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REPORT FROM

Virtual ERS International Congress

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The role of oscillometry in pulmonary function testing

During the expert´s view session on respiratory physiology, Professor Simon Bayat from Grenoble addressed the role of oscillometry in pulmonary function testing. He explained that this technique requires minimal collaboration of the patient who just breathes quietly through the device. By superimposing soundwaves generated either by a piston or a loudspeaker to the patient´s normal breathing, Impedance of the respiratory system (Zrs) can be calculated by dividing the oscillometric pressure of the soundwave by the airflow. Impedance consists of two parts, Resistance (Rrs) and Reactance (Xrs). Resistance depends on the airflow in conducting airways and to a lesser extent peripherally in the tissue. Reactance itself consists of two parts, elastance and inertance, and depends on the lung volume and the stiffness of the lung on the one hand, and the calibre of the airways and the acceleration of air in the peripheral tissue on the other hand. The frequency where Resistance and Reactance are cancelling out each other is called resonance frequency, Fres. He explains that oscillometric measurements are frequency--dependent, where medium-high frequencies of approximately 20Hz measure the proximal airways, and low frequencies of ca 5Hz measure the whole respiratory system. Subtracting the measurements at medium-high frequencies from those at low frequencies will allow to identify peripheral airways obstruction as well as mechanical ventilation heterogeneity. Another clinically relevant parameter, Ax, describes the area under the reactance curve at a range of frequencies and shows the heterogeneity of the peripheral lung. When asked what oscillometry adds to conventional testing such as spirometry, Professor Bayat stressed the possibility to pick up peripheral airway obstruction and ventilation inhomogeneity, as shown experimentally by Eddy et al, Phys Resp 2019. He also gave the example published by Cho et al, AJRCCM 2010, where oscillometry was able to detect pathological changes in transplanted lungs sensitively and a timely treatment could be initiated.

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ERS/EAACI statement on adherence to international adult asthma guidelines

An ERS/EAACI statement on adherence to international adult asthma guidelines was presented by Alexander Mathioudakis from Manchester. The presentation summarised the findings of the ERS/EAACI taskforce who evaluated the understanding of and adherence to international asthma guidelines by health professionals of different specialties; assessed the effectiveness of strategies aimed at improving implementation of guideline recommendations; and compared guidelines adherence and treatment outcomes in patients managed by specialists (respiratory physicians or allergists) or generalists (internists or general practitioners).

Non-adherence to guidelines was found to be caused by poor dissemination or lack of knowledge, differences among guidelines used, diverse clinical settings and local adaptations of the guidelines. There was however a general agreement on core therapeutical strategies such as the role of corticosteroids, action plans, inhalator training, and supporting smoking cessation.

The taskforce found evidence that a positive effect of adherence to guidelines was obtained when patient-specific input by an additional specialised health professional was provided as well as the presence of multifaceted quality improvement projects. However, the effect of interventions to increase guideline adherence tend to wane and they need continuous reinforcement, through e.g. audits, feedback and re-training. It was also stressed that guideline recommendations need to account for differences in resource availability across various settings.

The taskforce found evidence of significantly better adherence to guidelines by specialists compared to generalists. Specialist care was also associated to improved clinical outcomes. The taskforce discussed that patients visit a specialist in more severe disease; as these patients were less adequately controlled, they had more space for improvement. Thus, the taskforce concluded that locally agreed referral pathways are crucial both for generalists and specialists from different specialities as generalists are the first point of contact for a patient.

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Diagnosing asthma in the era of personalised medicine: *biology, physiology and imaging*

During the Monday afternoon session *"Precision medicine in asthma and COPD"*, Prof. Daiana Stolz from Switzerland talked about diagnosing asthma in the era of personalised medicine and focussed on asthma phenotypes and endotypes.

Asthma is a heterogenous disease and there is an ongoing evolution in the understanding of asthma phenotypes and endotypes, where phenotypes can refer to any symptom whereas endotypes are based on specific biological pathways. The development in asthma understanding has progressed from the first distinction between extrinsic and intrinsic asthma to the terms allergic and non-allergic asthma, further focusing on Th2 and non-Th2 asthma before the current classification of T2-high and T2-low asthma.

Despite the emerging new knowledge in this field, Prof. Stolz pointed out that precision medicine in asthma is not trivial because different phenotypes and endotypes share common symptoms and biomarkers. Three biomarkers are often linked to T2 inflammation, including eosinophils, FeNO and IgE, however research shows that all three biomarkers are not always present in everyone. Also, asthma phenotypes are found to not be stable over time nor homogenously present in different matrixes. Hence, precision medicine in asthma remains challenging and when looking at biomarkers it is important to go a step beyond not only evaluating eosinophils, and to re-evaluate the patient over time.

In addition to biomarkers, Prof. Stolz discussed the advantages of combining functional methods, including impulse oscillometry, multiple breath nitrogen washout, lung volumes and spirometry. To look at combinations of these functional methods is particularly important to diagnose small airways disease in asthma. Moreover, additive information can be provided by CT (increased residual static lung volumes and air trapping values).

Finally, Prof. Stolz brought up the importance of also bringing attention to extrapulmonary "treatable traits", such as physical inactivity, obesity and anxiety, in addition to biomarkers and functional testing.

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Greenhouse gas emissions associated with asthma care in the UK: *results from SABINA CARBON*

Supported by AZ.

At the session, *"Highlights for primary care in 2021",* the Greenhouse gas (GHG) emissions associated with asthma care in the UK, was addressed. Alexander JK Wilkinson explained that the GHG emission generated from the health care system correspond to a carbon footprint equivalent of 4,4% of all the global net emissions and that the UK national health system aims to achieve net zero emission by 2045.

In Europe, around 50% of all asthma patients are not well controlled. In this study, Wilkinson and colleagues aimed to estimate the GHG emissions associated with asthma care in the UK, with focusing on the environmental impact of asthma that was well controlled versus not well controlled. The study consisted of UK primary care data of asthma patients older than twelve years of age. In patients that had no exacerbations or prescriptions of less than 3 canisters of SABA per year asthma was classified as well controlled, whilst patients with more than one exacerbation or more than three canisters of SABA were classified as not well controlled. Of 236505 patients analyzed, 52 % of the patients were considered well controlled. The GHG emissions were measured as CO2 equivalents (CO2e) and included emissions associated with asthma medication use, exacerbations and other health care utilization, assessed during the first year of follow-up. Results showed that GHG emissions were three-fold higher in asthma patients that were not well controlled. SABA relievers accounted for the majority (60%) of per capita GHG emissions with the smaller contributions by outer pharmacotherapy, routine health care utilization and exacerbations. Addressing the SABA overuse and reducing the risk of asthma exacerbations may reduce the carbon footprint of asthma care. Therefore, it is of importance to implement the guidelines into clinical practice to address the unmet need in asthma management and to reduce the carbon impact that is associated with poor treatment.

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Updates on inhalers for COPD and asthma

At the session *"Updates on inhalers for COPD and asthma"*, professor Omar Usmani was first out addressing how to choose and use an inhaler device. He talked about three areas; Appreciate the problem of inhalation errors on disease control, Understand the difference between inhaler devices and Identify the right inhaler device for the right patient. Despite there has been a lot of evolution around development and innovations on devices, the inhalation technique by the patient has not improved over the last 60 years. He means that it is not because of the devices but among the HCP there is a lack of knowledge in device selection and training in patients which explains to some level why patients are using their inhalers incorrectly. He also highlights the need for the HCPs to be "device detectives" meaning that they need to know if the patients are using and preparing the devices correctly. It was shown that inhalation errors are significantly associated with poor disease outcome (e.g. uncontrolled asthma and more exacerbations) and greater health-economic burden. It is not only the speed or force of the inhalation that is of importance, it is also important to lift the chin for better access to the trachea. Usmani also reflects on the dose-counters on the devices, and how we know if the drug was actually delivered? With a "standard" dose-counter the dose counter is activated upon opening the device, which does not give any indication of the correct use of the device. The functional inhalation counter activates only following inhalation by the patient, indicating that the correct force of inhalation is reached.

To tailor the right inhalation device to the patient, they have developed a special algorithm in the UK. It is called ACT on inhalers, and stand for Assess, Choose and Train.

Professor Usmani also addressed the effect of inhalers on the environment. This is related to the propellants and their contribution to the green-house gas emissions, although now there are low global warming potential propellants in every class of inhalers. It is interpreted by some that it is ok to switch stable patients from pMDIs to DPIs to reach a green target, but this is not the case according to Professor Usmani: Patients should not be stig-matized for using their lifesaving medication, and devices should not be considered as interchang-eable, since there is no "one size fits all". A forced switch is not good as you need to get the patient engaged in order to preserve trust. It has been shown that overuse of SABA (> 3 canisters per year) and underuse of ICS is related to an increase in greenhouse gas emission. By improving con-trol of asthma in patients by inducing ICS to their treatment and thereby reduce the use of SABA, it will benefit the environment. Dr. Usmani ends the presentation with "The greenest inhaler is the one that the patient can and will use".

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