7.95 (0.66)</td>
<td>0.016 (0.013)</td>
<td>0.115 (0.056)</td>
</tr>
<tr>
<td>0.6L, 15</td>
<td>8.18 (1.00)</td>
<td>0.021 (0.016)</td>
<td>0.241 (0.208)</td>
</tr>
</tbody>
</table>

Discussion: We confirmed an earlier report on 4 adults that increasing VT reduces ventilation inhomogeneity within acinar airways1; in contrast we found no effect on Scond. Frequency also influenced some indices of ventilatory homogeneity. We recommend that both VT and frequency are controlled.