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Oral Sessions

Session 17: Free Communications – COPD

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Treatment of COPD Exacerbation in Switzerland – Results and Recommendations of the European COPD Audit

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Introduction: The “European COPD Audit” initiated by the European Respiratory Society (ERS) evaluated the management of hospital admissions due to exacerbation of COPD in several Euro-

pean Countries. Data on the treatment of severe acute exacerbation of COPD (AECOPD) in Switzerland is scarce. In light of the current guidelines, this work aims to examine the quality of care for AECOPD and to provide specific recommendations for the management of severe AECOPD in Switzerland.

Methods: 295 patients requiring hospital admission to 19 Swiss hospitals due to exacerbation of COPD during a predefined 60 days in 2011, were included in the study. We compared the Swiss data to the official GOLD recommendations and to the results of other European countries.

Results: Approximately 43% of the Swiss patients with a severe AECOPD were still smoking at hospital admission, compared to 33% of patients in other European countries ($p < 0.001$). In Switzerland and in Europe, spirometry data were not available for most patients at hospital admission (65% versus 60%, $p = 0.08$). In comparison to other European countries, antibiotics were prescribed 14% less often in Switzerland ($p < 0.001$). Only 79% of the patients in the Swiss cohort received treatment with a short-acting bronchodilator at admission. In Switzerland, non-invasive ventilation (NIV) support before admission (7.5% vs 2.6%, $p < 0.001$) and during hospitalization (33.3% vs 13.4%; $p < 0.001$) was significantly higher than in other European countries.

The following recommendations were made: 1) smoking cessation should be offered to COPD patients admitted to the hospital for exacerbation; 2) arterial blood gas analysis or a venous blood gas should be collected; 3) medical staff should be trained in administering bronchodilators through a nebulizer with oxygen in the emergency ward; 4) systemic steroids should be administered; 5) antibiotics should be given in patients with increased sputum volume, prudent sputum and increased C-reactive protein or procalcitonin, and in patients requiring ICU admission; 6) non-invasive ventilation is indicated if pH < 7.35 and PaCO₂ > 6 kPa; 7) spirometry should be performed before discharging the patient or at least 4–6 weeks thereafter.

Conclusions: Considering the overall high standard of health care in Switzerland, the management of severe acute exacerbations of COPD could be improved based on the proposed 7 bundle-care measurements.

Which Prognostic Score to Use in Clinical COPD Practise? An Answer Merging the Assessment of Prognostic Properties and of Clinical Applicability

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Introduction: Many prognostic scores for various diseases and disease outcomes exist. The majority of prognostic scores have never been externally validated. This renders uncertain their accuracy in populations different from the one in which they were developed. Furthermore, the different scores are rarely compared against each other. Thus, practitioners cannot base their decisions on which prognostic score to use on firm evidence.

Methods: Using a novel network meta-analytic technique (Multiple Score Comparison (MSC) meta-analysis), we compared the predictive performance of all the available scores predicting mortality in patients with COPD. We used a large-scale international database of 24 cohorts (15,762 patients with COPD, 1,871 deaths and 42,203 person-years of follow-up).

Results: Depending on data availability, between 2 and 9 prognostic scores could be calculated for each cohort. The most commonly used BODE score (combining body mass index, airflow obstruction, dyspnoea and exercise capacity) had a median AUC of 0.679 [1st quartile–3rd quartile = 0.655–0.733] across cohorts. The ADO score (combining age, dyspnoea and airflow obstruction) showed the best performance for predicting mortality (difference $AUC_{ADO} - AUC_{BODE} = 0.015$ [95% confidence interval (CI) -0.002 to 0.032], $p = 0.08$, probability of being better than any other considered score = 0.96) followed by the updated BODE ($AUC_{BODE\ updated} - AUC_{BODE} = 0.008$ [95% CI -0.005 to +0.022], $p = 0.23$, probability of being better than any other considered score = 0.87).

Conclusions: Using MSC meta-analysis for external validation and concurrent comparison of multiple prognostic scores, we showed best performance for the ADO and updated BODE scores to predict 3-year mortality in patients with COPD. We supported prognostic properties evaluation with clinical applicability assessment, possibly facilitating the way for stratified medicine, targeted public health interventions and use of prognostic scores in research.

Fig. 1. Performance comparison (for Abstract 107).

Fig. 2. Network representing which prognostic scores belong to the different groups (unit of the method) (for Abstract 107).

Laryngopharyngeal Reflux in Chronic Obstructive Lung Disease – A Multicenter Study

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Introduction: Gastroesophageal reflux disease (GERD) has been reported to be a risk factor for exacerbations of chronic obstructive pulmonary disease (COPD). Laryngopharyngeal reflux (LPR) is defined as the retrograde flow of gastric content into the larynx and pharynx which may cause respiratory symptoms such as hoarseness, dysphonia and globus. A laryngopharyngeal monitor has been validated to reliably detect LPR. We hypothesize, that LPR, even if silent, may be a contributing factor for the prognosis of, and clinical outcomes of COPD.

Methods: 200 patients with COPD GOLD Class I–IV with stable disease >4 weeks were recruited from in- and out-patients from the Clinic of Respiratory Medicine from 2 tertiary care institutions. In addition to lung function assessments and LPR (Restech, Respiratory Technology Corporation, San Diego, USA), assessing pH through a probe for 24 hours 5–10 mm below the uvula, the patients completed 3 questionnaires (Leicester cough questionnaire, Belafsky (RSI) and GERDQ). RYAN score, which combines the number of reflux episodes, the duration of the longest reflux episode and the percentage of time below the respective threshold, was used to evaluate the presence of LPR. Ryan score ≥ 9.4 (pH <5.5) in an upright position or ≥ 6.8 (pH <5.0) in a supine position was considered pathologic.

Results: Data from 86 patients and 11 healthy controls were included in a preliminary analysis. Patients with COPD had a significantly higher RYAN (upright) score than healthy controls (me-

dian 20.2 vs 2.12; $p = 0.005$) but RYAN (supine) did not differ between the groups. 58% of the patients had pathologic RYAN score compared to 18% of the controls ($p = 0.021$). RYAN (upright) score was associated with GOLD stage (beta 0.228, 95% CI 5.041 to 162.85; $p = 0.037$) but there was no association between RYAN (upright) score and any of the questionnaires. RYAN (supine) showed an association with the Leicester cough questionnaire (beta -0.303, 95% CI -0.129 to -0.022; $p = 0.006$). There was no association between RYAN (upright or supine) score and gender, age, body mass index, or pack years. 50% (25/50) of the patients with a pathologic Ryan (upright) score were receiving PPIs, compared to 28% (10/36) of patients with normal RYAN (upright) score (HR 2.60, 95% CI 1.04 to 6.5; $p = 0.041$).

Conclusion: Laryngopharyngeal reflux seems to be more common among patients with COPD and may be associated with GOLD stage.

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Occupational Exposure and the Risk of Chronic Obstructive Lung Disease and Mortality – A Swiss Large-Scale Cohort Study

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Introduction: An estimated 25–45% of cases with chronic obstructive pulmonary disease (COPD) is due to non-smoking causes. Occupational exposure to vapours, gases, dusts and fumes (VGDF) has been described as a relevant risk factor for COPD and mortality. Up to now, studies investigating the effects of occupational exposures on the lung and on mortality are limited by their designs, options to account for confounding (e.g., smoking) or were underpowered to detect effects on mortality. Thus, the con-

Table 1. Occupational exposure to VGDF (for Abstract 109)

Outcome	Occupational exposure	
	VGDF exposure in current job	VGDF exposure in learned profession
FEV1 in liters (95% CI), p value	-0.03 (-0.05 to -0.00), 0.03	-0.05 (-0.07 to -0.03), <0.001
FVC in liters (95% CI), p value	-0.03 (-0.06 to 0.01), 0.10	-0.06 (-0.08 to -0.04), <0.001
FEV1/FVC ratio % (95% CI), p value	-0.13 (-0.47 to 0.22), 0.48	-0.06 (-0.31 to 0.20), 0.67
COPD OR (95% CI), p value	1.08 (0.87 to 1.33), 0.51	1.14 (0.99 to 1.32), 0.08
Mortality HR (95% CI), p value	0.87 (0.62 to 1.20), 0.39	1.15 (0.98 to 1.35), 0.09

Workers without exposure in their learned profession or current job were used as reference. All regressions are adjusted for sex, age, smoking status, body mass index, medication and residential proximity to main road. COPD = chronic obstructive pulmonary disease (COPD was defined as lower limit of normal: FEV1/FVC z-score < -1.64 SD); FEV1 = forced expiratory volume in 1 second; FVC = forced vital capacity; FEV1/FVC ratio = (FEV1/FVC) x 100; CI = confidence interval; OR = odds ratio; HR = hazard ratio. 2'420 cases with exposure vs. 24'913 cases without VGDF exposure in current job, 5'031 cases with exposure vs. 18'392 cases without VGDF exposure in learned profession.

tribution of occupational exposures on the risk of COPD and mortality is still very much debated.

Method: We based the analysis on the linkage of two Swiss datasets (LuftiBus and Swiss National Cohort [SNC]) resulting in 27'333 adults (≥ 25 years) with information about the current job in the year 2000 and 23'423 adults with information about their learned profession. For all cases we have lung function measurements between 2002–2012 and all-cause mortality up to 2014. We did job coding and exposure assignment concerning VGDF using the Airborne Chemical Exposure Job Exposure Matrix (ACE JEM) (Sadhra, SS. et al. *Occup Med* 2016;66:358–364). We used linear, logistic and proportional hazard regression to study the association of VGDF with lung function, COPD (defined through lower limits of normal) and mortality while adjusting for age, sex, smoking, body mass index, medication and residential proximity to main roads.

Results: We found statistically significantly lower forced expiratory volume in 1 second (FEV1) and forced vital capacity (FVC) among workers with VGDF exposure in their learned profession compared to workers without exposure. The FEV1 was also lower in workers with current VGDF exposure. Workers who stayed in an exposed job and workers who changed from an exposed to a not exposed job showed poorer FEV1 (-0.04 liter, 95% CI -0.07 to -0.01 , $p < 0.01$; -0.06 , 95% CI -0.08 to -0.03 , $p < 0.001$) than workers who stayed in a not exposed job. For workers who changed from an exposed to a not exposed job the FVC was also lower (-0.07 , 95% CI -0.10 to -0.04 , $p < 0.001$). Although the analyses suggested increased risks for COPD and mortality, the associations were not significant on a statistically relevant level.

Conclusions: The LuftiBus-SNC cohort indicates that occupational exposure to VGDF is associated with lung function, the association with COPD and mortality however remains unclear. Some of our findings may be partially explained by the “healthy worker effect”.

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On-Line Breath Analysis with Secondary Electrospray Ionization Discriminates between COPD Patients with and without Frequent Exacerbations

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Introduction: On-line breath analysis is a painless, non-invasive method to get insights into the metabolism of patients. Using real-time mass spectrometry, we investigated the profiles of volatile and semi-volatile organic compounds (VOC, sVOC) in exhaled breath of patients suffering from chronic obstructive pulmonary disease (COPD) with and without frequent exacerbations.

Fig. 1. ROC curve for the LOOCV with pointwise 95% confidence intervals (bootstrapping). Feature selection was choosing the 2–6 best predictors in each iteration. This gave an ROC-AUC of 0.89 (95% CI 0.75–0.96) with an accuracy of 86.5% at the optimal operating point (circle) (for Abstract 110).

The aim of the study was to discriminate between the two groups as well as to get insights into underlying metabolic differences and to better understand the pathogenesis of exacerbations.

Methods: COPD patients with frequent (≥ 2 exacerbations during the preceding 12 months, $n = 26$) and non-frequent exacerbations ($n = 26$) were recruited and matched in terms of gender, age and smoking history. Breath analysis was performed in real-time, using secondary electrospray ionization mass spectrometry (SESI-MS). Extensive data analysis was then applied to identify metabolic patterns that differ between the two groups and to assess their classification performance.

Results: We successfully identified metabolic patterns in exhaled breath, which discriminate COPD patients with and without frequent exacerbations. Using a leave-one-out cross validation (LOOCV) we obtained a ROC-AUC of 0.89 (figure 1). In total, we observed 380 significant ($q < 0.05$) features, many of which formed correlating chemical families. Amongst others, a series of nitro-aromatic compounds was increased in frequent exacerbaters. We propose that these findings correlate with elevated nitric oxide production in response to the pulmonary inflammation. Other significant groups were different short and medium-chained fatty acid derivatives.

Conclusions: On-line breath analysis is capable of discriminating COPD patients with and without frequent exacerbations with good accuracy. It is a painless, non-invasive method that has the potential to provide information on biochemical processes in contrast to conventional lung function tests. We propose that our findings correlate with the increased oxidative stress caused by elevated nitric oxide production in response to the pulmonary inflammation.

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Can Early Introduction of Specialized Palliative Care Limit Intensive Care, Emergency and Hospital Admissions in Patients with Severe and Very Severe COPD? A Pilot Randomized Study

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Introduction: Morbidity/mortality in severe COPD are comparable to that of lung cancer. Severe COPD has a profound impact on health-related quality of life (HRQL). End-of-life in COPD is often associated with repeated admissions to emergency wards, intensive care unit (ICU) and hospital stays, in spite of its' poor prognosis. However, palliative care is seldom proposed to severe COPD and very few palliative care intervention studies are available. This trial aimed to determine the effectiveness of introducing specialized palliative care on rate of hospital, ICU and emergency ward admissions of patients with severe or very severe COPD.

Methods: Pilot RCT; 2 arms parallel groups design; 1 year period. Intervention: a monthly early palliative care consultation (EPCC) at home was added to standard care (SC). Patients included: MMSE >23; stage III or IV COPD (GOLD criteria) and/or long term oxygen therapy (LTOT) and/or home mechanical ventilation (HMV) and/or >1 hospital admission in the previous year for an acute exacerbation. Mood and anxiety, HRQL, ESAS symptom scales and completion of advance care directives (AD) were also collected.

Results: 49 patients were included (mean age: 71 ± 8; 23 men; FEV1: 37 ± 14% predicted; COPD Assessment Test (CAT): 19.4 ± 7.3; 88% had a CAT >10; 26 EPCC/23 SC). Smokers: 44 (90%), 16 (33%) active; LTOT and/or HMV: 34 (69%). 36 (73%) were hospitalised during previous year. 8 patients died during the study. Hospital Anxiety and Depression scales were >10 for anxiety in 13 (26%), and for depression in 8 subjects (16%). SF-36 scores were markedly decreased for Vitality (36 ± 20), General Health (35 ± 21), and Physical functioning (28 ± 20). There was no effect in the EPCC group on Hospital, ICU or emergency admissions ($P > 0.05$). Both groups demonstrated a significant improvement in quality of life (SF-36 and CAT) 3 and 6 months after inclusion, but there was no group effect and no effect overtime after 6 months. There was no effect of EPCC on mood and anxiety (HADS) or on use of antibiotics. Number of ADs completed at the end of the study was higher in the EPCC than in the SC group (12 vs 6; $P = 0.064$).

Conclusion: Results of this pilot study failed to demonstrate the effectiveness of an EPCC on the predefined outcomes. Among the possible explanations are the high degree of care already provided for these patients, and the limited number of cases. Further studies are necessary to improve symptom control in these patients.

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Home Non-Invasive Ventilation in the Canton of Geneva: A Comprehensive Descriptive Study. Population and Medical Follow-Up

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Introduction: Practices regarding home non-invasive mechanical ventilation (HMV) (indications, mode of prescription, devices, settings) have evolved since the last study published in the Geneva area (Janssens, Chest 2003). This study describes HMV in the Canton of Geneva, with data obtained through all actors involved (public and private hospitals, private practitioners, home care providers).

Methods: Systematic survey of all cases aged >20 years followed by public or private hospitals, private practitioners, and home care providers treated by HMV for >3 months; written information to all patients; collection of information regarding patient (diagnosis, ABG), ventilator, and modalities of follow-up.

Results: (Median, range, or N, % of total): 357 patients (232 Male, 65%; aged 71 (20–95) years) were included (5 refusals). Eight patients ventilated by tracheostomy are not described. Estimated prevalence of NIV in Geneva for patients aged >20 is 93.3/10E5 inhabitants. Former smokers (154; 47%), active smokers (59; 18%), or never smokers (116; 35%).

Median BMI was 31.2 (12.4–71.7) kg/m²; BMI was <20 kg/m² in 10%, >30 kg/m² in 54%, and >40 in 18.5%. Most recent daytime arterial blood gases without NIV were (n = 208): pH: 7.41 (7.3–7.51); PaCO₂: 5.5 kPa (3.8–9.1); PaO₂: room air (n = 178): 9.1 kPa (4.8–14.3); HCO₃: 26.3 mmol/L (14.6–41.9). Daytime PaCO₂ was >6.5 kPa in 18% of subjects.

Diagnoses were (missing: 17): obstructive lung disease: 89 (26%); restrictive disorders: 89 (26%; 19.7% with OHS); neuromuscular disorders: 36 (10.6%); sleep-related breathing disorders: 125 (36.8%); palliative NIV: 1.

Initiation was performed after an acute episode of respiratory failure (105; 32%) or electively (224; 68%). NIV was started in a hospital ward (216; 67.5%) or on an outpatient basis (104; 32.5%).

Medical follow-up was assured by a pulmonologist in private practice (168; 47.1%), an expert center (179; 50.1%), or both (10; 2.8%); 50 patients (15.5%) had not seen a pulmonologist within the past year. Regular home visits by specialized nurses were provided for 197 (55.2%) patients. Add-on oxygen therapy during NIV was provided in 93 cases (26%).

Conclusion: Obesity-hypoventilation, closely followed by COPD remain the most frequent indications for NIV in our area. More than 50% of all patients treated are obese. Data also show an important involvement of private practitioners and a third of patients being started on NIV on an outpatient basis.

Table 1. Population characteristics (for Abstract 113)

Feature	Total (203 participants)		2nd follow-up AT +2 years (88 participants)	
	n	%	n	%
Males	168	82.76	74	84.09
Smokers and ex-smokers	117	57.64	46	52.27
Arterial hypertension	151	74.38	62	70.46
Diabetes mellitus	13	6.4	6	6.81
Adipositas	36	17.73	17	19.32
Dyslipidemia	115	56.65	48	54.55
Stroke	28	13.79	17	19.32
Coronary heart disease	46	22.66	20	22.73
Other known aneurysms	8	3.94	2	2.27
Chronic obstructive pulmonary disease	13	6.4	5	5.68
Atrial fibrillation	45	22.17	20	22.73
Renal failure	22	10.84	11	12.50
Family history of vascular incidents	47	23.15	28	31.82
Family history of aortic aneurysms	20	9.85	8	0.09
AHI <5	77	37.93	29	32.96
AHI 5–15	61	30.05	27	30.68
AHI 15–30	40	19.7	14	15.91
AHI >30	25	12.32	9	10.23
CPAP	12	5.91	9	10.23

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Is Obstructive Sleep Apnea (OSA) a Risk Factor for the Progression of Thoracic Aortic Aneurysm (TAA)?

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Introduction: Care of aortic aneurysms (AA) consists of regular imaging follow-up and managing cardiovascular risk factors. OSA has been proposed to be associated with accelerated expansion of abdominal AA in observational studies. The purpose of this ongoing study is to evaluate whether OSA has an influence on the progression of thoracic aortic aneurysm (TAA).

Methods: In total, 340 people with known TAA are to be included in this prospective, observational study. In women the TAA is defined as aortic diameter >39 mm at the level of *Sinus valsalvae* and >42 mm at the level of the ascending aorta. The values for men are >44 mm and >46 mm, respectively. Each participant undergoes a home sleep study at baseline and at the 3-year follow-up. OSA is defined as Apnea-Hypopnea-Index (AHI) ≥5/h, and its severity classified into mild, moderate or severe according to the guidelines by the American Academy of Sleep Medicine (AASM). Each participant receives an annual TAA assessment by transthoracic echocardiography. The primary outcome is the yearly expansion rate of TAA in relation to OSA severity. The secondary outcomes encompass aortic events (ruptures, dissections), endovascular repairs and rapid progressions of TAA.

Fig. 1. TAA-Progression in relation to AHI (for Abstract 113).

Results: To date, 228 patients have been recruited, 20 patients have dropped out during follow-up and 5 have reached a secondary outcome (TAA surgery). Out of 203 still active participants, 148 have reached the first follow-up (1 year) and 88 the second one (2 years). In total, 12 patients were started on continuous positive air pressure therapy (CPAP) during follow-up – these were considered as a separate AHI category. The baseline characteristics are listed in table 1.

The one-year progression rates were similar in all subgroups. After 2 years, the mean systolic TAA progression rate at *Sinus valsalve* (0.051 ± 0.107 cm) was significantly greater in moderate-to-severe OSA (AHI ≥ 15 /h) than in participants with an AHI < 15 /h (0.014 ± 0.098 cm) or in the CPAP subgroup (-0.003 ± 0.055 cm). A similar trend was observed for the ascending aorta.

Conclusions: Moderate-to-severe OSA seems to increase the TAA expansion rate at the level of Sinus valsalvae, whereas CPAP seems to be an effective countermeasure. It might therefore be beneficial to routinely screen and treat for OSA in the management of TAA.

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Telemetrically Triggered Interventions in the First Month of CPAP: 6-months Results of a Prospective, Randomized Controlled Trial

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Introduction: CPAP is the standard treatment for OSAS. Long term adherence is relatively low, many patients abscond in the first months of treatment. In a pilot study, we observed an improvement in 1-month adherence for patients supported with telemetrically triggered interventions. Therefore, a prospectively randomized trial was conducted.

Methods: 240 symptomatic OSAS patients with an apnea-hypopnea index (AHI) of > 5 /h started CPAP with a structured instruction session of 1 hour, including a trial period in bed. Patients who agreed for long-term CPAP were randomized 1:1 to a telemedicine (TM) or control group (non-TM). For the TM group, CPAP usage, mask leakage and residual AHI were checked on an online data depository 3 times per week during the first month of treatment. Phone calls were undertaken if there was usage < 4 h or excessive leakage for 2 consecutive nights. For all patients, data on usage and sleep and daytime quality of life (Quebec sleep Quality QSQ) was collected at 1 and 6 months of treatment.

Table 1. (for Abstract 114)

	With TM	Non-TM	p-value
N	82	87	
% male	82.5	85.4	ns
Age	55.2 [44.4–66.0]	57.2 [43.8–65.7]	ns
BMI	31.3 [27.5–34.7]	31.0 [27.9–34.9]	ns
ODI	32.5 [17.0–59.0]	36.0 [23.5–60.5]	ns
AHI	39.0 [26.0–69.0]	52.0 [32.5–70.5]	ns
ESS	10 [6–13]	10 [7–13]	ns
QSQ sum score	140.0 [103.5–170]	151.5 [124.5–176.5]	ns

Table 2. (for Abstract 114)

	With TM	Non-TM	p
N	82	87	
Month 1: Daily usage (h)	5.7 h [4.4–6.8]	5.3 [4.2–7.0]	0.8
Month 1: % nights with CPAP used	95.3 [85.4–98.6]	95.3 [88.7–98.6]	0.811
Month 1: % nights with efficient CPAP use	93.4 [80.3–100.0]	90.1 [67.1–100.0]	0.233
Month 1: QSQ sum score	174 [152–195]	172 [150–194]	ns
Month 6: Daily usage (h)	5.6 [3.8–6.3]	4.8 [3.3–6.7]	0.663
Month 6: % nights with CPAP used	92.0 [72.3–98.0]	88.2 [71.5–97.7]	0.565
Month 6: % nights with efficient CPAP use	89.6 [79.2–96.7]	89.6 [74.0–97.3]	0.716
QSQ sum score	174 [150–195]	169 [145–188]	ns

Results: 240 patients were randomized. According to the pre-defined protocol, 17 1-month absconders (11 TM, 6 non-TM) and 54 6-months absconders (27 TM, 27 non-TM) were excluded from analysis. Baseline characteristics of the study population were comparable in both groups (Table 1). Among TM patients, 18 (22%) had no indication for calls, 26 (32%) received 1 or 2 calls and 38 (46%) 3 or more calls. Usage data at 6 months for TM and non-TM patients are given in Table 2. Usage differences between groups were not statistically significant. In a subgroup analysis, we found that for the quartile of patients with low baseline scores in the Epworth sleepiness scale (ESS), a significant increase in usage was observed. Similarly, the quartile of patients with low baseline AHI had a significantly higher CPAP usage in the TM group. Interestingly, there was a significantly higher improvement in QSQ when comparing TM vs. non-TM from baseline to 1 month ($p = 0.021$) and from baseline to 6 months ($p = 0.028$).

Conclusion: Telemetrically triggered targeted patient support during the first CPAP month did not result in a statistically significant increase in CPAP usage at 1 and 6 months of treatment in an unselected patient population. A significant improvement was observed in the subgroup of patients with low ESS scores as well as in patients with low AHI.

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Home-Based Non Attended Respiratory Polygraphy in Children: Feasibility and Accuracy for Interpretation

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Introduction: Sleep related breathing disorders (SDB) in children are common. There is increasing awareness for symptoms as snoring or observed apnoea during sleep as possible indicators for airway obstruction, fatigue or irritability during daytime. SDB are associated with morbidities such as obesity or face abnormalities. In the presence of such symptoms, clinical examination including ENT exam will indicate further investigations for diagnosis and assessment of severity of SDB.

To investigate SDB, respiratory polygraphy (RP) is becoming more accepted as an alternative to classical polysomnography because now widely available and of lower technical burden for children (Curr Opin Pulm Med 2015). RP can be performed at home to allow a familiar surrounding environment. To be successful, this approach needs to demonstrate its feasibility and acceptable quality of RP.

Our aim was to evaluate our RP regarding its technical feasibility and quality as sufficient for interpretation according to the American Academy of Sleep Medicine scoring rules.

Method: We retrospectively reviewed our non attended home-based RP performed between 2012 and 2015. We analyzed the quality of the following channels: nasal airflow, respiratory move-

ments and their sum recorded by thoracic and abdominal respiratory inductance plethysmography belts, oxygen saturation by pulse oxymetry and time interpretable and technically acceptable of at least 300 minutes.

Results: We analyzed 242 non attended home-based RP performed in children with a mean age of 7.3 (± 4.5) years. Underlying pathologies were for two thirds obstructive ENT disorders. Other pathologies included obesity, craniofacial malformations and neuromuscular diseases. 89 % of RP performed at home achieved a sufficient quality to be scored. The most frequent reason for insufficient quality was an absent or highly artifacted channel of oxygen saturation.

Conclusions: We report here one of the largest series of RP at home in children. RP is feasible and technically acceptable in a non attended home-based setting. The most vulnerable channel is oxygen saturation.

Session 19: Free Communications – Interstitial Lung Disease, Translational Research and Pulmonary Hypertension

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Multicenter, Observational Screening Survey for the Detection of Chronic Thromboembolic Pulmonary Hypertension Following Pulmonary Embolism

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Introduction: The prevailing hypothesis on chronic thromboembolic pulmonary hypertension (CTEPH) is that pulmonary embolism (PE) is a necessary trigger for its pathogenesis. The true incidence of CTEPH after PE is actually not well known and has been found to vary almost ten-fold (0.57% to 4.7%) according to published studies. Therefore, the usefulness of a screening program after PE is uncertain. The aim of our study was to establish

the 2-year incidence of CTEPH after PE in a large Swiss cohort. Additionally, we tested the performance of a 3 step screening algorithm based on an initial dyspnea questionnaire.

Methods: In a prospective, multicenter, observational phase V study, conducted between 2008 and 2015 we screened 1699 patients with PE in 11 Swiss PH centers. 602 patients with a confirmed acute PE were included and followed over a two-year period. The three steps follow-up algorithm included: 1 a dyspnea based telephonic survey, 2 an echocardiography and 3 a right heart catheterization with either V/Q scan or angio-CT. The algorithm was repeated at 6, 12 and 24 months.

Results: Our main finding is a cumulative CTEPH incidence of 0.79% over two years. We identified 4 cases on 507 patients who fully completed the follow-up. The incidence rate of CTEPH was 0.36 per 100 persons pro year after PE in Switzerland. A match between the Swiss pulmonary hypertension registry and our study database of all the 1699 screened patients strengthened our results. According to the registry, we missed no CTEPH case during our follow-up. Four additional cases occurred in the 1193 patients excluded or not fully screened from our study. Therefore, the study protocol did not segregate a higher risk population. The dyspnea based screening algorithm yielded a sensitivity of 100% and a specificity of 94.1% (Youden index 0.94). Echocardiography in newly dyspneic patients showed a negative predictive value of 100%.

Conclusion: To our knowledge, this multicenter prospective study on CTEPH is one of the largest cohorts conducted in PE patients. The three steps screening algorithm was able to detect all new CTEPH cases occurring in the 2 years following acute PE. The low 0.79% incidence, when compared to the ~25 new diagnosed cases/year in Switzerland, raises the importance of silent embolic events in the pathogenesis of CTEPH.

Acknowledgement: This work was supported by the Swiss Society for Pulmonary Hypertension.

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Serum Levels of Glycosaminoglycans are Altered during Acute Exacerbations in Chronic Obstructive Pulmonary Disease

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Introduction: COPD is an inflammatory condition associated with disturbance of the homeostasis of extracellular matrix (ECM) molecules contributing to airway remodeling. In the lung, the ECM is subjected to a daily turnover of about 10%. Among other ECM molecules, glycosaminoglycans (GAGs) play a key role in airway remodeling in COPD. The aim of our study was to investigate whether serum levels of various GAGs are altered during acute exacerbation of COPD.

Methods: This is a prospective, observational, multicenter study including 506 patients with COPD, GOLD stages II-IV, >10 PY seeking care in pulmonary tertiary hospitals in 8 European countries and included in the PROMISE cohort. The primary outcome of the study was exacerbation and/or death. Median observation time was 24 months. Serum levels of hyaluronic acid (HA), heparan sulfate (HS) and chondroitin sulfate (CS) were measured by ELISA in patients with COPD at stable state (n = 206), at exacerbation (moderate n = 162; severe n = 88) and 4 weeks after exacerbation (n = 152).

Results: Serum levels of HA increased in moderate (34.7 ± 1.6 µg/l) and in severe (66.3 ± 5.2 µg/l) exacerbations, as compared to stable state of the disease (28.6 ± 1.1 µg/l), ($p < 0.001$ for all) and remained significantly higher 4 weeks after exacerbation (50.1 ± 3.6 µg/l, $p < 0.001$). Serum levels of HS increased in moderate (1487 ± 50 µg/l) and in severe (1525 ± 95 µg/l) exacerbations, as compared to stable state (1255 ± 66 µg/l), ($p < 0.001$ for all) and remained significantly higher 4 weeks after exacerbation (1534 ± 60 µg/l, $p < 0.001$). Serum levels of CS, however, decreased in moderate (22.0 ± 2.3 ng/l) and in severe (16.8 ± 3.0 ng/l) exacerbation, as compared to stable state (32.7 ± 2.5 ng/l), ($p < 0.001$ for all). CS

remained significantly lower 4 weeks after exacerbation (24.6 ± 3.2 ng/l, $p = 0.001$).

Serum levels of HA were positively correlated with FEV1% pred ($p = 0.002$) and FEV/FVC ($p = 0.025$). Furthermore, HA was associated significantly ($p < 0.001$) with the time to death (Exp(B) 1.019 95% CI 1.009–1.029). Cox-regression multivariate analysis revealed that this association was independent of adjusted Charlson score, annual exacerbation rate and BODE index components.

Conclusions: Acute exacerbations of COPD are associated with changes in serum levels of individual GAGs reflecting ECM remodeling and affecting COPD progression and severity.

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Lung-Derived Mesenchymal Stem Cells Exert Anti-Fibrotic Effects *in vitro*

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Introduction: Idiopathic pulmonary fibrosis (IPF) is associated with damaged alveolar epithelial cells and an excessive proliferation and extracellular matrix deposition by fibroblasts. Stem cell-based therapy is a promising approach in the treatment of IPF. The therapeutic effects of stem cells are, at least in parts, mediated by the stem cell derived secretome through paracrine signaling. In this study we isolated mesenchymal stem cells (MSC) from fibrotic human lung tissue and investigated the anti-fibrotic properties of their secretome *in vitro*.

Methods: MSC were cultured from lung tissue obtained from patients with fibrotic lung diseases and characterized by immunofluorescence stainings. The effects of the MSC-derived secretome (= conditioned medium) on human lung fibroblast proliferation and the expression of hepatocyte growth factor (HGF), collagen 1A1 (Col1A1), matrix metalloproteinase-1 (MMP-1) and tissue inhibitor of metalloproteinase (TIMP-1) were assessed by CyQUANT cell proliferation assay, ELISA or real-time RT-PCR. Furthermore, the effect of MSC-conditioned medium (MSC-CM) on epithelial wound repair was studied.

Results: CD44, CD90, and CD105 expression and their ability for osteogenic, myogenic, and chondrogenic differentiation characterized the cells as MSC. The MSC-CM significantly inhibited proliferation and the expression of Col1A1 in fibroblast. The expression of MMP-1 was up-regulated, whereas TIMP-1 levels were not affected by the MSC-CM in fibroblasts. The MSC-CM increased the secretion of anti-fibrotic HGF by fibroblasts and enhanced epithelial wound repair.

Conclusions: Our study demonstrates that the secretome of lung resident MSC is anti-fibrotic *in vitro* by (1) inhibition of fibroblast proliferation, (2) decreased Col1A1 deposition, which is possibly mediated by an increased ration of MMP-1 to TIMP-1 expression (3) enhanced HGF secretion by fibroblasts and (4) in-

creased epithelial wound repair. The secretome of lung derived MSC might therefore represent a novel therapeutic approach for patients with IPF.

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Exhaled Breath Analysis by Real-Time Mass Spectrometry in Patients with Pulmonary Fibrosis

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Introduction: Idiopathic pulmonary fibrosis (IPF) is recognized as a distinct clinical disorder. However, despite major endeavors to understand the pathogenesis, the diagnosis of IPF remains elusive [1]. Metabolic profiling of biopsied tissue specimens has been shown promise to gain insights into IPF pathogenesis [2]. Thus we hypothesized that analysis of exhaled metabolites may also provide further insights.

Methods: 21 patients with IPF and 21 matched controls were recruited for this exploratory study. Exhaled breath analysis was performed by Secondary Electrospray Ionization-Mass Spectrometry (SESI-MS) [3]. Significant differences in exhaled metabolite levels in IPF were subsequently sought. A two-sample t-test followed by estimation of false discovery rate in multiple comparisons was used for this purpose. Statistical significance was set at $p < 0.05$. Finally, we attempted to predict IPF vs control in a leave-one-out-cross-validation (LOOCV) using a set of 15 metabolites per sample predicted.

Results: Fig. 1a shows an example of six replicate exhalations of one subject for one particular metabolite with the molecular formula $C_{16}H_{23}NO_5$ (m/z 310.1640). Fig. 1b shows the same compound exhaled in a selected group of controls (left-hand-side) and IPF patients (right-hand-side). The graph suggests that this particular compound is exhaled in higher concentrations in IPF patients than in controls. Fig. 1c shows the ROC curve obtained as a result of the LOOCV. The obtained area under the curve was 0.8 (0.61–0.91).

Conclusions: Analysis of exhaled breath by real time mass spectrometry shows promise to help in the diagnostic process of IPF. Breath analysis complements ongoing efforts to characterize IPF at the metabolic level using more invasive approaches (e.g. biopsy). Ongoing in-depth structural identification of altered breath metabolites is likely to provide insights on IPF pathogenesis. These findings will require further validation in larger and independent cohorts.

References:

- 1 Am J Respir Crit Care Med 2000, 161, 646–64.
- 2 Kang et al., J Proteome Res 2016, 15, 1717–24.
- 3 Schwarz et al., Thorax 2015, 71, 110–7.

Fig. 1. Breath metabolomics in IPF. (a) Real-time analysis of one selected compound (six replicate exhalations); (b) Real-time signal intensity for the same compound as in (a) for a selected group of

controls (left) and IPF patients (right). The graph suggests increased levels of this particular compound in IPF; (c) ROC curve (for abstract 119).

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Teleradiology in Interstitial Lung Disease: First Experiences

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Introduction: High resolution computed tomography (HRCT) is an essential component of the diagnostic algorithm for idiopathic pulmonary fibrosis (IPF). In the absence of an identifiable cause of interstitial lung disease (ILD), an HRCT showing a typical usual interstitial pneumonia (UIP) pattern is diagnostic for IPF. However, it might be difficult to identify a typical UIP pattern, specifically if there is no access to a specialized thorax radiologist experienced in ILD. Here we report first experiences with a teleradiology-project that offers the possibility for second opinion HRCT read for patients with suspected IPF.

Methods: Physicians caring for patients with suspected IPF were given the possibility to send HRCTs for a second opinion regarding the presence of UIP pattern. HRCT were uploaded through a secured internet connection. Only images in original Digital Imaging and Communication in Medicine (DICOM) format were accepted to provide uncompressed full digital information of all HRCT images. HRCTs were assessed by a radiologist and a pulmonologist, both experienced in the diagnosis of ILD. The HRCT criteria for UIP pattern were applied according to the current

guidelines: features necessary for the diagnosis of a typical UIP pattern were: i) subpleural and basal predominance, ii) reticular abnormality, iii) honeycombing ± traction bronchiectasis, and iv) absence of features inconsistent with UIP pattern. Each HRCT was rated showing either a) typical UIP pattern, b) possible UIP pattern, or c) being inconsistent with UIP pattern.

Results: Between March 2015 and January 2017 we received 160 HRCTs for a second opinion read from physicians in 10 different Eastern European countries. All images were of diagnostic quality. In 58/160 (36%) patients a typical UIP pattern was diagnosed, possible UIP pattern was detected in 27/160 (17%) patients, and in 75/160 (47%) patients the prevailing pattern was considered as inconsistent with UIP.

Conclusions: Our data demonstrate a useful application of teleradiology to provide expert reading of HRCT in patients with suspected IPF, particularly when local radiological expertise for reading ILD chest CT is limited. This project is not intended to replace local multidisciplinary panels, but to support local panels by providing specific expertise and standardised reading of chest CT in accordance to specific guidelines. More experience will be needed to define the role of teleradiology in patients with suspected IPF.

Session 20: Free Communications – Lung Cancer and Thoracic Surgery

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Correlation between Diversity of Pulmonary Diagnoses and Distance to Tertiary Lung Centers in Switzerland

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Introduction: The availability of specialized pulmonary medicine differs considerably between geographical areas in Switzerland. Currently there are 6 tertiary centers supplying the broadest spectrum of pulmonary diagnostics and therapy. The diagnostic diversity is a marker of medical quality in terms of precision medicine. We hypothesize that diagnostic diversity could be lower in more isolated regions. Our aim was to investigate the relationship between the diversity of pulmonary diagnoses and the distance between patients' area of residence and the closest tertiary lung center.

Methods: We used a database provided by the Swiss Federal Office for Statistics offering a nation-wide coverage of all hospitalization cases between 2009 and 2015. For each hospitalization case, the data set included one main diagnosis as well as up to 50 additional diagnoses, coded using the International Classification of Disease version 10 (ICD-10-GM) codes. The data set also included

Fig. 1. (for abstract 121).

patients' area of residence (705 medstat regions). The distance between each region and the closest tertiary lung center was obtained using the finaroute webtool (<http://www.finaroute.ch>). The Shannon diversity index was used to calculate the diversity of pulmonary diagnoses. The relationship between the diagnostic diversity and the distance to the closest tertiary lung center was investigated using linear regression.

Results: There was a significant inverse association between the diagnostic diversity of pulmonary diagnoses and the distance between the area of residence and the closest tertiary lung center (Figure 1). For each 100 km increase of distance there was a decrease of 0.05 points in the Shannon diversity index (estimate: $-5.2e-04$, $se = 6.5e-05$, $p < 0.001$).

Conclusion: Regions located remotely from tertiary lung centers show lower diagnostic diversity which implicates a possible lower diagnostic precision leading to a higher rate of diagnostic errors. Remote regions should receive more medical support from specialists, e.g., through collaborative networks.

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Clinical and Oncological Safety of 129 Pulmonary Segmentectomies by VATS

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Background: Pulmonary anatomical segmentectomies are increasingly performed by video-assisted thoracoscopic surgery (VATS). The aim of this study was to review the demographics, short term oncological outcome and define predictors of complications after anatomical VATS segmentectomies.

Methods: Prospective analysis of all patients undergoing anatomical VATS segmentectomy from 1/2014 to 12/2016 at our institution.

Results: One hundred and twenty-nine patients (64 men, 65 women; median age 68 years, range 29–85 years) underwent anatomical VATS segmentectomy for primary lung tumors ($n = 100$), metastases ($n = 16$) and benign lesions ($n = 13$). The segmentectomies were localized in the upper and lower lobe or two lobes in 73, 51 and 5 patients, respectively. Segmentectomies performed for primary tumors revealed adenocarcinoma, squamous cell carcinoma and neuro-endocrine tumors in 77, 15 and 8 patients, associated with pT1, pT2, pT3 and pT4 tumors in 80, 17, 1 and 2 patients, respectively. The mean tumor size was 17 mm (range 6–48 mm). In patients undergoing mediastinal lymph node dissection, the mean number of extracted lymph nodes was 11.8 ± 7.9 and nodal upstaging was found in 8 patients (8%). The overall 30 days mortality and morbidity rates were 0.8% and 31%, respectively. The reoperation rate was 4.7% (hemothorax 2, prolonged air leak 2, segmental torsion 1, empyema 1). The median duration of hospitalization was 6 days (range 1–33 days) and the median length of hospitalization was 6 days (range 2–37 days). COPD, active smoking, smoking pack years (SPY) and FEV1 were significantly associ-

ated with postoperative complications; however, there was no statistical difference comparing the first 50 cases with consecutive patients. During the median follow-up of 10 months, no oncological patient presented a local recurrence in the operated lobe.

Conclusion: Pulmonary anatomical segmentectomies can be safely performed by VATS. Short-term oncological outcomes are good but the long-term oncological safety of VATS segmentectomy needs to be further evaluated.

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Utility of Rapid On-Site Cytologic Evaluation During EBUS-TBNA in Malignant and Non Malignant Disease

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Background: Endobronchial ultrasound guided transbronchial needle aspiration (EBUS-TBNA) is an accurate procedure to sample mediastinal lesions. Rapid on-site cytological evaluation (ROSE) has been advocated to improve the performance of this procedure, but its benefit remains controversial.

Objectives: To assess the benefit of ROSE in EBUS-TBNA among unselected patients.

Methods: We prospectively collected data from all consecutive EBUS-TBNA performed between 2008 and 2014, with introduction of ROSE in 2011. The accuracy of EBUS-TBNA with and without ROSE was compared in a univariate and multivariate model accounting for confounding factors. The impact of ROSE was then analyzed according to the aetiology and size of the lesions.

Results: 348 EBUS-TBNA were analyzed, among which 213 performed with ROSE. The overall accuracy tended to be better with ROSE than without (90.6% vs 84.4%, $p = 0.082$). After adjustment in a multivariate model, the benefit of ROSE still remained non significant (adjusted OR 1.86, 95% CI 0.79–4.41). Similar results were obtained in subgroups of patients with malignant disease or sarcoidosis. The size of lesion did not influence the impact of ROSE on accuracy.

Conclusions: ROSE was associated with a moderate increase in the accuracy of EBUS-TBNA, but the difference was not statistically significant. Still, the interest of ROSE goes beyond its impact on the sole accuracy.

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Plasma Thioredoxin Reductase 1 as a Diagnostic Marker for Non-Small Cell Lung Cancer

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Introduction: Non-invasive diagnostic markers for patients with suspicious non-small cell lung cancer (NSCLC) may provide needed guidance on invasive diagnostic and therapeutic decisions. Thioredoxin reductase 1 (TrxR1) is a pivotal intracellular redox sensor and antioxidant enzyme, and plays an important part in tumor growth, progression, metastasis, and chemotherapy resistance. The goal of this study is to test the feasibility of developing plasma TrxR1 as a novel diagnostic marker for NSCLC.

Methods: The plasma TrxR1 activity was determined spectrophotometrically by monitoring the NADPH-dependent production of 2-nitro-5-thiobenzoate at 412 nm and at 37°C. All detection kits and automatic analyzer possess independent intellectual property rights, and have been widely used in breast cancer screening.

Results: In this study, the plasma levels of TrxR1 were measured in 45 treatment-naïve NSCLC patients and 10 individuals with benign tumor-like pulmonary diseases. Taking plasma TrxR1 activity of 4 as reference, the overall concordance rate was 73.3%, while those of CEA, CA199, CA125, NSE, CYFRA21-1 and SCC were 19.0%, 7.1%, 16.7%, 35.7%, 24.4% and 2.5%, respectively. Furthermore, using TNM staging (AJCC 7th ed.) as classifier, the concordance rates of TrxR1 in local, local regional and advanced stage subgroups were 66.7% (20/30), 77.8% (7/9) and 100% (4/4), respectively. A multipoint linear fitting correlation model was created, and the equation was $\text{TrxR1} = 5.821 + 0.396 \times \text{Stage}$. Besides, the concordance rates of TrxR1 in benign tumor-like pulmonary diseases was 60% (6/10).

Conclusions: Our data suggest that plasma TrxR1 activity is a useful non-invasive diagnostic marker for NSCLC, and there may be a linear correlation between TrxR1 activity and pathological stage.

Outcome of Patients with Lung Re-Transplantation Requiring Preoperative Extracorporeal Membrane Oxygenation

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Background: Lung re-transplantation has been shown to be a valid option in selected patients with chronic lung graft dysfunction. While being listed and due to pulmonary function deterioration, a subgroup of patients may require extracorporeal membrane oxygenation (ECMO) before re-transplantation. The outcome of these patients, compared to primary transplantations (TX) with and without ECMO and to re-transplantations (re-TX) without ECMO is the subject of this report.

Patients and Methods: A retrospective, single institution experience based on a prospective data set of all patients undergoing lung transplantation between 1/2004 and 7/2016.

Results: There were 212 patients, of them 117 women (0.55) and 111 men (0.45). The mean age was 47.4 years (range 12–66).

We proceeded to 185 TX without preoperative ECMO (mean survival 118 months), 11 TX with preoperative ECMO (mean survival 67 months), 9 re-TX without preoperative ECMO (mean survival 87 months) and 7 re-TX with preoperative ECMO (mean survival 26 months). There was no significant difference in overall survival between patients undergoing TX with and without preoperative ECMO ($p = 0.7$), and between patients undergoing TX or re-TX without preoperative ECMO ($p = 0.8$). However, patients undergoing re-TX with preoperative ECMO had a significantly lower overall survival than patients with TX, with and without preoperative ECMO ($p = 0.026$, $p < 0.0001$). Re-TX with preoperative ECMO also had a lower overall survival than re-TX without preoperative ECMO, however, the difference was of borderline significance ($p = 0.05$).

Conclusion: Re-transplantations requiring preoperative ECMO were accompanied with a significantly lower overall survival rate than primary lung transplantations with and without preoperative ECMO and also revealed a lower survival rate than re-transplantations without preoperative ECMO.

Poster Walks

Poster Walk 1: Airway Disease I

P126

Longitudinal Change of COPD Assessment Test (CAT) in a Telehealthcare Cohort Is Associated with Exacerbation Risk

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Introduction: The COPD assessment test (CAT) has been developed in 2009 with the input of COPD patients to provide an easy to use quantified measure of health-related quality of life. A systematic review supported the reliability and validity of the CAT and found that the tool is responsive to interventions, although the minimal clinically important difference is not well established. Regarding the course of the CAT over time, only few data is available. Our aim was to investigate the course of the CAT over one year in a telehealthcare (THC) cohort and to evaluate its potential to predict exacerbations.

Methods: The CAT was measured weekly over up to one year in our THC cohort of 40 COPD patients. The evolution of the CAT score was analysed using linear regression. The association between the course of the CAT score and the occurrence of exacerbations was evaluated using the Andersen-Gill formulation of the Cox proportional hazards model which is appropriate for the analysis of recurrent time-to-event data with time-varying predictors.

Results: The median CAT score at study inclusion was 17 points (range 1–30, interquartile range 13–21.5). The course of the CAT-score over the study period for each patient is shown in Figure 1. 25% of patients had a significant negative slope (= improvement; median -7.4 points per year, IQR -8.7 to -5.1), 38% were stable (median +0.4 points per year, IQR 0 to +2.0) and 38% had a significant positive slope (= deterioration; median +6.2 points per year, IQR +3.9 to +11.0). The median slope of the CAT-score in the overall population was +1.2 points per year (IQR -3.0 to +6.2). A significant positive association was found between the evolution of the CAT score and the occurrence of exacerbations (HR = 1.08, 95% CI: 1.03–1.13; $p < 0.001$). There was an 8% increase of the risk of exacerbation per unit change in CAT.

Conclusions: We provide longitudinal measurements of the CAT score in a THC cohort of COPD patients over up to one year and found that 63% of patients experienced a stable or improved CAT while being monitored with THC. We found a significant positive association between the evolution of the CAT over time and the risk of exacerbations. The CAT is not only a reliable mea-

Fig. 1. (for Abstract P126).

sure of health-related quality of life in COPD patients but also a marker for exacerbation risk when assessed in a longitudinal fashion.

P127
Asthma Rehabilitation at High vs. Low Altitude: Randomized Controlled Parallel-Group Trial

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Introduction: Environmental conditions at high altitude reduce allergens and pollution. We thus investigated the additive effect of asthma rehabilitation at high altitude (Tuja Ashu, 3200 m, HA) compared to the same rehabilitation at low altitude (Bishkek, 760 m, LA) on asthma control.

Methods: For this randomized controlled trial adult asthmatics diagnosed according to Global Initiative for Asthma – guidelines and living in the Bishkek area (<1000 m) were recruited. Patients were randomly assigned to a 3-week in-hospital rehabilitation at either LA or HA, comprising patient education, endurance & strength training, breathing exercises and guided walks (5x/week 30–45 min). Co-primary outcomes assessed at 760 m were changes in peak expiratory flow (PEF)-variability [(day’s highest – day’s lowest) / mean of day’s highest & lowest], and scores in the Asthma Control Questionnaire (ACQ) from baseline to end-rehabilitation and 3 months thereafter between groups.

The trial has been registered on clinicaltrials.gov (NCT02741583).

Results: 50 asthmatics (4 non-atopic, 34 females) were randomized [median (quartiles) LA: 47 (34; 53) years, FEV1%pred. 74

(53; 99)%, PEF 311 (274; 378) L/min vs. HA: 43 (33; 49) years, FEV1%pred. 80 (74; 86) %, PEF 326 (261; 368) L/min].

The results of the PEF-variability and the ACQ are shown in the Table 1.

The additive effect of HA vs. LA directly after the rehabilitation and after 3 months on PEF-variability and the ACQ were not significant.

Conclusions: Asthma rehabilitation is highly effective in improving asthma control in terms of PEF-variability and symptoms, both at LA and HA to a similar degree.

P128
Prevalence and Risk Factors for Bronchiectasis in Adult Patients – A Single Center Experience from United Arab Emirates

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Bronchiectasis is one of the common chronic respiratory diseases. The diagnosis is established clinically on the basis of daily productive cough, and radiographically by the presence of bronchial wall thickening on CT scans.

A wide range of causes of bronchiectasis has been reported, but etiology and risk factors are not well defined.

We aim to estimate the prevalence and risk factors for bronchiectasis in adult patients attending ZMH and tried to identify the causes such as old TB, recurrent infections, cystic fibrosis, connective tissue diseases or idiopathic.

All CT scans of chest done in ZMH from 1st January 2011 until December 2015 were reviewed. All cases of bronchiectasis reported by consultant radiologist on CT scans were included. Medical records were reviewed to document demographic details,

Table 1. (for Abstract P127)

	Baseline	3 weeks	3 months	Median difference (95% CI) BL-3w	Median difference (95% CI) BL-3m
Peak-flow variability, %					
LA	19 (14; 33)	15 (8; 23)	15 (9; 24)	7.4 (0 to 13.9)*	2.5 (–2.2 to 17.5)
HA	17 (12; 32)	6 (4; 9)	8 (5; 14)	10.4 (3.4 to 21.3)**	8.9 (2.8 to 10.3)**
HA-LA				–5.8 (–14 to 2)	–5.0 (–13.6 to 5.0)
Asthma Control questionnaire, score					
LA	2.7 (1.7; 3.2)	0.8 (0.4; 1.6)	1.4 (0.9; 2.1)	1.4 (0.9 to 2.2)***	0.9 (0.3 to 1.3)**
HA	2 (1.6; 3.0)	0.9 (0.4; 1.6)	1.6 (0.9; 3.0)	1.1 (0.7 to 1.3)***	0.2 (–0.4 to 0.9)
HA-LA				0.3 (–0.4 to 1.1)	0.4 (–0.4 to 1.1)

Data are given as median (quartiles) and median difference (95% confidence interval). 3w: 3 weeks; 3m: 3 months; * p < 0.05; ** p < 0.01; *** p < 0.001.

smoking history, symptoms, hemoptysis, extent of bronchiectasis, PFTs, and pathogens on sputum cultures.

1583 CT scans were done in this time period. Bronchiectatic changes were reported in 201 (13%) patients. 123 (61%) were males and 78 (39%) were females with mean age of 60 years (14–106). 38 (19%) patients were smokers and 36 (18%) ex smokers. Severity of bronchiectasis was categorized into mild, moderate and severe based on radiology. 85 (42%) had mild, 78 (39%) moderate and 38 (19%) patients had severe changes. 121 (60%) had bilateral and 80 (40%) unilateral changes.

Chronic cough was reported in 120 (60%) patients, however only 18% (36) had hemoptysis. Obstructive pattern on PFTs was documented in 59 (39%) out of 148 and of these only 17% were smokers or ex smokers.

Sputum culture showed mixed flora in 33 patients, *Pseudomonas Aureginosa* in 28, *H Influenzae* in 15, *Strep Pneumonia* in 14, *Klebsiella Pneumonia* in 6, *Mycobacterium Tuberculosis* in 3 and other pathogens in 13 patients. Patients with severe disease were more likely to have *Pseudomonas* infection.

Old or recurrent childhood infections were the cause in 85 (42%), old TB in 44 (22%) and Rheumatoid arthritis in 9 (4%) of patients. In 66 (33%) patients were labeled as having idiopathic bronchiectasis.

In our cohort bronchiectasis is more common in males and is bilateral. Patients with severe disease are more likely to have *Pseudomonas* infection. Less than half (40%) are asymptomatic. Major etiological factor is old /recurrent childhood infections. Idiopathic bronchiectasis is common constituting almost 33% patients. Obstructive airways disease is common regardless of smoking history.

P129

Overview of the Inpatient Management of Acute Exacerbations of COPD – A Case-Series

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Introduction: First-line treatment for patients admitted for acute exacerbation of COPD (AECOPD) includes inhaled short-acting bronchodilators (beta-2 adrenergic agonists or anticholinergics), short course of systemic corticosteroids (SCS) and antibiotics (for patients with clinical symptoms of respiratory infection) to decrease hospital stay, early relapse and failure of treatment. The use of inhaled corticosteroids (ICS) alone for the treatment of exacerbations is not recommended. Electronic data collected by our pharmacy suggest an over-prescription of ICS for AECOPD.

The goal of this study is to verify the hypothesis that inhaled corticosteroids are over-prescribed for AECOPD and to provide an overview of its pharmacotherapeutic management (SCS, bronchodilators and antibiotics).

Methods: This is a 12 months retrospective observational study performed on medical records of randomly selected patients admitted for AECOPD (n = 71) in the internal medicine wards of the Centre Hospitalier du Valais Romand (Sion, Sierre, Martigny, Montana) between 1.5.2015 and 30.4.2016. Main outcomes measures are % of patients receiving ICS alone, SCS, bronchodilators and antibiotics according to guidelines. GOLD 2016 recommendations were used as reference to measure guidelines adherence for AECOPD pharmacological management.

Results: Out of 267 admissions for respiratory conditions 71 were selected for full record exams, 48 met predefined criteria for AECOPD (67.6%) and were analyzed. Although not recommended as first choice, 15% of the patients were treated with ICS (inhaled budesonide). While 67% received at least one dose of SCS only 23% received SCS at low dose for a 5-day period. Short-acting inhaled bronchodilators were systematically prescribed at admission to 63% of the patients and antibiotic treatment was in agreement with recommendations for 83% of the patients.

Conclusions: In our setting, the pharmacotherapeutic management of patients hospitalized with COPD exacerbation is only partially consistent with recommendations. In particular, prescription of SCS can be improved. The identification and removal of the barriers preventing compliance to the recommendations as well as the sensitization of the staff to follow recommendations should be further studied in order to improve the treatment of COPD exacerbations.

P130

Serum Albumin Is an Independent Predictor for Respiratory Hospitalization in Patients with Non-Cystic Fibrosis Bronchiectasis

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Background: Serum albumin level is one of the prognostic factors in chronic respiratory diseases. Thus, we aimed to evaluate the usefulness and prognostic significance of serum albumin in patients with NCFB.

Methods: The medical records of 107 patients with NCFB were retrospectively reviewed. Eligible subjects were categorized into low (n = 13) and normal (n = 94) serum albumin group and clinical characteristics were compared. The performances of serum albumin, bronchiectasis severity index (BSI), and FACED score in predicting respiratory hospitalization were compared. Finally, predicting factors of respiratory hospitalization were analyzed.

Results: Body mass index and FEV₁ were lower, and mMRC dyspnea scale, percentage of *pseudomonas* colonization, FACED score, and BSI were higher in low albumin group. The area under the receiver operator characteristic curve of serum albumin, BSI, and FACED score for respiratory hospitalization was 0.84 (95% CI, 0.76–0.92), 0.87 (95% CI, 0.78–0.95), and 0.74 (95% CI, 0.62–0.89), respectively. Low albumin, *pseudomonas* colonization, and low bilirubin level were independent risk factors for respiratory hospitalization.

Conclusion: Serum albumin level is a simple and relevant biomarker that correlates well with BSI and FACED score. Furthermore, low serum albumin is an independent predictor for respiratory hospitalization in patients with NCFB.

P131

Prevalence of Coronary Artery Diseases among COPD Patients with More Symptoms and Low Risk of Exacerbation (GOLD B) in Ramathibodi Hospital

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Introduction: Cardiovascular disease is common comorbidity in COPD and associated with mortality. Prevalence of coronary artery diseases (CAD) in COPD with low risk of exacerbation and more symptoms (GOLD B) and the associations with serum N-terminal pro-B type natriuretic peptide (NT-proBNP) and high-sensitivity C-reactive protein (hs-CRP) were investigated in tertiary care center Thailand.

Methods: Cross sectional study was conducted in 2013. GOLD B COPD patients were defined by CAT ≥ 10 and FEV₁ $\geq 50\%$ predicted with < 2 exacerbations in the past year. The CAD was defined by either history of diagnosed or treated coronary artery diseases (myocardial infarction or revascularization) or coronary stenosis detected by CT angiography or positive cardiac stress imaging. The serum NT-proBNP and hs-CRP were measured.

Results: Total 51 GOLD B COPD patients were enrolled (47 males, mean age 72.1 years). The mean post-bronchodilator FEV₁ was $78.5 \pm 16.3\%$ predicted. The mean CAT score was 16.7 ± 5.9 . Twenty two patients (43.13%) had co-existing CAD. There was no statistical difference of the CAT score between patients with and without CAD (17.59 ± 6.3 vs. 16.03 ± 5.6 , $p = 0.37$). However, the higher median serum NT-proBNP was noted in patients with CAD than those without CAD (313.50 pg/mL vs. 68 pg/mL, $p = 0.003$). The higher median serum hs-CRP was noted in patients with CAD than those without CAD (3.10 mg/L vs. 0.95 mg/L, $p = 0.032$). Odds ratio for having CAD in GOLD B patients having NT-proBNP > 125 pg/mL and having hs-CRP > 3 mg/L was 4.36 (95% CI; $1.31-14.5$, $p = 0.02$) and 3.79 (95% CI; $1.16-12.30$, $p = 0.04$) respectively.

Conclusion: The prevalence of CAD in COPD with more symptoms and low exacerbation risk is common. Biomarkers of cardiac dysfunction and systemic inflammation (NT-proBNP and hs-CRP) may be helpful for screening GOLD B COPD patients with coexisting CAD.

P132

Recurrent Pulmonary Infections in a Patient with Tracheobronchopathia Osteochondroplastica

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Tracheobronchopathia osteochondroplastica (TO) is a rare disorder of unknown etiology characterized by the formation of submucosal nodules affecting the lumen of large airways. A 31-year old female was referred to pulmonary clinic for recurrent hemoptysis. She had a history of latent TB diagnosed at age 28 treated with INH for 6 months. Following treatment, she complained of intermittent cough and hemoptysis. She had 2 episodes of pneumonia within the same year that were treated with oral antibiotics. Sputum cultures obtained grew *Pseudomonas aeruginosa* and *Klebsiella pneumoniae*- unusual organisms in an otherwise healthy individual. 3 sputum samples were negative on AFB culture. Bronchoscopy revealed an abnormal trachea with nodular mucosal lesions on the anterior and lateral walls with sparing of the posterior walls. Bronchial washings returned positive for *Mycobacterium avium intracellulare*, *Pseudomonas aeruginosa*, and *Klebsiella pneumoniae*. Biopsies of the nodular lesions showed marked inflammation with squamous metaplasia and focal dystrophic ossification but were negative for granulomas or malignancy. AFB and PAS stains were negative. A CT scan revealed scattered areas of mucous plugging, middle lobe bronchiolitis, and tracheal mucosal irregularity characteristic of TO. She was treated with ethambutol, rifampin, and azithromycin for 6 months with resolution of symptoms. She did well for 14 months but then developed hemoptysis without any other symptom. A follow up CT scan showed a new nodule and increase in nodular infiltrates in the right middle lobe. 8 sputum samples were sent for AFB smear and culture. 1 grew *Mycobacterium fortuitum* and the rest were negative. Bronchoscopy was again performed. Bronchial washings grew *Pseudomonas aeruginosa* and *Klebsiella pneumoniae*. AFB cultures were negative. Given recurrent infections, a workup for immunosuppression including HIV screening, and immunoglobulin levels were obtained and found to be within normal limits. The patient has remained asymptomatic and no recurrence of hemoptysis has been noted. No infection outside of the lungs has been observed.

This case demonstrates a rare airway disease found incidentally after two episodes of pneumonia and Mycobacterial infections. Many individual case reports have been previously published. Investigation is needed to establish the etiology, pathophysiology and treatment of this rare disease that predisposes some affected individuals to recurrent pulmonary infections.

The Correlation Between Oral Health Status and COPD Exacerbations

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Introduction: The aim of our study is to evaluate the potential correlation between oral health status and systemic inflammatory syndrome at COPD patients during exacerbation.

Method: We performed a transversal descriptive study which evaluated 14 patients hospitalized at Constanta Pneumoftiziologie Hospital, diagnosed with COPD. The mean age was 65 years old and 13 patients were men. The patients were in exacerbation and we evaluated clinical, functional, biological and imagistic respiratory status. Also, they were investigated to evaluate their oral health status due to the fact that infectious oral focuses might be risk factors for COPD exacerbations.

Results: 28.57% of the patients were newly diagnosed with COPD, 28.57% of the patients have moderate COPD and 28.57% have very severe COPD. Average exacerbations/year is 1.28. 35.71% are smokers and 35.71% are ex-smokers. 42.85% of the patients have high level of fibrinogen, 57.14% have high level of ESR and 28.57% have leukocytosis. 21.42% are both maxillary and mandibular total edentulous with esthetic and phonetic disturbances, malocclusion, bone resorption and no prosthetics. More than half of the patients (71.42%) have periodontal disease, 21.42% with pathological tooth mobility 3rd grade. We found correlation between one or two biological parameters and periodontal disease and infectious oral focuses, as 28.57% have high level of ESR and periodontitis and 14.28% of the patients have simultaneous leukocytosis, high level of ESR and are total edentulous. But none of the patients have in the same time high levels of fibrinogen, ESR, leukocytosis, signs of systemic inflammatory syndrome, and periodontitis or oro-dental infectious focuses.

Conclusions: The findings of this study are that oral infectious focuses (incorrect restorations or prosthetics, complicated tooth decay with crown destruction) and periodontal disease are risk factors for systemic inflammatory syndrome and COPD exacerbation. However, it is difficult to differentiate if this syndrome is related directly to COPD or it is secondary to oral health status or which has more impact on determining it. This study will be extended to complex research and we propose that these patients should be monitored for a two-year period and we recommend scaling and root planing and complex oral rehabilitation.

Acknowledgement: The research is funded by "Iuliu Hatieganu" University of Medicine and Pharmacy, Department of Medicine, Cluj-Napoca, Romania.

Inclusion of Patients with Severe or Very Severe COPD in a Randomised Controlled Trial on Early Specialised Palliative Care: A Difficult Challenge

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Introduction: Severe COPD is associated with a high morbidity/mortality, with a major impact on quality of life. Prognosis is similar to that of lung cancer. Symptom control is often poor. Randomized controlled trials (RCT) are necessary to analyse the benefit provided by early intervention of palliative care specialists in this setting. An RCT was initiated in a tertiary center experienced with severe COPD, to determine the effectiveness of introducing specialized palliative care on hospital, ICU and emergency admissions in patients with severe or very severe COPD. Important difficulties were encountered during the inclusion process.

Methods/Design: RCT; 2 arms parallel groups design; 1-year observation period. Intervention: monthly early palliative care consultation (EPCC) at home was added to standard care (SC). Inclusion criteria: Stage III or IV COPD (GOLD criteria) and/or long term oxygen therapy and/or home mechanical ventilation and/or ≥ 1 hospital admission in the previous year for acute exacerbation; Mini Mental State Examination (MMSE) >23 . Power computation required inclusion of 80 patients/group for an 80% power to detect a difference in hospital admissions (main endpoint of study) of 20% between groups at an α significance level of 0.05. Analysis of flow chart and reasons for non-inclusion.

Results: During inclusion period (Oct 2013–Feb 2015), 315 patients were screened: only 51 (16%) were included: 137 (45%) patients declined to participate. Reasons for refusal included: fear of "palliative care", of "over-medicalisation", of "being a guinea pig", refusal of randomization. 30 (10%) were already included in another research protocol; 6 (2%) patients died during the inclusion process; 91 (29%) had exclusion criteria: cognitive impairment (MMSE ≤ 23): 28 (9%); active cancer: 63 (20%). Extension of recruitment to another hospital, to GPs and pulmonologists in private practice, and of duration of recruitment failed to increase inclusion.

Conclusion: Inclusion of these patients is challenging. First, because of the high rate of persons who declined to participate to the study. Second, because of the high prevalence of cancer and cognitive impairment in this population. A better understanding of reasons for refusal (too many home visits? misrepresentation of the palliative approach? being randomized to the control group?) to develop strategies to increase inclusion rate is important to pursue exploration of pathways for a better symptom control.

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Right Heart Function and Pulmonary Pressure in Asthma Patients during 17 Days at High-Altitude

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Introduction: Asthmatics may benefit from the climate and reduced allergens at altitude. But the hypoxic environment may also be associated with adverse health effects, such as right heart strain due to increased pulmonary artery pressure (PAP), especially during the first days. We studied the right ventricular function (RVF) and SpO₂ at lowland, immediately after arrival at 3200 m and after 17 days at that altitude in asthmatics.

Methods: Twenty-two asthmatics (living <800 m, means $\pm$ SD age 44 $\pm$ 12 y, FEV₁ 92 $\pm$ 19% predicted) who participated in a three-week rehabilitation program at the Tuja Ashu High Altitude Clinic, 3200 m, were assessed before departure in Bishkek (Kyrgyzstan, 760 m) and on the 2nd and 18th day at 3200 m. The RVF was assessed by several echocardiographic indices: tricuspid annular plane systolic excursion (TAPSE), tricuspid annular systolic velocity (TASV), mean (m) PAP, stroke index (SI), and cardiac index (CI). SpO₂ was measured by pulse oximetry.

Results: The mPAP (mean $\pm$ SD) was 13.5 $\pm$ 5.4 mmHg at 760 m, 18.5 $\pm$ 5.5 mmHg after one and 18.2 $\pm$ 5.5 mmHg after 17 nights at 3200 m ($p < 0.01$ vs. 760 m, $p = \text{ns}$ at altitude). Heart rate was 72 $\pm$ 11/min, 75 $\pm$ 9/min, 79 $\pm$ 9/min ($p = 0.03$ vs. 760 m & vs. day 17) and SI 38.5 $\pm$ 7.4 ml/m², 34.2 $\pm$ 7.1 ml/m² and 34.6 $\pm$ 5.6 ($p < 0.02$, $p = \text{ns}$ at altitude). There was no difference in CI, TAPSE and TASV between altitudes and days. SpO₂ was 96 $\pm$ 2.3% at 760 m and 89.1 $\pm$ 5.2 and 91.2 $\pm$ 2.7 on day 1 and 18 at 3200 m, $p < 0.02$, all changes.

Conclusions: In otherwise healthy asthmatics acute exposure to high altitude induces a significant increase in mPAP and heart rate along with a decrease in SI resulting in an unchanged CI. During the subsequent 17 days at 3200 m there is no further change in the studied indices of RVF despite increasing SpO₂. Therefore, respiratory acclimatization seems to be more rapid than acclimatization of the pulmonary circulation.

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Pneumonitis and Reactive Airways Dysfunction Syndrome with Persistent Airway Obstruction due to Inhalation of Industrial Disinfectant: A Case Report

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Reactive airway dysfunction syndrome (RADS) is a severe form of irritant-induced occupational asthma with acute onset after a single exposure to high levels of a respiratory irritant without a latency period. The pathophysiology of RADS is not well understood but it is thought that high concentrations of an irritant substance may cause airway injury which leads to chronic airway inflammation, hyperresponsiveness and remodelling. Data on long term outcomes of RADS is limited.

Chemical pneumonitis is rarely reported together with RADS and we report the case of a patient who presented with pneumonitis after accidental inhalation of an industrial disinfectant with subsequent diagnosis of RADS.

A 27-year-old man presented with cough, dyspnoea, hoarseness of voice and chemical burns 6 hours after accidental inhalation and splash injury by industrial disinfectant containing a mixture of hydrogen peroxide, acetic acid and peracetic acid. He was a non-smoker with no prior history of atopy, asthma or lung disease. A diagnosis of pneumonitis was made on the basis of hypoxia requiring mechanical ventilation, diffuse airspace opacities on chest radiography, ground glass changes in a peribronchovascular distribution on high resolution computed tomography of the chest and reduced diffusion capacity. He improved clinically with radiological resolution of pneumonitis but remained dyspnoeic on exertion. Spirometry 1 month post-exposure revealed severe airway obstruction with a FEV₁ of 1.03 L (26% predicted), FEV₁/FVC ratio of 45% and no reversibility with bronchodilator. He was diagnosed with RADS and started on asthma therapy. His diffusion capacity normalised at 4 months. 18 months' post-exposure, he continued to be symptomatic with severe and persistent airway obstruction on spirometry requiring combination asthma therapy with high dose inhaled corticosteroids, long-acting beta-2 agonist and long-acting muscarinic antagonist.

Pneumonitis and RADS may occur together from inhalation of a respiratory irritant, as in our case, lending further support to the injury hypothesis in the pathogenesis of RADS. The outcome of RADS in our case, at 18 months follow-up, appears to be poor.

The Aspect of GERD in the Lung Diseases with Non-Cystic Fibrosis Bronchiectasis

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Introduction: Non cystic – fibrosis bronchiectasis (NCFBE) is a chronic heterogenous disease, with variety of predisposing factors and disease mechanism implicated in its pathogenesis. As a consequence the pathophysiologic processes are still not well defined.

Increasing knowledge and awareness about the disease and improved diagnostic possibilities (CT or MRI) increase the reported prevalence. Gastro-oesophageal reflux disease (GERD) causes a wide spectrum of non-oesophageal conditions including asthma, pneumonia, pulmonary fibrosis, chronic cough, hoarseness, posterior laryngitis, and even dental erosions. GERD is also one of etiological factors NCFBE. We are focusing in our study on the aspect of GERD.

Methods: For a period of 1 year (2016), we examined 55 patients (31 women, 24 men) with NCFBE (100%), from 450 patients, hospitalized at Hochgebirgsklinik Davos for a variety of lung diseases. The average age of patients was 53 years. From the monitored group had 21 difficult – to – treat BA (38.8%),

11 BA + ABPA (20.1%), 12 COPD (21.8%), 7 Kartagener sy (12.7%), 2 patients had cough of unknow cause (3.6%), 2 patients had AB and tracheomalacia, confirmed by bronchoscopy (3.6%).

9 patients from the group reported the history of recurrent pneumonia (16.4%). In all patients, despite adequate treatment of the underlying disease, we were unable to achieve stability. To confirm GERD we provided 24-hour esophageal impedance pH metry with the device: ORION MMS.

Results: We confirmed the gastroesophageal reflux in 51 patients from the group of 55 patients (93%). GERD was not confirmed in 4 patients (7%). The reflux in patients with difficult-to-treat asthma and BA with ABPA was serious, presented more than 12 hours during the day and night. Those patients, who had a cough of unknow cause (2) we confirmed GERD, subsequently we confirmed BE by HRCT.

Conclusion: We confirmed the high frequency of the GERD in patients with NCFBE with difficult-to-treat chronic pulmonary disease. GERD also contributes to the development of the symptoms and non stability of the chronic pulmonary disease. It should be also matter of the therapeutical management of the disease. In conclusion to our results, the future analysis and monitoring is needed.

Conflict of Interest: I declare no conflict of interest.

One Lung to Live: A Case of Unilateral Pulmonary Artery Agensis

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Introduction: Unilateral pulmonary artery agenesis (UPAA) is a rare congenital anomaly, with only 150 cases reported since its first description in 1868. ¹ We present a case encountered in clinical practice.

Case Presentation: A 24 y/o non smoking African American female with a history of morbid obesity, premature birth, exercise induced asthma, presented with complaints of progressive shortness of breath, cough, fever of 103, and chills. On arrival to the ER, she was noted to be in severe respiratory distress despite non-rebreather mask and eventually required intubation. Arterial blood gas revealed: pH 7.32, pCO₂ 46 mmHg, pO₂ 41 mmHg, HCO₃ mEq/L, O₂ Saturation 63.6% on 100% FiO₂ on mechanical ventilation. Chest x-ray was limited due to body habitus, therefore spiral CT was done to rule out pulmonary embolism given the degree of hypoxia. CT angiography was remarkable for dense right lower lobe consolidation, patchy infiltrates though out both lungs, an enlarged pulmonary trunk and right pulmonary artery, however absent left pulmonary artery. No definitive filling defects in the pulmonary arteries existed to suggest pulmonary emboli and timing of contrast was appropriate. Respiratory status worsened precipitously and patient eventually required extracorporeal membrane oxygenation (ECMO) for severe ARDS. She had a prolonged hospitalization complicated by sepsis, bacteremia, transient renal failure requiring CRRT and tracheitis. With extensive rehabilitation the patient improved and no longer requires supplemental oxygen. Four months after discharge, pulmonary function tests revealed a total lung capacity 79% predicted, residual capacity 58% predicted, FEV₁- 2.88 L (92%), FVC- 3.37 L(86%) and a DLCO 69% predicted.

Discussion: UPAA is an uncommon anomaly that is typically associated with congenital cardiac defects. Isolated UPAA may be asymptomatic or present with recurrent respiratory tract infections, decreased exercise tolerance and shortness of breath with exertion³. Diagnosis of unilateral pulmonary agenesis is typically made upon CT imaging of the chest⁴. Patients with unilateral pulmonary agenesis are at higher risk for ventilation-perfusion defects.

Poster Walk 2: Airway Disease II

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Is It Really Asthma? – Appropriate Assessment and Testing Is Important for Accurate Diagnosis.

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Introduction: Asthma is common in United Arab Emirates with an estimated prevalence of 10%. A significant area of country comprises of desert and dust storms are common. Weather is extremely hot/humid and exposure to dust is a risk factor for air ways disease. There is no objective evidence to back up estimated prevalence of 10%. General practitioners have a tendency to over diagnose asthma without appropriate testing. A significant number of patients are wrongly diagnosed with Asthma in early childhood and they carry this diagnosis throughout their life.

National military service has been made mandatory for young Emirati males, aged 19 to 34 years. During health screening we have come across a huge patient population who has been labeled with a diagnosis of Asthma.

Aim of this study was to identify patients who have been wrongly diagnosed with Asthma and to document true prevalence of Asthma in this group.

Methods: Patients with Asthma identified during health screening for national service are referred to the Pulmonology department in Zayed Military Hospital for further assessment. These patients underwent clinical assessment by consultant pulmonologists who arranged for pre and post bronchodilator spirometry. Clinical assessment included symptoms of cough, wheeze, chest tightness, night time symptoms, exercise tolerance, use of rescue inhalers, hospitalization and smoking history. Patients who had a high clinical suspicion but no bronchodilator response on spirometry were subjected to Methocholine challenge test.

Results: Consecutive patients seen in Pulmonology outpatients from July 2015 to August 2016 were included. 2000 male patients aged 19 years to 34 years were evaluated. All patients had clinical assessment and spirometry. A significant number of patients were diagnosed as asthma based on chest infections in early childhood. 498 patients (25%) were smokers or ex smokers. All patients had spirometry in our hospital. 489 (24%) patients had methacholine challenge. Asthma was confirmed in 22% (441). Diagnosis was based on positive bronchodilator response in 268 and positive methacholine challenge in 173 patients. 346 methacholine challenge tests were negative.

Conclusion: We identified a significant number of patients who had been wrongly labeled with Asthma. There is a need to increase awareness among general practitioners about the importance of proper clinical assessment and appropriate testing for accurate diagnosis of asthma.

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Multiple Breath Nitrogen Washout and Methacholine Challenge Test in Patients with Clinical Suspicion of Asthma and Normal Lung Function

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Introduction: Lung function tests with inert gas washout methods, such as nitrogen multiple breath washout (N₂MBW), offer a great diagnostic tool in pulmonology since they have proven to be more sensitive than conventional lung function tests to detect ventilation heterogeneity. Data are scarce regarding the association between ventilation heterogeneity and the presence of bronchial hyperreactivity in patients with clinical suspicion of asthma and normal lung function.

Methods: In this cross-sectional pilot study, 50 consecutively recruited adults undergoing a methacholine challenge test (MCT) for clinical suspicion of asthma at a tertiary care hospital were included. N₂MBW, MCT, fractional exhaled nitric oxide (FeNO) and a skin prick test for the 16 most common aero-allergens were performed. The MCT was considered positive if one of the following 2 criteria were achieved: a) a fall of 20% in FEV₁, with methacholine pulmonary concentration expressed as PC₂₀; and/or b) an increase of 40% in airway resistance (sReff), expressed as PC₄₀. For N₂MBW, the outcome was the lung clearance index (LCI). The N₂MBW was performed using the Exhalyzer D (Eco Medics AG, Durenten, Switzerland), according to ERS/ATS current guidelines.

Results: 50 consecutive patients, 62% females, mean age 45 ± 16.3 years, 51% never smokers were included. Overall, 45% of the patients had a positive MCT with the increase in resistance criteria (mean PC₄₀ 0.37 mg ± 0.06) and 42% had positive MCT based on a decline in FEV₁ (mean PC₂₀ 0.68 mg ± 0.10). The skin prick test was positive in 29 (58%) cases. In the group of positive MCT due to increased sReff, patients with positive test had a significantly higher LCI% than the ones with a negative test (125.04% ± 20.95 vs. 112.23% ± 15.61, p = 0.028). LCI% also tended to be higher in patients with a positive vs negative MCT according to FEV₁ fall, but this difference was not significant (122.04% ± 19.5 vs. 114.36 ± 17.75, p = 0.07). There was a significant association between LCI% and PC₄₀ (Beta -0.340 95% CI -2.503–0.063, p = 0.04), adjusting for smoking status and skin prick test. This association however was not observed between LCI% and PC₂₀ (Beta -0.282 95% CI -2.404–0.203, p = 0.095).

Conclusions: LCI is higher in patients with a positive methacholine challenge test. This study supports the more detailed evaluation of the inert gas washout methods to assess bronchial hyperreactivity in patients with clinical suspicion of asthma.

IFNL3 Polymorphisms and Circulating Levels are Associated with COPD Severity and Outcomes

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Introduction: Exacerbation of chronic obstructive pulmonary disease (COPD) is associated with high morbidity and mortality. Interferon lambda (IFNL) has an important anti-viral/bacterial and immunomodulatory function in the respiratory tract. However, the impact of IFNLs in the context of COPD and its exacerbations has not been explored yet.

Material and Methods: We determined the genetic polymorphisms (rs8099917 and rs12979860) within the IFNL3/4 gene region and the circulating levels of IFNL3 in COPD patients recruited in a prospective observational multicentre cohort (PROMISE) study. The genotypes and the circulating levels of IFNL3 were associated with disease activity and outcome parameters during a median follow-up of 24 months.

Results: The GG genotype of the rs8099917 SNP significantly influenced the severe exacerbation rate (42% vs. 23%; $p = 0.032$) and the time to severe exacerbation (HR = 2.260; $p = 0.012$). As compared to the TT or TG genotypes, the GG genotype was also associated with more severe dyspnoea, as reflected by the modified medical research council (MMRC) ≥ 3 (= median; 22% vs 42%, $p = 0.030$). The CC genotype of the rs12979860 SNP was associated with a poorer prognosis as assessed by the BODE index ≥ 4 (= median; body mass index, airflow obstruction, dyspnea and exercise capacity; 46% vs. 36% TC vs. 20.5% TT; $p = 0.031$). Patients with stable COPD and patients in an exacerbation phase had significantly lower circulating IFNL3 compared to healthy controls ($p < 0.001$ and $p < 0.001$, respectively). No GOLD IV patients had detectable circulating IFNL3 compared to 3% of the GOLD III patients and 5% of the GOLD II patients. There was a significant correlation between circulating IFNL3 and post-bronchodilator

FEV₁ % predicted ($r = 0.098$; $p = 0.034$) and the tissue maturation biomarker Pro-C3 ($r = 0.134$; $p = 0.003$).

Conclusions: In conclusion, IFNL3 polymorphisms may play a role in disease activity and outcomes in COPD and circulating IFNL3 seems to be associated with disease severity and extracellular matrix remodelling.

Collagen Degradation and Formation Markers in Stable and Exacerbated COPD

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Introduction: The role of the extracellular matrix (ECM) molecules in lung disease is gaining in importance. Changes in turnover of these molecules result in changes in lung architecture. Degradation fragments of collagen type I (C1M), type IV ($\alpha 1$ chain, C4M2), type IV ($\alpha 3$ chain, C4Ma3), all degraded by metalloproteinases (MMPs) and the pro-form of collagen type V (Pro-C5) were investigated and associated with chronic obstructive pulmonary disease (COPD) severity and outcome.

Methods: In a prospective, observational, multicenter study including 498 patients with chronic obstructive pulmonary disease (COPD, Grades II to IV), ECM markers were assessed in serum at stable state, exacerbation and at follow up, 4 weeks after exacerbation.

Results: At stable state, there was a significant inverse association between FEV1% predicted and C1M (HR = -0.152; $p = 0.003$), C4Ma3 (HR = -0.146; $p = 0.005$) and Pro-C5 (HR = -0.139; $p = 0.006$).

C1M, C4M2, C4Ma3 and Pro-C5 were associated with GOLD stage (HR = 0.107, $p = 0.030$; HR = 0.149, $p = 0.002$; HR = 0.152, $p = 0.002$; and HR = 0.133, $p = 0.011$, respectively), body mass index, airflow obstruction, dyspnea and exercise capacity (BODE) index (HR = 0.150, $p = 0.003$; HR = 0.152, $p = 0.003$; HR = 0.135, $p = 0.008$; and HR = 0.159, $p = 0.002$, respectively) and MMRC

score (HR = 0.120, $p = 0.016$; HR = 0.113, $p = 0.023$; HR = 0.118, $p = 0.017$; and HR = 0.108, $p = 0.028$, respectively).

C1M (median 24.3 vs 41.2, $p < 0.001$), C4M2 (median 54.6 vs. 65.5, $p < 0.001$), C4Ma3 (median 5.7 vs. 7.2, $p < 0.001$) and Pro-C5 (median 469.0 vs. 560.1, $p < 0.001$) were significantly increased from stable state to exacerbation and decreased at follow-up (medians, 41.2 vs. 25.8, $p < 0.001$; 65.5 vs. 60.2 $p = 0.010$; 7.2 vs. 5.9, $p < 0.001$; 560.1 vs. 476.9, $p < 0.001$, respectively). The circulating biomarkers were significantly higher during severe exacerbation compared to moderate exacerbation (medians, 70.9 vs. 31.4, C1M $p < 0.001$; 75.6 vs. 61.0 C4M2 $p = 0.040$; 9.3 vs. 6.2 C4Ma3 $p < 0.001$; 643.2 vs. 450.2 Pro-C5 $p < 0.001$).

Multivariate analysis adjusted for BMI, MMRC score, adjusted Charlson score, gender and FEV1% predicted, showed a significant influence of C1M (HR = 1.003; $p = 0.017$), C4Ma3 (HR = 0.871; $p = 0.006$) and C4M2 (HR = 1.016; $p = 0.023$) on time to exacerbation. None of the biomarkers were predictors for mortality.

Conclusion: Collagen degradation and formation appear to play a significant role in COPD severity (airflow limitation, dyspnea) and disease outcome (time to exacerbation, and prognosis as assessed by the BODE index).

P145

Modeling of Oxygen Recovery after 6-min Walk Tests in COPD

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Introduction: 6-min walk tests (6MWT) are routinely performed in patients with chronic obstructive pulmonary diseases (COPD). Oxygen (VO₂) kinetics during 6MWT can be modeled and derived parameters provide indicators of patients' exercise capacity. Post-exercise VO₂ recovery has not been extensively investigated. A number of nonlinear regression models with partly different underlying biological assumptions and mechanisms may be suitable for describing recovery kinetics. Subsequently, model averaging can be used to capture the uncertainty in considering several models. We applied model averaging in the context of nonlinear mixed effects regression to describe and better understand the physiological underpinnings of the VO₂ recovery after 6MWT in patients with COPD.

Methods: 61 patients with COPD (GOLD stages 2 to 4) were included in this study. Oxygen kinetics during 6MWT were obtained using a portable cardiopulmonary exercise testing device. All 3 phases of the VO₂ kinetics (rest, exercise, recovery) were modeled using nonlinear regression. The recovery phase was modeled using 3 distinct equations: one describing a symmetrical sigmoid pattern (log-logistic), and 2 describing different asymmetrical patterns with an inflection point either at beginning (Weibul 1) or at the end of the recovery kinetics (Weibul 2). The Akaike Information Criterion (AIC) was used to assess the goodness of fit.

Fig. 1. (for Abstract P145).

Model averaging was used to estimate the weighted estimate of the time to half decrease of the VO₂ level (T1/2 VO₂).

Results: Three models were fitted to the whole set of 61 oxygen kinetics. Figure 1 displays a close-up of the recovery phase according to the 3 COPD stages. A significant model-averaged difference of 40.39 sec (se = 17.1) in T1/2 VO₂ was found between stage 2 and 4 ($p = 0.0178$). In addition, the Weibul 1 model characterized by a steeper decrease at the beginning of the recovery phase showed some improvement of goodness of fit (lower average AIC of 10 points) when fitted to the kinetics of the stage 2 patients in comparison with the 2 other models.

Conclusion: Nonlinear mixed models combined with model averaging were successfully applied to model VO₂ recovery after 6MWT in patients with COPD. Significant differences in T1/2 VO₂ were found between moderate and very severe COPD patients. Furthermore, the pattern of VO₂ recovery differed among COPD stages, patients with moderate COPD showing a steeper decline of their VO₂ consumption at the beginning of recovery.

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The Patients with Acute Exacerbation of COPD Maybe Benefit from Autotitrating EPAP During Noninvasive Ventilation: A Prospective Study

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Introduction: To determine whether the patients with acute exacerbation of COPD benefit from noninvasive ventilation, which EPAP is required for a varying range rather than a fixed level.

Methods: A randomized, prospective and controlled study, 30 elderly patients in AECOPD were divided into three groups: S/T(spontaneous/time) mode group, AVAPS(average volume assured pressure support) mode group and AVAPS-AE(average volume assured pressure support auto-EPAP) mode group. Each group was accepted noninvasive ventilation therapy (NIV via total face mask), for a period of 48 hours. Parameters in three NIV modes: S/T group(IPAP = 18 cmH₂O, EPAP = 5 cm H₂O, tidal volume depending on individual BMI); the same adopted in AVAPS mode; AVAPS-AE mode(maximum EPAP = 8 cm H₂O, minimum EPAP = 4 cm H₂O, tidal volume depending on individual BMI). The arterial blood gas analysis was observed at different time(the 0.5th, 1st, 2nd, 24th and 48th hour). During the NIV, RR, HR and Borg score were monitored and recorded continuously. Degree of patients' comfort was measured by the VAS (Visual Analog Scale, 0°C 10).

Results: 1. The 0.5th, 1 st, and 2nd hours after NIV treatment, there was a greater decrease in PCO₂ and increase in PO₂ and PH during AVAPS-AE mode than two other modes($p < 0.05$). RR, HR and Borg score in AVAPS-AE mode had a greater changes than others($p < 0.05$). Compared with the S/T and AVAPS group, the recovery duration of shortness in AVAPS-AE group was significantly shorter than two others ($p < 0.05$).

2. During the whole NIV period, the main result was a higher VAS score in AVAPS-AE mode than others ($p < 0.05$). 3 cases with patient-ventilator asynchrony occurred in S/T group, 3 cases and 1 case happened in AVAPS group and AVAPS-AE group respectively.

Conclusions: Autotitrating EPAP during noninvasive ventilation support could be adjust to changing levels of PEEP in AE-COPD patients. AVAPS-AE mode maybe more likely to relieve shortness quickly, especially in synchronization and comfort, worthy of promotion, and it may play an important role in improving dynamic hyperinflation of patients with AECOPD.

objective assessments has not been thoroughly investigated in COPD. In this COPD cohort study, we evaluated whether PA measured by accelerometer and its annual changes can also be assessed by self-reported questionnaires.

Methods: In 178 COPD patients with at least two assessments of PA the agreement between objectively measured and self-reported activity was analysed by Bland Altman plots. Daily PA was assessed by a triaxial activity monitor over one week and by the self-reported German PA questionnaire 50+.

Results: Comparison between the two methods of measurement revealed no convincing agreement with a mean difference and limits of agreement (± 1.96 SD) of time spent in at least moderate PA (>3 MET) of -77.6 ($-340.3/185.2$) min/day, indicating a self-reported overestimation of PA by the questionnaire. The mean difference and limits of agreement (± 1.96 SD) in the annual change of PA was 1.2 min/day ($-208.2/282.6$ min/day), showing also a poor agreement on an individual level.

Conclusion: Evaluation of objectively measured and self-reported PA and their annual changes revealed no agreement in patients with COPD. Therefore, the evaluated questionnaire seems not helpful for measurement of PA and its changes over time.

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Is a Questionnaire Suitable to Assess Physical Activity and Its Changes in COPD?

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Background and Objective: Physical activity (PA) is an important outcome parameter in patients with COPD regarding hospitalizations and mortality. Both, objective assessment by accelerometers and self-evaluation by questionnaires were used in studies investigating PA in COPD. Whether self-reported questionnaires can adequately reflect PA and its changes over time compared to

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Bacteria Profile of Acute Exacerbations of Chronic Obstructive Pulmonary Disease in Singapore

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Background: Acute exacerbations of chronic obstructive pulmonary disease (AECOPD) are clinically relevant events with therapeutic and prognostic implications. Up to 50% of the AECOPD are associated with bacterial infections, such as *Hemophilus influenzae*, *Streptococcus pneumoniae* and *Moraxella catarrhalis*. The differences in risk factor exposure, ethno-geography, genetic background and antibiotic resistance in Asia results in distinct bacterial profiles and antibiotic response during AECOPD. Data on Asian COPD cohorts is essential for patient management and antibiotic choice during AECOPD.

Aim: To examine the prevalence and profile of bacteria isolated from sputum during AECOPD requiring hospitalization in Singapore, and its relation to clinical outcome in AECOPD.

Method: Patients attending the Singapore General Hospital COPD clinic from 2013 to 2016 were studied. Clinical data including demographics, episodes of AECOPD and hospitalization history was obtained from a prospectively collected Redcap database and hospital electronic record system.

Results: 100 patients were admitted for AECOPD with a total of 313 AECOPD recorded from January 2013 to June 2016. Mean patient age was 72 ± 8 years; mean post-bronchodilator FEV₁ was $46.8 \pm 18.3\%$ pred with postbronchodilator FEV₁/FVC ratio of 51.7 ± 11.4 . Of the 101 sputum cultures collected, bacteria were

isolated in 40 (39.6%) sputum samples. The most common bacteria isolated were: *Pseudomonas aeruginosa*(N = 14), *Hemophilus influenza*(N = 10), *Klebsiella pneumoniae*(N = 8) and *Acinetobacter baumannii*(N = 8). A positive sputum culture during AECOPD was associated with an increased length of stay(6.35 days vs 3.46 days p = 0.014) and lower FEV₁ %pred(mean 38.56 vs 51.75 p < 0.01). There was no significant difference in respiratory failure requiring ventilation(18.2%vs 18.5% p = 0.59) or blood inflammatory markers between the positive and negative sputum culture groups.

Conclusion: Gram-negative bacteria, particularly *Pseudomonas aeruginosa*, were most frequently isolated during AECOPD requiring hospitalization in our cohort of COPD patients. Positive sputum cultures were associated with more severe airflow limitation and increased length of stay during AECOPD. Given the variation in bacteria identified in our cohort of patients, the selection of antibiotics during severe AECOPD in Singapore should include coverage of gram-negative bacteria particularly *Pseudomonas aeruginosa* that may reflect an Asian microbiological phenotype of COPD.

P149
Targeted On-Line Breath Analysis Discriminates COPD Patients vs. Healthy Controls and Subjects Suffering from Asthma

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Introduction: Recently we found markers in exhaled breath discriminating patients with chronic obstructive pulmonary disease (COPD) from healthy controls using real-time mass spectrometry. The aim of this study was to validate the previously found disease specific metabolic profile of COPD in an independent cohort of patients suffering from chronic obstructive lung

Fig. 1. Boxplots of the average intensities of the mass spectral features of exhaled breath at 201.0702 Da in the ‘exploratory’ study (left) and independent cohort (right). This compound was significantly increased in the ‘exploratory’ study consisting of 22 COPD patients (* q = 0.03). This finding could be reproduced in the independent cohort consisting of COPD patients and healthy controls /asthma patients (** q = 0.0001) (for Abstract P149).

disease, i.e. COPD, asthma, or healthy controls using real-time mass spectrometry (validation study).
Method: Breath analysis was performed on-line in patients suffering from COPD or asthma and healthy subjects using secondary electrospray ionization mass spectrometry (SESI-MS). The previously reported COPD specific mass spectrometric exhaled breath pattern was then analysed in this new cohort with respect to statistical significance and classification performance.
Results: Breath analysis was performed in a total of 133 subjects (COPD n = 49, asthma n = 31, healthy controls n = 53) (table 1). Using this independent, more heterogeneous cohort, we were able to reproduce and validate our previous findings. Many of the COPD specific markers that were reported in the previous study

Table 1. (for Abstract P149)

	COPD (n=49)	Asthma (n=31)	Controls (n=53)
Age (years)	64±8	41±15	43±18
Sex (f/m)	20/29	11/20	28/25
FEV1 % pred.	44.6±17.5	84.4±13.3	101.2±10.7
FVC % pred.	75.6±18	99.5±11.6	105.3±12.2
FEV1/FVC %	44±11.9	70±8.5	80.6±6
Smokers/ex-smokers/never-smokers (n)	9/38/2	0/0/31	12/13/28
PY smokers/PY ex-smokers	46±24/44±14	–	10±11/14±15
n=133, PY = pack years, mean±SD			

were also significantly altered in this new dataset (figure 1) and allowed for discrimination between COPD patients and asthma/healthy controls.

Conclusions: These preliminary results confirm our recent finding that breath analysis by real-time mass spectrometry allows the identification of mass-spectral features discriminating COPD patients from an independent cohort of asthmatics and healthy controls with good accuracy. Thus untargeted real-time mass spectrometry seems to be an easily applicable method which allows to identify subjects with COPD.

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Insulin-Like Growth Factor 1, Leptin and Adiponectin in Patients with Cystic Fibrosis

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Background: Insulin-like growth factor 1 (IGF-1) is mainly produced in the liver, leptin and adiponectin predominantly in adipose tissue. Production and serum levels are dependent, on nutritional status and insulin. IGF-1 and leptin decrease with fasting and low insulin activity while adiponectin increases in wasting, and insulin deficiency. Cystic fibrosis (CF), a multi-organ disease, is characterized by inflammation, malnutrition, wasting and impaired insulin production. We assessed IGF-1, leptin and adiponectin to evaluate potential relation with body mass index (BMI), insulin secretion, and insulin treatment in patients with CF.

Methods: CF patients evaluated for lung transplantation were included. Patients and a control group of healthy subjects underwent an oral glucose tolerance test (oGTT). Apart from BMI and routine biochemistry IGF-1 as well as leptin and adiponectin were measured. Patients with known diabetes had no oGTT.

Results: oGTT was performed in 14 controls (7 female; age 28 ± 2 y (mean $\pm$ SEM)) and in 25 CF patients (14 female; age 27 ± 1 y); 19 CF patients were treated with insulin (11 female; age 30 ± 2 y). CFRD was newly diagnosed by oGTT in 11 CF patients. BMI was lower in CF patients (18 ± 1 kg/m² in patients undergoing oGTT and 20 ± 1 kg/m² in insulin-treated patients vs 22 ± 1 kg/m² in the controls). CRP was higher (24 ± 5 and 39 ± 12 , respectively, vs 1 mg/l) and albumin was lower (37 ± 1 and 37 ± 1 , vs 42 ± 1 g/l) in CF patients. IGF-1 was lower in CF patients (109 ± 8 µg/l) than in controls (163 ± 19 µg/l), but in insulin-treated CF patients, IGF-1 was not significantly decreased (160 ± 19 µg/l). Leptin was also lower in CF patients undergoing oGTTs (3 ± 1 µg/l) than in controls (9 ± 2 µg/l) and intermediate in CF patients treated with insulin (7 ± 2 µg/l). Adiponectin was higher in CF patients undergoing oGTTs (10.9 ± 0.9 µg/l) than in controls (7.4 ± 1.1 µg/l), and not lower in CF patients treated with insulin (12.0 ± 0.9 µg/l).

Conclusions: CRP levels were higher and albumin and leptin levels (along with BMI) were lower in insulin treatment-naïve CF patients. IGF-1 and leptin levels were decreased and appeared to be corrected towards normal by insulin treatment. Apparently, in the context of inflammation and wasting, insulin treatment barely

modifies albumin, CRP and adiponectin but still exerts positive effects on IGF-1 and leptin levels suggesting that the serum levels of some proteins produced by liver and adipose tissue almost normalized by insulin therapy.

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Endothelial Dysfunction, Disease Severity and Outcome in Moderate to Severe COPD

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Introduction: Chronic obstructive pulmonary disease is significantly associated with extra-pulmonary comorbid conditions such as cardiovascular and peripheral vascular disease. It has been hypothesized that local airway inflammation may cause changes in systemic circulation which result in vascular changes, namely, endothelial dysfunction. The measurement of endothelial dysfunction using reactive hyperemia peripheral arterial tonometry (RH-PAT) is well documented in the field of cardiovascular research. There are no data available for COPD patients. We, therefore, investigated endothelial dysfunction in a cohort of COPD patients using RH-PAT to determine the importance of endothelial dysfunction in assessing disease severity and systemic burden in COPD.

Materials and Methods: One hundred and fifty-seven patients with moderate to very severe COPD (GOLD II-IV) were consecutively recruited from in- and out-patients referred for clinical evaluation and lung function tests to a tertiary institution. Endothelial function was assessed measuring reactive hyperemia with finger plethysmographic according to the recommendations of the manufacturer (Itamar medical Ltd, Caesarea, Israel). The reactive hyperemia index and arterial stiffness were associated to various parameters of COPD such as lung function parameters, MMRC, BODE index, number of exacerbations, time to exacerbation and death.

Results: Univariate analysis showed a significant difference in RHI between healthy controls and patients with COPD (median 1.94 vs. 1.58; $p = 0.030$), however, this difference disappeared after adjustment for age, BMI, blood pressure and pulse (HR = 2.148; $p = 0.385$). There was no significant difference in RHI between patients with COPD and age-matched smokers without COPD (median 1.58 vs. 1.82; $p = 0.120$). RHI did not change significantly whether the patient was in stable state or during an exacerbation (means 2.05 vs 1.91; $p = 0.521$; paired T-Test, $p = 0.625$). There was no association between RHI or arterial stiffness and lung function, MMRC, BODE, exacerbations or death ($p \geq 0.05$ for all). Arterial stiffness was not significantly different between COPD patients and healthy controls ($p = 0.374$) or smokers without COPD ($p = 0.959$).

Conclusion: Endothelial dysfunction does not appear to be either a predictor of disease severity or of outcome in COPD.

Diagnostic Discrepancies between Rapid and Standard Polymerase Chain Reaction Laboratory Tests for Influenza Virus Detection in Nasopharyngeal Swabs from Symptomatic Lung Transplant Recipients

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Introduction: Lung transplant recipients (LTR) have an increased risk of complications from influenza virus infection. Early treatment with neuraminidase inhibitors is recommended for LTR with suspected influenza virus infection. Standard multiplex polymerase chain reaction (PCR) testing for influenza virus takes 36–48 hours. LTR with suspected influenza are treated empirically with oseltamivir pending the results of the nasopharyngeal swab (NPS). In the influenza season 2016/2017 a rapid test for influenza virus A and B was introduced with PCR-based test results available in 2 hours. The objective of this audit was to compare results obtained with the two different tests in order to detect possible diagnostic discrepancies.

Methods: According to internal guidelines all patients with suspected respiratory tract infection were sampled for both virological and bacteriological analysis of NPS specimens. The rapid test was performed in addition to the standard multiplex-PCR. NPS sampling was performed twice by the same person (transplant nurse or physician) and the same material (brush and transport media) were processed by two different laboratories within our organization: Chemistry lab for rapid test and virology lab for standard multiplex-PCR detecting 11 different viruses. All samples were processed immediately after sampling as clinical routine in 12/2016 and 1/2017.

Results: The first 50 consecutive samples were analysed: Average age of LTR 46.4 years (range 21–68), 31 men. The rapid test was positive for influenza virus A in 7 LTR. The standard laboratory test was positive for influenza virus A in 8 LTR. The standard laboratory multiplex-PCR test was considered gold standard (= true result). Forty results were true negative, 2 false negative, 1 false positive and 6 true positive when evaluating the rapid test against the gold standard. Based on this preliminary data the calculated test statistics are: Sensitivity 75% (95% confidence interval 34–96%), specificity 97.6% (87–99%), positive predictive value 85.7% (45–98%) and negative predictive value 95.4% (86–98%). Disease prevalence: 16%.

Conclusion: The rapid test appears to be useful to exclude influenza A infection. The evaluation is ongoing without change of our current diagnostic and treatment policy. Further evaluation in a larger sample is necessary to substantiate the performance of this rapid test and to establish its utility in the setting of symptomatic LTR.

Poster Walk 3: Sleep / Breathing

Effect of CPAP Treatment for Obstructive Sleep Apnea on Long-Term Functional Outcome in Patients with Ischemic Stroke/TIA – A Randomized Controlled Interventional Trial (SAS-CARE-2 Study)

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Background and Aims: Obstructive sleep apnea (OSA) is frequent in ischemic stroke/TIA patients and may negatively affect functional outcome. Little is known about the effect of OSA treatment on the long-term outcome following ischemic stroke/TIA. We aimed to assess prospectively the effect of CPAP treatment for moderate to severe OSA on long-term stroke outcome.

Methods: Patients with ischemic stroke/TIA and OSA (AHI ≥ 20 /h) 3 months after the acute event were included in an international multicenter trial (SAS-CARE-2). Sleepy patients (ESS ≥ 10) were directly assigned to CPAP treatment and non-sleepy patients (ESS < 10) were randomized to either CPAP or no OSA treatment (CPAP-). Patients with AHI < 20 /h were followed observationally. Stroke outcome was determined by the modified Rankin Scale (mRS) at CPAP-initiation and after 6, 12, and 24 months.

Results: A total of 240 patients were included (61 $\pm$ 9 years; 73% males; 82% stroke; BMI 27 $\pm$ 5 kg/m²; baseline NIHSS 0.84 $\pm$ 1.5; baseline mRS 0.8 $\pm$ 0.8). Thereof 51 patients (21.3%) had OSA with AHI ≥ 20 /h; 12 patients were sleepy (mean ESS 11.6 $\pm$ 4.5) and 39 non-sleepy (mean ESS 5 $\pm$ 2.6). 22 non-sleepy patients randomly received CPAP. At 12 months, change in mean mRS was significantly higher in randomized CPAP+ patients compared to CPAP- (-0.3 $\pm$ 0.6 vs. 0.2 $\pm$ 0.8; p = 0.0429). There were no significant differences in mean mRS change at 6 and 24 months.

Conclusion: CPAP treatment started 3 months following acute stroke/TIA in non-sleepy OSA patients may improve stroke outcome 12 months after the event (however not at 24 months).

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The Effect of Continuous Positive Airway Pressure in Atrial Fibrillation after Ablation and Cardioversion

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Introduction: A strong association between obstructive sleep apnea (OSA) and atrial fibrillation/flutter (AF) has been consistently observed in both epidemiological and clinical cohort studies. The effect of treatment with positive airway pressure (PAP) on AF recurrence is not conclusive. This study aims to evaluate the effect of treatment of sleep apnea with PAP on AF recurrence.

Methods: This is a single-center retrospective study conducted at a tertiary referral hospital. All adult patients who had OSA documented by polysomnography (PSG) and had AF intervention (ablation or cardioversion) after PSG from January 1992 to December 2014 were analyzed in this study. The primary outcome was time to recurrence of AF after AF intervention calculated by Kaplan-Meier.

Result: Among 30,188 patients who diagnosed of sleep apnea by polysomnography. 429 patients had a polysomnography-confirmed diagnosis of Sleep Apnea before AF intervention. While 269 patients were "PAP compliance users" the remaining 160 patients were "PAP nonusers." Patients in both groups had similar age, gender, body mass index, ejection fraction, left atrial index, antiarrhythmia medications and rates of diabetes, hypertension, and congestive heart failure. Times to recurrence of AF after AF intervention of PAP users were not significantly different from PAP nonusers (4.8 and 4.1 months respectively, $P = 0.7$).

Conclusion: Our study found no effect of sleep apnea treatment with PAP in duration of time to recurrence of AF after AF intervention. Left atrial index, type of intervention (cardioversion compared with AF ablation), usage of diuretic, digoxin and sotalol. Type of intervention was the strongest independent predictor of recurrent AF after catheter ablation ($OR = 2.03$, $P = 0.0002$). BMI and Left atrial index were also significant with adjust analysis. Increase risk of recurrence AF in high BMI. This finding may impact the clinical management of AF.

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Risk of Cardiac Arrhythmias in Lowlanders with COPD Travelling to High Altitude. Randomized Trial of Nocturnal Oxygen Therapy

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Background COPD is associated with impaired pulmonary gas exchange and cardiovascular disease. Travelling to high altitude may increase the risk of cardiac arrhythmia due to hypoxemia and central sleep apnea in COPD patients as previously shown in patients with obstructive sleep apnea syndrome. The current study investigates whether staying at moderate altitude increases markers of cardiovascular risk and arrhythmias in lowlanders with COPD and whether this can be prevented by nocturnal oxygen therapy.

Methods 24 patients with COPD, median age (quartiles) 66.0y (62.5; 69.8), FEV1 55.0% pred. (39.8; 62.3) living <800 m underwent sleep studies at Zurich (490 m) and during 2 sojourns of 2 days each at St. Moritz (2'050 m) separated by a washout period of >2 weeks at <800 m. In the nights at 2'050 m, they received either oxygen (2'050 m-O2) or room air (2'050 m-RA) according to a single-blinded crossover design. During nights, ECG and pulse oximetry were recorded to measure heart rate and rhythm, heart rate adjusted QT interval (QTc, as measure of arrhythmic risk), mean oxygen saturation (SpO2) and oxygen desaturation index >3% (ODI).

Results In the first night at 490 m, 2050 m-RA and 2'050 m-O2 median (quartiles) SpO2 and ODI were 92.0% (90.3; 94.0) and 3.6/h (1.3; 13.7), 86.0% (83.3; 89.0) and 37.8/h (16.7; 59.5), and 97.0% (95.0; 98.0) and 0.6/h (0.1; 2.6), ($p < 0.05$ all comparisons of corresponding variables). QTc increased from 417 ms (404; 439) at 490 m to 426 ms (405; 440) at 2'050 m-RA ($P < 0.05$) and was 420 ms (405; 440) at 2'050 m-O2 ($p = NS$ vs. 2'050 m-RA). The number of ventricular and supraventricular extrabeats was similar at 490 m and 2'050 m with RA or oxygen.

Conclusions Lowlanders with COPD experienced more pronounced nocturnal hypoxemia and cyclic oxygen desaturations due to central sleep apnea during a stay at moderate altitude. Nevertheless, the QTc interval was only slightly prolonged and the number of arrhythmias did not increase at the higher altitude. Nocturnal oxygen improved oxygenation and prevented central sleep apnea at altitude but did not modify QTc, the marker of arrhythmic risk.

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Effect of Repeated Altitude Exposure on Nocturnal Breathing Disturbances in Lowlanders

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Objective: To evaluate the effect of acute exposure, acclimatization and re-exposure to very high altitude on nocturnal breathing and subjective sleep quality in lowlanders.

Methods: 21 healthy lowlanders, aged 18–30y, underwent two 6-day sojourns at the ALMA observatory, Chile (6 hrs/day spent at 5050 m, nights at 2900 m), separated by a 1-week recovery period at 520 m. Subjective sleep quality (SSQ, visual analog scale 0–100 with increasing quality) and respiratory sleep studies were assessed at 520 m before ascent (LA1) and in the recovery period (LA2), and at 2900 m during the first and second sojourn, on days 1 and 6 (sojourn 1: 1-HA1 and 1-HA6; sojourn 2: 2-HA1 and 2-HA6). www.ClinicalTrials.gov NCT02730143

Results: Mean nocturnal oxygen saturation (SpO₂), oxygen desaturation index (ODI, >3%) and SSQ were, respectively; medians(quartiles): LA1 95% (94; 95), 2.2/h (1.5; 3.0), 60 (48; 72); 1-HA1 86% (85; 88), 13.1/h (9.6; 33.6), 35 (26; 56); 1-HA6 90% (89; 90), 5.8/h (4.5; 7.9), 60 (46; 65) ($P < 0.05$ LA1 vs. 1-HA1 and 1-HA6 vs. 1-HA1, all comparisons). Compared to values in the first sojourn (LA1, 1-HA1 and 1-HA6), during the second sojourn (LA2, 2-HA1 and 2-HA6), SpO₂ and ODI, respectively, changed by medians(95% CI) LA2 +1% (0; 2), -0.7/h (-1.2;-0.2); 2-HA1 +1% (0; 2), -4.7/h (-19.7; -1.4); 2-HA6 0% (0; 1), -1.1/h (-2.7; 0.2). SSQ was not different between first and second sojourn.

Conclusions: In healthy subjects, acclimatization over 6 nights at 2900m, with daily 6hrs exposures to 5050m, improved SpO₂ and ODI compared to the first night at 2900m. After 1-week at lowland, re-exposure to 2900m and 5050m had a milder effect on SpO₂ and ODI, suggesting some retention of physiologic acclimatization from the previous altitude exposure although no changes in subjective sleep quality were perceived.

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CPAP Compliance after a 3 Month Trial of Interface Selection

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Introduction: Continuous Positive Airway Pressure (CPAP) treats Obstructive Sleep Apnea (OSA) effectively but compliance is poor. Interface type may impact long term compliance, with oronasal (ON) being associated with adverse effects and reduced compliance. Extended trial of interface before deciding on a preferred interface may improve compliance.

Method: Patients with newly diagnosed moderate-severe OSA (*Apnea-Hypopnea Index (AHI)* >15) had autoPAP trial of 3 interfaces (nasal mask (NM), ON, nasal pillow (NP)) in randomised order for 1 month each before continuing on their preferred interface for months 3–6. Compliance was defined as CPAP use >4 h/night and was reassessed at 6th month. Satisfaction was assessed by Visual Analogue Scale of 0(very happy) to 10(very unhappy).

Result: Out of 100 patients (mean age 46 ± 12 years, mean *AHI* 52 ± 24) recruited, 86 completed 1 month trial for each interface; 51.8%, 17.6%, 30.6% preferred NM, ON and NP respectively. During the trial, proportion of patients compliant with CPAP was 65.9%, 28.6% and 44% for NM, ON and NP respectively ($p = 0.03$) and mean compliance was better when patients were using their preferred interface (3.95 ± 0.24 vs 3.53 ± 0.23 h, $p = 0.02$). At 6th month, 46 more dropped out (2 surgery for OSA, 11 on CPAP but lost to follow-up, 33 off CPAP). Of remaining 40, 50%, 15%, 35% remained on NM, ON and NP respectively. Interface choice did not affect dropout rates (NM54.5%, ON60%, NP46.2%, $p > 0.5$). At 6th month, compliance by intention to treat analysis (NM34.1%, ON26.7%, NP34.6%, $p = 0.85$) and CPAP usage (NM4.83 ± 2.00 h, ON4.45 ± 1.82 h, NP4.18 ± 1.87 h, $p = 0.63$) were similar among the interfaces. Regardless of preference, during the 3 month trial, both NM and NP had significantly lower residual AHI (NM4.23 ± 4.40, ON7.06 ± 5.10, NP4.25 ± 3.35), % time in large leak (NM2.04 ± 4.82%, ON19.03 ± 18.82%, NP0.64 ± 1.24%) and better satisfaction score (NM4.1 ± 2.6, ON5.9 ± 2.8, NP4.9 ± 2.8) than ON, $p < 0.02$. At 6th month, no significant difference in residual AHI and satisfaction was seen but ON had significantly more % time in large leak (NM1.81 ± 2.83%, ON15.76 ± 12.05%, NP0.33 ± 0.60%, $p = 0.00$).

Conclusion: NM was the most preferred interface when patients had an extended trial. Compliance was better on the preferred mask during the trial. Despite this, CPAP dropouts remained high at 6 months. Contrary to previous studies, ON did not have reduced efficacy, compliance or satisfaction even though it had more leak.

Effects of Subacute Hypobaric Hypoxia on Human Respiratory Muscle Function and Diaphragm Morphology

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Introduction: Respiratory – especially diaphragmatic – muscle function is of utmost importance in the context of hypoxia of any type to compensate for the increased ventilatory demand. Data from short-term exposure to moderate hypoxia suggest a decrease in respiratory muscle strength and increased fatigability during exercise. This study examined the effects of severe and prolonged hypobaric hypoxia on respiratory muscle strength in addition to diaphragmatic function and morphology during a high altitude expedition.

Methods: In 39 mountaineers (mean age 45 years, 18 female) medical assessments, including spirometry, measurements of breathing frequency, tidal volume and minute ventilation, and Borg Scale, were performed at 480 m at baseline and after the expedition, at Base Camp at 4800 m before ascent and after 12 days of acclimatization, and at 6025 m. Inspiratory muscle strength was measured by sniff nasal inspiratory pressure (sSNIP). Ultrasound was used to assess diaphragmatic excursion (DE) as well as diaphragmatic thickness (tdi) in the zone of apposition. End-inspiratory (tdi_{Insp}) and end-expiratory (tdi_{Exp}) values were obtained to calculate the percentage change tdi during respiration at rest (Δ tdi).

Results: With increasing altitude sSNIP decreased from mean 10.3 ± 2.6 kPa at baseline to minimal 8.2 ± 2.0 kPa at 6025 m ($p < 0.001$). sSNIP improved at 4800 m from 8.6 ± 2.3 kPa to 9.3 ± 2.1 kPa after acclimatization. DE increased with progressive hypoxia ($p < 0.001$), as well as after 12 days at 4800 m ($p = 0.03$). Both, tdi_{Exp} ($p = 0.003$) and tdi_{Insp} ($p = 0.0003$) increased with cumulative time spent at altitude with highest values obtained at 4800 m after acclimatization of 12 days with an increase of + 19.2% for tdi_{Exp} and + 20.6% tdi_{Insp}, respectively. Δ tdi was not affected by altitude and did not change ($p = 0.959$) in the longitudinal course.

Conclusions: This field study reveals decreased respiratory muscle strength in the setting of subacute, severe hypobaric hypoxia. An exposure to hypoxia at 4800 m results in increasing respiratory muscle strength at day 12 compared to day 1. In the longitudinal setting these changes are accompanied by a gradual increase in diaphragmatic muscle thickness (both, in- and expiratory) without affecting principles of diaphragmatic contractility (Δ tdi) *per se*.

Agreement between Mouth Maximal Inspiratory Pressure and Sniff Nasal Inspiratory Pressure in Patients with Amyotrophic Lateral Sclerosis and Correlation with Anthropometric Measurements

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Introduction: Amyotrophic Lateral Sclerosis (ALS) is a progressive neurodegenerative disease leading to progressive loss of motor function and muscular mass and respiratory failure. Indices commonly used to predict occurrence of respiratory failure include clinical symptoms, daytime arterial blood gases, vital capacity seated and supine, sleep oximetry, and strength of inspiratory muscles assessed by Mouth Maximal Inspiratory Pressure (MIP) and Sniff Nasal Inspiratory Pressure (SNIP). This study aims 1/ to measure agreement between MIP and SNIP in bulbar and non-bulbar ALS patients at diagnosis and 2/ to analyze correlation between MIP, SNIP and anthropometric variables in this population.

Methods: Prospective assessment of ALS patients in the Geneva area, as of 2012 at initial visit. All patients underwent inspiratory muscle testing with MIP and SNIP, performed according to ATS/ERS recommendations. Anthropometric variables (bioelectric impedance, BMI) were also recorded. Patients were clinically classified as having a bulbar or non-bulbar ALS presentation. Correlation between MIP and SNIP was measured by Pearson's coefficient and Bland & Altman method. Univariate correlations were computed between MIP, SNIP (absolute values and % predicted), BMI, Fat-free Mass (FFM) and Fat-free mass index (FFMI).

Results: 65 patients were included (13 with and 52 without bulbar presentation). Median ALS-FRS score was 38.5 [IQR: 32–43]. Average ($\pm$ SD) values were 48.6 ± 23.4 cm H₂O for SNIP and 44.1 ± 22.1 cm H₂O for MIP. Correlation between MIP and SNIP was significant ($r = 0.68$; 95% CI [0.48; 0.81]). Average [Δ (SNIP-MIP)](bias) was 4.4 ± 18.3 cm H₂O, with wide limits of agreement (cm H₂O; -31.4; 40.2) (Figure 1). Correlations between MIP (absolute value or % predicted) and BMI, FFM or FFMI were not significant. However SNIP was significantly correlated with FFMI ($r = 0.55$; 95% CI [0.29; 0.73]) and BMI ($r = 0.41$; 95% CI [0.12; 0.69]); this was also true for SNIP as % predicted: vs FFMI: ($r = 0.49$; 95% CI [0.22; 0.70]); vs BMI: ($r = 0.43$; 95% CI [0.14; 0.65]).

Conclusions: Although significantly correlated, with a small bias, MIP and SNIP showed very wide limits of agreement, both in bulbar and non-bulbar subjects, suggesting that both measurements are complementary, and one cannot replace the other. Interestingly, SNIP was correlated with indices of muscular mass, suggesting a relation between peripheral muscular mass and inspiratory muscle performance in ALS.

Fig. 1. a Bland and Altman graph of (SNIP-MIP) vs (SNIP + MIP)/2 in ALS patients. **b** Correlation between MIP and SNIP values in bulbar and non-bulbar ALS patients (for abstract P160).

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Obstructive Sleep Apnoea and Quality of Life in Fabry Disease: A Parallel Cohort Study

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Background. Patients with Fabry disease (FD) often suffer from impaired quality of life and excessive daytime sleepiness. Obstructive sleep apnoea (OSA) is frequently reported among patients with FD, however, its prevalence and its effect on quality of life in this population is unclear.

Methods. Patients with FD recruited from the cohort of the University Hospital Zurich (n = 52) were compared in a 1:2-matching adjusted for age, sex, weight and height, with healthy adult controls (n = 104). Participants underwent structured interviews (including short-form 36) and level-3 respiratory polygraphy. OSA was defined as apnoea-hypopnoea index ≥ 5 /hour. Logistic regression was used to compare the outcomes.

Results. The apnoea-hypopnoea index was significantly higher in patients with FD when compared to the control group (3.6 [0.2–3.0] vs. 1.8 [0.1–1.8], $p = 0.026$). In patients with FD, OSA prevalence was 19.2% versus 9.0% in the matched control group ($p = 0.09$). The FD group reported significantly impaired quality of life in the following dimensions: general health, physical functioning, and physical role; however, sleep apnoea did not have an effect on quality of life in patients with FD. Furthermore, patients with FD reported a significantly higher daytime sleepiness measured via the Epworth Sleepiness Scale (7.6 points vs. 6.3 points; $p = 0.01$).

Conclusion. Patients with FD have a higher apnoea-hypopnoea index during sleep and suffer from excessive daytime sleepiness

when compared to a matched control group. Although patients with FD disease experience an impaired quality of life, OSA does not seem to have an effect on quality of life dimensions. Further studies are needed to assess the clinical benefit of OSA-treatment in patients with FD.

P162

Effect of Treatment of Central Sleep Apnoea/Cheyne Stokes Respiration on Left Ventricular Ejection Fraction in Heart Failure – A Network Meta-Analysis

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Introduction: Heart failure patients with central sleep apnoea/Cheyne Stokes Respiration (CSA/CSR) have a unfavourable prognosis. Both continuous positive airway pressure (CPAP) and assisted servo-ventilation (ASV) are accepted treatment modalities for CSA/CSR. Nocturnal oxygen (O₂) is a treatment alternative. Whether treatment of CSA/CSR by these modalities is beneficial for cardiac function is controversial.

Methods: Databases were searched up to November 2016 for randomized controlled trials (RCTs) comparing the effect of any combination of CPAP, ASV, O₂ or an inactive control on left ventricular ejection fraction (LVEF) in patients with heart failure and CSA/CSR. A systematic review and network meta-analysis using multivariate random-effects meta-regression was performed.

Fig. 1. Forrest plot (for abstract P162).

Results: 23 RCTs (1041 patients) were included in the systematic review and the data of 15 RCTs (703 patients; age 64 ± 1 years, apnoea-hypopnoea-index $38 \pm 3/h$, LVEF $29 \pm 3\%$) could be pooled in a network meta-analysis. Compared to an inactive control, both CPAP and ASV significantly improved LVEF by 4.7% (95% CI 0.7–8.8%, $p = 0.026$) and 4.5% (95% CI 1.1–7.9%, $p = 0.014$), respectively, whereas O2 had no effect on LVEF ($p = 0.29$). There were no differences in treatment effects on LVEF between CPAP and ASV ($p = 0.91$). The treatment effect of positive pressure ventilation was independent of baseline LVEF.

Conclusions: CPAP and ASV are effective in improving LVEF in patients with heart failure and CSA/CSR, whereas O2 is not. There is no difference in the effect on LVEF between CPAP and ASV. Larger, long-term RCTs are needed to evaluate whether improvement in LVEF by positive pressure ventilation translates into benefits on hard cardiovascular end-points.

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Home Non-Invasive Ventilation in the Canton of Geneva: A Descriptive Study. Ventilators, Modes, Interfaces. Preliminary Data

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Introduction: This study describes technical aspects of home non-invasive mechanical ventilation (HNV) in the Canton of Geneva, based on data obtained through all actors involved (public and private hospitals, private practitioners, home care providers). Population, ABG and modalities of medical follow-up are reported in another abstract.

Methods: Systematic survey of all cases aged >20 years followed by public and private hospitals, private practitioners, and home care providers treated by HNV for >3 months in Geneva; written information to all patients; collection of information regarding patient (diagnosis, ABG), ventilator, and modalities of follow-up.

Results: (Median, range, or N, % of total): 357 patients (232 Male, 65%; aged 71 (20–95) years) were included (5 refusals). Eight patients ventilated by tracheostomy are not described. Diagnoses were: obstructive lung disorders: 89 (26%); restrictive lung disorders: 89 (26%); neuromuscular diseases (NMD): 36 (10.6%); sleep-related breathing disorders (SRBD): 125 (36.8%); missing data: 17. Patients had been on HMV for 37.6 months (3–347).

Ventilators used were: Bi-level positive pressure ventilators (BPPV; 241, 67.5%; 98.7% in ST Mode, 1.3% in S Mode); Adaptive Servo Ventilators (ASV, 113; 31.7%, mostly ASV-CS mode) and volumetric ventilators (3; 0.8%). For BPPV, IPAP and EPAP values were (median, range, cm H₂O): 18.2 (8.5–33) and 8 (2–23). Use of ventilator was (median; IQ25%; IQ75%): 400 min/24 hrs (295; 522). 125 patients (35%) had been put on HMV after failure of nC-PAP.

Interfaces used were (missing data: 20): nasal masks (68; 20.2%), nasal prongs (21; 6.2%), facial masks (248; 73.6%); daytime mouth-piece (1; 0.3%).

229 patients (64%) used a humidifier. Ten patients (2.8%) had a 2nd ventilator provided; 2 had an external battery. Oxygen was added to NIV in 93 (26%) cases. Six (1.8%) had a Cough Assist, and 1 used an IPPB device.

Conclusions: Use of HMV is a chronic disorder with an average use of 54 months (Median: 38) in the population studied. Volumetric ventilation (VAC) has virtually disappeared in our area, despite a 10.6% of the population with NMD, which have historically mainly been treated with VAC. Conversely, ASV is widely used and represents one third of positive pressure devices used for HMV. Use of ASV-CS must be reevaluated at the light of the results of the SERVE-HF trial.

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Nocturnal Breathing in Adult Obese Subjects with and without Prader-Willi Syndrome

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Introduction: To detect clinical, functional respiratory and nocturnal complete cardio-respiratory data in adult PWS patients and in obese subjects matched for sex, age and BMI.

Methods: 15 PWS obese patients (9 males, age 20–35 years, BMI 44.3 kg/m², and 15 obese subjects (9 males, age 21–36 years, BMI 44.2 kg/m²) underwent a nocturnal cardio-respiratory polygraphy (CR-PSG). Respiratory parameters included: apnea/hypopnea index (AHI), basal oxygen saturation, lowest oxygen saturation, % time spent at oxygen saturation below 90%, average minimum SaO₂ during desaturations.

Results: Apnea Index (AI) was significantly different ($p < 0.05$) between the two groups (20.0 ± 6.0 in obese subjects vs 12.2 ± 5.3 in PWS patients). Sleep Apnoea (SA) was diagnosed in 14 obese subjects (93.3%) and in 9 PWS patients (64.3%) ($p = 0.08$). Among

PWS patients, 3 resulted positive for SA with the indication to ventilotherapy, and among obese subjects 12 were positive for the same indication ($p = 0.025$). The average minimum SaO₂ during desaturations was pathological in both groups and significantly different ($p < 0.05$) between them ($86.9\% \pm 1.1$ SEM in PWS patients vs $81.3\% \pm 2.3$ SEM in obese subjects).

Conclusions: PWS patients of this study show less pathologic CR-PSG data compared to obese subjects matched for sex, age and BMI. Yet, their frequent pathologic oxygen nocturnal saturimetry imply a particular care for respiratory function in case of pulmonary infection.

P165

Chest-MRI Under Non Invasive High Frequency Ventilation: A New Promising Technique

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Introduction: Magnetic Resonance Imaging (MRI) of the chest has long suffered from its sensitivity to respiratory and cardiac motion with an intrinsically low signal to noise ratio and a limited spatial resolution. The purpose of this study was to perform chest MRI under an adapted non invasive high frequency ventilation system allowing 10 to 15 times longer breath hold durations than other existing systems.

Methods: One volunteer and one patient known for a thymic lesion underwent a chest MRI under non invasive High Frequency Ventilation (HFV). Routinely used sequences were performed with and without the device during three sets of apnoea on inspiration.

Results: Non invasive HFV was well tolerated in both cases. The mean duration of the apnoea was 10.5 min (range 8.5–12) and 5.8 min (range 5–6.2) for Volunteer 1 and Patient 1, respectively. An overall increased image quality was seen under HFV with a better delineation of the mediastinal lesion for Patient 1. Nodules discovered in Volunteer 1 were confirmed with low dose CT.

Conclusion: Non invasive HFV was feasible and increased spatial resolution of chest MRI by allowing acquisition at full inspiration in a prolonged apnoea. This new technique could be of benefit to numerous thoracic disorders.

Initiative to Improve Outcomes through the Use of an Adult Protocol for High-flow Nasal Cannula

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Introduction: High Flow Nasal Cannula (HFNC) is an oxygen delivery modality that has been increasing in popularity over the past few years as trials have shown it to be a non-inferior option in patients with acute hypoxic respiratory failure. At UC Davis, a recent retrospective study for failure rates (defined as need for transfer to the ICU, initiation of non-invasive ventilation or endotracheal intubation) in floor patients placed on HFNC was undertaken and demonstrated that 25/66 patients analyzed (38%) failed HFNC therapy. The mortality of patients who failed HFNC was also higher (48%) than the non-failure group (39%). It is unclear why this occurred, but there seems to be a lack of knowledge regarding when HFNC should be initiated and who should be involved in the decision to utilize it. Thus, the decision was made to create a protocol for the initiation and use of HFNC in floor patients and to study its effect on failure rates.

Methods: From 2015–2016, a multi-disciplinary committee was created to discuss the literature surrounding HFNC, the prior study results, and next steps in the creation of a protocol. A draft protocol was created and submitted to the appropriate hospital committees for approval. After being approved, a concerted effort at educating respiratory therapists, nurses, and Internal Medicine physicians was undertaken in order to pilot the protocol. The protocol was piloted from mid-January 2016 until mid-April 2016 through patients admitted to the Internal Medicine department. Data collection is currently being completed on various metrics including adherence to the protocol and outcomes (to include need for ICU transfer, need for intubation and mortality) compared to the prior study.

Results: Preliminary results from the pilot study include 13 patients that were placed on HFNC during the three-month pilot period. 3 patients did not meet criteria for use of the protocol. Of the 10 patients that met criteria, 2 (20%) died at some point following initiation of HFNC from an issue related to respiratory failure. Including those 2 patients, there were 4 “failures” as defined as death, need for transfer to the ICU and/or need for intubation; however, 2 of the 4 failures fully recovered to discharge. 8/10 (80%) patients placed on HFNC during the pilot program adhered to the protocol.

Conclusion: A protocol for the use of HFNC on floor patients led to slightly improved outcomes and was well adhered to.

Development and First Validation of a Simple Tool for Clinical Assessment of Patients Treated with Home N: The S³-NIV Questionnaire

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A short, valid and reliable tool is needed in daily practice to assess the burden of home non-invasive ventilation (NIV) on specific domains of health-related quality (HRQoL) of life such as respiratory symptoms (rS), sleep quality & attendant symptoms (Ss) and side-effects (Se) related to mechanical ventilation. Available questionnaires provide valid assessment of HRQoL, but are long and complex which limit their everyday use. The aim of this study was to develop and validate a short self-administered questionnaire, the “S³-NIV questionnaire” to assess key domains related to NIV treatment.

16 Items pertaining to rS and to Ss domains were selected from the original Severe Respiratory Insufficiency (SRI) questionnaire. The need for an additional assessment for Se of NIV was also agreed on by experts in the field. 7 items pertaining to Se were thus generated during qualitative one-to-one interviews with patients.

A total 23 selected core items were tested in a binational (Switzerland, France), french-speaking prospective cohort of patients on NIV (n = 325). The item reduction process was based on rigorous methodology to maintain validity of the original scale.

Fig. 1. Distribution of S3-NIV questionnaire score in 325 patients treated with home NIV (for abstract P167).

Fig. 2. Pearson correlation between scores in the SGRQ and the rS subscale (for abstract P167).

Classical psychometric, Rasch analysis and factorial analysis identified 15 items covering *a priori* the three important target health domains (rS, Ss and Se). Items were selected to cover a wide range of disease severity with the intention of maintaining excellent discriminant power, as illustrated by the distribution of the S³-NIV questionnaire scores over the entire scaling range (Figure 1). Internal consistency was excellent for the 15 items S³-NIV questionnaire with Cronbach's $\alpha = 0.81$ and good for the three subscales (rS $\alpha = 0.78$; Ss $\alpha = 0.76$; Se $\alpha = 0.76$). Test-retest at four weeks interval in a sample of stable patients ($n = 50$) was excellent ($ICC = 0.76$). Construct validity was also demonstrated by correlation analysis between subscales of the S³-NIV questionnaire and various scales of the St George Respiratory Questionnaire and the Quebec Sleep Questionnaire (Figure 2).

The S³-NIV questionnaire provides clinicians a simple and reliable tool to assess three important domains related to home NIV as a complement to physiological monitoring of home NIV. S³-NIV questionnaire has good measurement properties and repeatability and is likely to be sensitive to treatment modification although this should be tested in further studies.

Fig. 1. Correlation between SNIP and MIP measurements in the overall study population (for abstract P168).

P168

Agreement between Sniff Nasal Inspiratory Pressure and Mouth Maximal Inspiratory Pressure in Patients Surviving Severe Acute Hypercapnic Respiratory Failure in the ICU

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Introduction: Muscle weakness and diaphragmatic dysfunction are risk factors for readmissions following an acute hypercapnic respiratory failure (AHRF). Sniff Nasal Inspiratory Pressure (SNIP) and Mouth Maximal Inspiratory Pressure (MIP) are easy-to-perform, non-invasive tests that assess inspiratory muscle strength. Little is known about inspiratory muscle function in COPD and OHS surviving an AHRF. This study aims 1/ at reporting SNIP and MIP values 15 days after ICU discharge in a cohort of patients surviving AHRF 2/measuring agreement between SNIP and MIP in this population.

Methods: A Prospective follow-up of patients with COPD and OHS surviving a first AHRF in the ICU between 2012 and 2014. Demographic, anthropometric data and pulmonary function tests were recorded at Day 15 after ICU discharge. SNIP and MIP were measured according to ATS/ERS recommendations. The 5th percentile of SNIP value of a healthy population of the same age and gender was used to define inspiratory muscle dysfunction.

Results: 77 patients (males: 52%, age 68 ± 9.2 yrs) were included. 50 (65%) patients had COPD and 27 (35%) patients had OHS. Median SNIP value for the whole study population was 47 cmH₂O (in-

Fig. 2. Bland-Altman plot of SNIP and MIP measurements agreement in COPD and OHS subgroups (for abstract P168).

terquartile range [IQR]:38–64). No significant differences were observed between COPD and OHS groups (45 cmH2O [IQR: 37–65], respectively 52 cmH2O [IQR:42–63], $p = 0.23$). Median MIP value for the whole study population was 42.5 cm H2O ([IQR]:33–57) and no differences were observed between COPD and OHS groups (43 cm H2O ([IQR]:34–65), respectively 39 cm H2O ([IQR]:29–52), $p = 0.23$). 47 patients (61%) were diagnosed with diaphragm dysfunction with a mean SNIP value of 39.8 ± 8.9 cm H2O. Pearson's R demonstrated a strong positive correlation between SNIP and MIP ($\rho = 0.72$) for the whole study population but was moderate for COPD ($\rho = 0.65$) and weak for OHS ($\rho = 0.31$) subgroups (Fig. 1). Mean systematic bias (DP = SNIP-MIP) was 5.7 cmH2O with wide limits of agreement (cmH2O: -26.1 to +37.1) (Fig. 2). However, important differences in systematic bias were observed between groups (DP COPD: 2.5 cmH2O versus DP OHS 11.6 cmH2O, $p = 0.01$).

Conclusion: Diaphragmatic dysfunction is highly prevalent upon ICU discharge after AHF. Agreement between SNIP and MIP was moderate for COPD and low for OHS. Wide range of agreement suggest that both SNIP and MIP are complementary. Clinical relevance of testing inspiratory muscle function in this particular settings needs to be further studied.

P169

Radiological Neck Circumference, Evaluating a Novel Method in Establishing Risk of Obstructive Sleep Apnea. A Pilot Study

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Introduction: Increased neck circumference is a recognized risk factor for obstructive sleep apnea. For men, the cutoff is 43 cm and for women it is 37 cm. We are investigating a novel method in

measuring the neck circumference via the chest x-ray. Since a chest-x ray is a 2 dimensional image, measuring the circumference will be an indirect method " $\pi \times D$ ". We wanted to compare this to the clinical method and investigate how reliable would it be to depend on the chest x-ray alone.

Materials and Methods: Twenty-six patients whom were admitted to our in-patient service were assessed. Each one of those patients already had a clinical measure of the neck circumference upon admission as a part of the nursing assessment. One researcher looked at all 26 chest x-rays for those patients and measured the diameter of the neck in our medical record system. A radiological circumference was calculated then by the circle circumference formula " $\pi \times D$ ". Following that the measurements were compared.

Results: Among our 26 patients, 13 were males (50%). The average age was 66.54 years. We found an average of 45.86 cm (SD 7.55, CI 95 ± 2.9) for the standard clinical method while the radiological method had an average circumference of 46.45 cm (SD 8.52, CI 95 ± 3.27). The average difference was +2.24% between both groups. The p value was 0.98.

Discussion: The above results highlight a close correlation between both methods. The radiological methods will slightly overestimate the neck circumference "2.24% which translated into 2 cm in our patients". Although the sample is small and the study is ongoing, it appears that the proposed radiological method may be used to estimate the actual neck circumference.

Conclusions: Our study shows that the proposed radiological neck circumference method can be reliable with slight overestimation of the actual neck circumference. When validated by a larger study sample, this method will make assessing risk of obstructive sleep apnea possible from the chest x-ray alone even in patients who may be close to the cutoff points of 43 cm and 37 cm for men and women, respectively.

Fig. 1. Proposed radiological indirect method of measuring neck circumference. (for abstract 169).

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P170

Positional Central Sleep Apnea after Single-Lung Transplantation – A Case Report

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Background: Central sleep apnea (CSA) is a common comorbidity in heart failure and also seen in lung transplant recipients. If positional sleep apnea is present, the lateral position often leads to an improvement of the apnea-hypopnea-index (AHI) and oxygenation. Single-lung transplantation (sLTX) results in changes in pulmonary hemodynamics and ventilation. We present a case of posture dependent aggravation of CSA in single-lung transplant recipient.

Case Report: A 58-year-old patient with a favorable course after a right-sided sLTX for idiopathic pulmonary fibrosis (IPF) reported of nocturnal dyspnea in the right lateral position. He was also known for stable cardiovascular disease. Lung scintigraphy showed a perfusion (P) and ventilation (V) in favor of the graft (V 88%/ P 95%), the LV-EF was 50%. There was a small pleural effusion on the left side. After exclusion of other pathologies and confirmation of a good graft function a polysomnography revealed severe central sleep apnea with an AHI of 61.0/h. Parameters of sleep apnea and desaturations were clearly worse in the right lateral position: right vs left: AHI 78/h vs. 33/h, mean SpO₂ 70% vs. 84% and mean desaturation per event of 17.3% vs. 5.2%.

To explain the pathophysiology, we have to consider the heart failure and fluid retaining state, changes in muscle tonicity and breathing patterns during sleep, gravitational forces, and the particular anatomic situation related to the single-lung transplant procedure with subsequent changes in ventilation, perfusion, and ventilatory stability. The primary etiology for CSA in this case is most likely heart failure. The positional aggravation can be explained by the ventilation/perfusion-mismatch after sLTX with impaired mechanisms to fully compensate for the decrease in lung volume and oxygen stores with the good lung in the dependent position. Nocturnal fluid shift into the transplanted lung with disrupted pulmonary lymphatic and bronchial circulation worsens the ventilatory control. Positional-induced alteration of cardiac output may also contribute to the postural worsening of hypoxemia.

Treatment and Course: Heart failure treatment was optimized and the patient was started on adaptive servoventilation with a normalization of AHI, nocturnal oxygenation and disappearance of symptoms.

Conclusion: Pathophysiology in sLTX recipients during sleep is complex and not yet completely understood. Nevertheless conventional CSA treatment seems to be effective.

Poster Walk 4: Interventional Pneumology / Thoracic surgery

P171

Predicting Quality Adjusted Life Years Using St. George Respiratory Results in Patients with Severe Emphysema

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Introduction: End-stage emphysema is associated with severe dyspnoea, limitation of activities, recurrent lung infection and, ultimately, respiratory failure. The PneumRx Endobronchial Coil

Fig. 1. Methods and evidence sources for estimating QALYs (for abstract P171).

System is a minimally invasive treatment option for severe emphysema. At the individual patient level Health Related Quality of Life (HRQoL) is important in assessment of limitations, disease course over time, and the effects of interventions. The RENEW study was a randomised controlled study with lung volume reduction coils in patients with severe emphysema (NCT01608490). Quality-Adjusted Life Years (QALYs) a metric that combines quality and quantity of life is an important measure of patient benefit. The reported mean 1-year QALY difference in another coil RCT [REVOLENS] was 0.06. The purposes of this analysis were to: i) map available SGRQ data onto EQ5D preference (utility) values; ii) generate prognostic statistical models to quantify the impact of coils treatment on HRQoL; iii) generate indicative estimates of long-term QALY gains over a range of clinically plausible scenarios.

Methods: Patient level SGRQ data from RENEW and the National Emphysema Treatment Trial (NETT) were combined into a master dataset containing patients receiving Standard of Care (SoC; RENEW, NETT) or Coils+SoC (RENEW). SGRQ data were mapped to EQ5D values using a published algorithm. Impact of treatment, time, response, and other baseline characteristics on EQ5D were quantified using a statistical model. To generate QALY estimates we used the following additional data: published long-term all-cause mortality estimates for non-surgical patients; eight clinically plausible hypothetical response profiles. These were combined with two assumptions around the impact of treatment (constant or declining over time).

Results: Patients in RENEW and NETT were broadly comparable. Treatment and response had a statistically significant impact ($p < 0.001$) on HRQoL (+0.069 and +0.059, respectively). Coils+SoC generated more QALYs than SoC alone in all eight scenarios. Incremental lifetime benefits generated ranged from 0.20 to 0.44 QALYs. Incremental 1-years benefits ranged from 0.07 to 0.08 QALYs.

Conclusions: Our exploratory analyses are consistent with the REVOLENS results, indicating there is a likely quantifiable lifetime QALY benefit with PneumRx Coils+SoC over SoC.

P172

Qualitative Analysis of Pulmonary Perfusion Changes Assessed by Dual-Energy Computed-tomography after Endoscopic Lung Volume Reduction by Coils

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Background: Endoscopic lung volume reduction by coils (LVRC) is a recent treatment approach of severe emphysema. Furthermore, dual-energy computed-tomography (DECT) now offers a combined assessment of lung morphology and pulmonary perfusion. The aim of our study was to simply assess the impact of LVRC on pulmonary perfusion with a qualitative analysis by DECT.

Methods: Twelve patients (63.3 ± 8.9 yrs) underwent LVRC. DECT were performed prior and after LVRC. For each patient, a quantitative analysis was performed with 6 regions of Interest (ROI) bilaterally drawn in anterior, mid and posterior lungs at 4 defined levels. ROI values were averaged to obtain lung perfusion assessed by iodine lung concentration (C_{lung} , ug.cm^{-3}). C_{lung} were normalized using the left atrial iodine concentration (C_{LA}) to take into account differences between successive DECT. Iodine maps were also qualitatively analyzed using a 4-points scale score (Figure 1) by 2-blinded readers.

Results: After LVRC, lung perfusion significantly increased adjacent to treated areas ($C_{\text{lung}}/C_{\text{LA}}$ from 4.2 ± 2.2 to 6.3 ± 2.5 , $p = 0.027$) and in ipsilateral untreated areas (4.8 ± 1.7 to 7.1 ± 2.2 ; $p = 0.018$), corresponding to a mean 48% and 50% perfusion increase, respectively. No significant difference was observed in contralateral upper and lower areas (5.3 ± 2.2 to 5.6 ± 2.2 , $p = 0.56$; and 5.6 ± 2.6 to 5.6 ± 2.1 , $p = 0.76$, respectively). Qualitative analysis was in agreement with the quantitative analysis, with an excellent interreader agreement (kappa values ranging from 0.63 ± 0.16 to

Fig. 1. The 4-point color scale perfusion maps (for abstract P172).

1.00 ± 0). The visual score was also correlated with the quantitative values ($r = 0.51$, $p < 0.001$ and $r = 0.50$, $p < 0.001$ for reader 1 and 2, respectively). The mean $C_{\text{lung}}/C_{\text{LA}}$ significantly increased as the score increased $p < 0.001$ for both readers.

Conclusions: Qualitative analysis from DECT acquisition revealed that LVRC results in significant perfusion increase in the coil-free adjacent treated and ipsilateral untreated areas. It was also well correlated to the quantitative analysis and could be useful to easily evaluate perfusion changes after LVRC.

P173

Indications and Complications of Flexible Bronchoscopy in Very Elderly Patients

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Introduction: Flexible bronchoscopy (FB) is a recognized safe diagnostic and therapeutic procedure, useful in the assessment of lower respiratory tract and lung parenchyma. However, few data with conflicting results is available on the impact of age on indications and complications associated with FB, namely in the very elderly population, usually a minor sample. This study retrospectively compares the indications and complications of FB in very elderly patients (≥ 85 years old) with younger ones.

Methods: The clinical files of all adult patients who underwent FB at our Interventional Pulmonology Unit, between 1 st January 2014 and 30th April 2016, were reviewed. Patients on mechanical ventilation or when the technique was performed outside the Unit were excluded. Demographic data, indications, type of procedure, and complications with FB in patients aged ≥ 85 years and aged < 85 years were analyzed.

Results: 1592 patients were included. 91 patients (5.7%) were aged ≥ 85 years, and 1501 (94.3%) were < 85 years. The very elderly had poorer functional status than the younger patients ($p \leq 0.001$). The main indication for FB in patients aged < 85 years, was to support the diagnosis of lung carcinoma (12.5%, $p = 0.69$) and in the very elderly patients was persistence of atelectasis (21.9%, $p \leq 0.001$). FB without sampling techniques was more frequent in the younger group ($p = 0.231$). 5 patients had 6 complications in the older group paralleled with 67 patients with 75 complications in the younger group (5.5% versus 4.5%, $p = 0.400$). Bleeding, oxygen desaturation, arterial hypertension and bronchospasm were more frequent in the older group, but differences were not statistically significant. There was no mortality related to FB. To determine risk factors for FB complications a multivariate analysis was performed, revealing that poorer functional status was the greatest risk factor.

Conclusions: Our data indicates that main indications for FB are different in both groups. FB can be safely performed as adverse events are unusual and regularly not severe. The occurrence of complications and the percentage of participants with at least one complication were higher in the very elderly group. Poorer functional status was the greatest risk factor. Regardless of the extensive

use of FB, to our knowledge, this is the first study that examines the indication and safety profile in the largest population of very elderly patients with a higher age cutoff.

P174

The Bronchial Vacuum: A Directional Suction Catheter that Can Access Right or Left Bronchi Consistently

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Introduction: Ventilated patients do not cough and are suctioned to clear secretions. Current endotracheal suction catheters pass into the right main stem exclusively. Secretions accumulate in the left side and may lead to resistance. This problem has been addressed many times over thirty years. Several devices developed to access the left main met with no real success. We tested a patented device (The Bronchial Vacuum) that accesses the desired main stem bronchi consistently.

Methods: We evaluated the catheters in two intubated cadavers. Hundreds of passes were made into both main stem bronchi and monitored with fluoroscopy. After the cadaver studies, the catheters were adapted to ventilators and five different patients (one with a tracheostomy) tested, each with a different catheter directed ten times to each side, for a total of one hundred passes. The results were monitored with fluoroscopy. All patients were intubated for port placement, and required fluoroscopy and bronchoscopy. All gave informed consent.

Results: The cadaver studies demonstrated that the catheters worked reliably ($> 95\%$ of passes). After several hundred passes, the catheters fatigued, and were less reliable. The catheters were modified and 100 passes into five patients, ten each to each side, were made and confirmed with fluoroscopy. Ninety-nine of the one hundred passes went to the desired side. The single failure occurred in the first pass in patient number 4. Bronchoscopy showed that the endotracheal tube was down the right main stem. It was re-positioned into the mid-trachea and all remaining passes went as directed. All twenty passes in the tracheostomy patient passed as desired. Post-procedure bronchoscopy showed that one patient had some transient oozing while the other four had no significant trauma. All patients tolerated the use of the catheters without incident.

Conclusions: Current ventilator suction catheters pass only into the right main stem. The Bronchial Vacuum passes into the desired side 99% of the time, works in patients with standard endotracheal tubes and tracheostomies, and causes no significant trauma. Better secretion clearance could diminish the incidence of ventilator associated pneumonia and drug resistant pneumonia.

Endobronchial Coil Therapy: First Results from the Swiss Registry

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Introduction: Endobronchial coils for treatment of severe emphysema have been demonstrated in two randomized, controlled trials to improve quality of life, exercise tolerance, and lung function in bilaterally treated patients. In Switzerland, patients undergoing coil treatment have been followed in a post-market Registry; preliminary results are presented here.

Methods: 5 centres enrolled 64 patients between October 2013 and November 2016. Patients were diagnosed with bilateral, severe, symptomatic emphysema, were on optimal medical therapy, and had completed pulmonary rehabilitation (~65%) and smoking cessation (~75%) prior to consenting to treatment. Patients underwent high resolution CT scanning to assess emphysema distribution, exclude suspicious findings, radiographically severe bronchiectasis, and severe bullous disease.

Results: As of 30 November, 2016, 29 patients (38% male, 69% heterogeneous, mean 66 years, BMI 24, FEV₁ 30% pred., RV 247% pred., 6MWD 272 m, SGRQ total 57 points) had completed bilateral (mean 23 coils per patient) treatment and 6-month follow-up (median 204, min 124, max 272 days post-treatment). Median hospital stay was 1.0 days; average procedure time was 47 minutes (15 minutes under fluoroscopy). 7 Serious Adverse Events (SAEs) were reported in 6 of 29 bilaterally treated patients through six-month visit, of which 5 SAE occurred within day 0–30 of either treatment (1 pneumonia, 2 pneumothorax, 1 MI, 1 chest pain); all resolved. Deaths were reported in 2 of 64 enrolled patients through six-month visit (1 MI, 1 unconfirmed). No device removals were medically necessary.

Responder rates: RV, L (≥350 mL decrease) 76%; FEV₁, L (≥12% increase) 57%; SGRQ (≥4 pt decrease) 87%; 6MWD (≥26 m increase) 60%.

Conclusions: Endobronchial coil therapy performed in expert centres in Switzerland yields high 6-month responder rates across all relevant outcome measures, with an acceptable safety profile given the severity of the treated population, and high patient satisfaction.

Case Report of a Tracheo-Mediastinal Fistula after Radiotherapy

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Introduction: Tracheal or bronchial fistulae seem to be a very rare complication only reported in a few cases. Recently Wong et al published the case of a bronchomediastinal fistula (BMF) that occurred in the context of *bevacizumab* treatment.

Case Report: We report the case of a 68-year-old woman who presents a two day history of facial edema with upper thoracic and neck vein distension. The initial workup consisting of a chest CT-scan shows an upper lobe (27 x 21 mm) intraparenchymal mass with heterogenous mediastinal adenopathies that have a necrotic aspect in the 4R area. Those adenopathies are responsible for a major mass effect on the superior cava vein. The patient undergoes a diagnostic bronchoscopy with EBUS-TBNA of the 4R region under local anesthesia, without immediate complication. Cytology analysis confirms poorly differentiated lung adenocarcinoma.

The patient undergoes urgent decompressive mediastinal radiotherapy (total delivered dose = 45 Gy in 15 sessions) to treat the superior vena cava syndrome. An adjuvant chemotherapy is planned. Before the initiation of chemotherapy, a few days after the end of radiotherapy, the patient presents with cough, purulent sputum and fever. A thoracic CT scan shows pulmonary infiltrates suggestive of acute community-acquired pneumonia. In addition, there is evidence of BMF in front of mediastinal 4R station and located at the site of TBNA, but without any clinical or radiological element suggestive of acute mediastinitis. At this time a control bronchoscopy confirms the presence of BMF.

Conclusion: BMF is a rare complication with few reported cases. Yet this complication could be underreported as it could be asymptomatic in most cases, and a control CT scan is generally not mandatory in the immediate follow up of bronchoscopy. We assume that this complication was incidentally discovered in our patient in the workup of acute pneumonia. In 2015, Metha et al reported a case series of 36 patients in which they treated 50 sites of isolated mediastinal and hilar recurrence of lung cancer with bronchoscopic endobronchial ultrasound guided intratumoral injection of cisplatin. Two patients developed broncho-mediastinal fistula. In these cases, fistula contributed to increased morbidity but did not lead to additional hospitalizations or increased mortality.

This case highlights radiotherapy and necrotic adenopathy as hypothetical contributing factors for BMF.

P177

A Rare Case of Fentanyl-Induced Chest Wall Rigidity Syndrome during Routine Bronchoscopy

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Combination of sedatives such as fentanyl and midazolam during bronchoscopy is recommended by American College of Chest Physician due to its favourable drug profile. It improves patient comfort and tolerance, and is commonly given unless contraindicated. We describe a rare case of fentanyl-induced chest wall rigidity syndrome during a routine bronchoscopy with endobronchial ultrasound guided-transbronchial needle aspiration (EBUS-TBNA) in a 55 year old male presenting with a lung mass and mediastinal lymphadenopathy. This was effectively managed with neuromuscular blockade, intubation and reversal agents including naloxone. This rare complication should be effectively managed by all bronchoscopist as it carries significant mortality and morbidity if not recognised early. We review the literature on the occurrence of fentanyl-induced chest wall rigidity and its predisposing risk factors.

P178

Smoking History as a Risk Factor for Atrial Fibrillation Following Robotic-Assisted Video-Thoroscopic Pulmonary Lobectomy

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Introduction: Smoking history has been correlated to the development of atrial fibrillation (AFib) after noncardiac thoracic surgery, increasing hospital length of stay, post-operative mortality, and costs. This study sought to determine the effects of smoking history and pulmonary function on the development of AFib following robotic-assisted pulmonary lobectomy to allow for more targeted dispositioning of post-lobectomy patients.

Methods: We retrospectively analysed 353 consecutive patients without history of AFib who underwent robotic-assisted video thoroscopic (RAVTS) lobectomy by one surgeon from October 2010 to August 2016. Patients were analysed with respect to smoking status, pack-years, months of smoking cessation, and pulmonary function. Chi-Square (X^2), Fisher's exact test, and Student's t-test were used to compare variables, with significance at $p \leq 0.05$.

Results: In our study, 17 of 144 men (11.8%) and 16 of 209 women (7.7%) experienced new-onset AFib following RAVTS

lobectomy ($p = 0.19$). The average age of people who developed AFib was 72.8 years (yrs) and 66.4 yrs for those who did not ($p < 0.001$). Former smokers represented 72.7% of new AFib cases, current smokers 21.2%, and never smokers 6.1% ($p = 0.009$). Former smokers were at higher risk than both never (OR 5.30, 95% CI 1.22 to 23.09, $p = 0.03$) and current smokers (OR 2.62, 95% CI 1.09 to 6.31, $p = 0.03$). Former smokers who developed AFib also were older (74.6 vs. 69.1 yrs, $p = 0.004$) and more often diabetic (OR 3.27, 95% CI 1.31 to 8.17, $p = 0.01$). There was no difference in AFib rates for light (≤ 15 pack-years) and heavy (> 15 pack-years) smokers ($p = 0.21$). Never smokers fared better than light ($p = 0.02$) but not heavy ($p = 0.13$) smokers. There was no difference in pack-years for former and current smokers who developed AFib ($p = 0.11$). For all groups, the development of AFib was independent of pre-operative pulmonary function as measured by percent of predicted forced expiratory volume in 1 second and percent of predicted diffusion capacity of the lung for carbon monoxide ($p = 0.09$ and 0.63 , respectively). The development of AFib was also unaffected by the presence of COPD ($p = 0.80$).

Conclusions: Former and light smokers are at higher risk than both current and never smokers for developing AFib after RAVTS lobectomy, independent of pack-years and pre-operative pulmonary function. Duration of smoking cessation prior to lobectomy does not change the likelihood of developing AFib.

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Outcomes for Right Versus Left Lung Malignancies after Robotic-Assisted Pulmonary Lobectomy

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Introduction: In this study, we examined asymmetry of lung malignancies and outcomes in patients (pts) undergoing pulmonary lobectomy.

Methods: We retrospectively analyzed data for all pts undergoing robotic-assisted pulmonary lobectomy for cancer by one surgeon between Sept. 2010 and Aug. 2016. We analyzed laterality of lung resection and perioperative outcomes.

Results: A total of 374 pts (mean age, 67 ± 1 yr; range 24–87 yr), were included, with 42.5% males vs 57.5% females. Most common histologies were adenocarcinoma (61%) and squamous cell (19%), neuroendocrine (8.5%), and adenosquamous (1%) carcinomas. Both primary lung cancers and metastases were more prevalent on the right ($p = 0.005$), with 64.6% of primary cancers on the right vs 35.4% on the left ($p = 0.01$) and with 72.4% of metastases on the right vs 27.6% on the left ($p = 0.17$). Asymmetries were found in numbers of positive LN stations at levels 7, 10, 11, and 12, but only that at level 11 was significant ($p = 0.03$). Right

lobectomies had greater median estimated blood loss (EBL, 200 ± 31 mL vs 150 ± 19 mL; $p = 0.018$) and median operative time (188 ± 5 min vs 168 ± 6 min; $p = 0.014$). Neither overall nor urgent conversion rates to open lobectomy differed between right and left cases (overall, 6.6% vs 6.2%, $p = 0.88$; urgent, 3.7% vs 1.5%, $p = 0.24$), nor did intraoperative complication rates (8.2% vs 3.8%, $p = 0.11$). Right lobectomies had longer median chest tube duration (4.0 ± 0.4 days vs 3.0 ± 0.5 days; $p = 0.03$) and median hospital length of stay (LOS, 5.0 ± 0.4 days vs 4.0 ± 0.4 days; $p = 0.008$). Overall postoperative complication rate was higher after right lobectomies (38.5% vs 27.7%; $p = 0.045$). Rates of individual complications did not statistically differ between right and left in most categories, except prolonged air leak ≥ 7 days (22% vs 12%; $p = 0.007$), with chyle leak (4.5% vs 0.8%; $p = 0.059$) being not quite significant. There was no significant effect on in-hospital mortality (right, 1.6%, vs left, 0%; $p = 0.14$) or on 1-year mortality (right, 12%, vs left, 10%; $p = 0.51$).

Conclusion: Right lung tumors are more frequent, but left lobectomies have lower risk of postoperative complications and better perioperative outcomes. This asymmetry does not affect in-house mortality or 1-year overall survival. Understanding the asymmetry of lung tumors may assist in preoperative discussion and facilitate further improvements in perioperative care during and after lung resection in order to improve short- and long-term pt outcomes.

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Bronchopulmonary Sequestration in Adults – A Croatian Single Institution Experience

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Introduction: Pulmonary sequestration (PS) is a congenital lung defect rarely diagnosed in adults. PS is often misdiagnosed or not recognized early, delaying surgical management. The aim of this case series analysis was to determine the characteristics of all PS patients with surgical resections occurring over an 8-year period in a single tertiary centre.

Methods: A retrospective chart review of the surgical records for all adult patients evaluated and subsequently operated due to PS from 2009 through 2016 at the University Clinic for Thoracic Surgery "Jordanovac", University Hospital Centre Zagreb, was conducted.

Results: Five patients (three males and two females) underwent surgical correction for PS at 16.5 to 68.9 years old (median age 58.0 years; mean age 50.4 ± 20.6 years). All patients ($n = 4$) were symp-

tomatic preoperatively; data was missing for one patient. In the majority of patients ($n = 4$, 80%), PS was suspected or diagnosed by radiological imaging (i.e. multi-slice computed tomography angiography [CTA]) prior to surgery, while intraoperative confirmation was made in one patient (20%). The mean time period from CTA diagnosis to surgery was 36.7 ± 16.8 days (range 21–58 days). The predominant type of PS was intralobar in four patients; one patient had extralobar PS. The main localization of the sequestered segment ($n = 3$, 60%) was the right lower lobe (LL) versus the left LL ($n = 2$, 40%). In all cases ($n = 5$), thoracotomy with lobectomy was performed. The systemic arterial supply to the PS was the celiac trunk artery in one patient ($n = 1$, 20%) and the thoracic aorta in the rest ($n = 4$, 80%). Post-operative complications occurred in three patients (60%) and included atrial fibrillation, acute respiratory insufficiency with retention of bronchial secretions, and surgical wound infection with right-sided empyema of the pleura, respectively.

Conclusions: PS is very rare in adults 50 years and older, with intralobar sequestration predominating. Clinical suspicion of PS should be raised in patients presenting with histories of recurrent respiratory symptoms, particularly in the context of radiological confirmation of persistent lower lobe consolidation. CTA is the imaging modality of choice to aid diagnosis of PS and delineate the anomalous vasculature for preoperative planning. Surgery is curative, but close post-operative follow-up is recommended as surgery-related complications may occur.

P181

Acute Right Ventricular and Pericardial Wall Perforation after a Permanent Endocardial Pacemaker Implantation

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Cardiac perforation by a pacemaker is a rare but potentially fatal complication. The reported rate of occurrence is 0.1–3%. Acute perforations occurring within twenty-four hours of insertion of a pacemaker, it can lead to hemopericardium, cardiac tamponade, and death. Within one month are subacute while perforations which occur after one month are chronic. Pacemaker perforations may occur through the walls of the large veins, atria, or ventricles. The most accurate study to identify and determine the tip's location has been demonstrated to be computed tomography.

A 68-year-old female patient presented to the Emergency Department with a three day history of with syncope. Electrocardiogram presented a complete AV block, requiring a permanent endocardial pacemaker, which was performed without complications and functional. Five days later it stopped capturing pacemaker, whereby a temporal endocardial pacemaker was placed. Thoracic x-ray showed the lead outside the cardiac silhouette. Chest CT revealed the tip of the lead into the pericardial cav-

Fig. 1. Thoracic Rx showed the lead outside the cardiac silhouette with the tip over the diaphragm (a). Chest CT revealed the tip of the lead into the pericardial cavity (b) (for abstract P181).

Fig. 2. a, b Right ventricular perforation with the tip of the lead embedded into the parietal pericardium (for abstract P181).

ity (Figure 1). With a low mini-sternotomy approach, we found a right ventricular perforation with the tip of the lead embedded into the parietal pericardium (Figure 2). The repair was made by placing a “U” shape stitch on the exit orifice of the cable, removing it without any complications. Two days after surgery a new endocardial pacemaker was placed and she was discharged without any complications. The number of pacemaker implantations is still on the rise with a broad variety of techniques described and devices available. Complications are not rare and attention has to be paid to avoid potential risks, identify and treat all kinds of adverse events. Symptoms and signs of pacemaker perforation depend on the location of the displaced lead. It may perforate the vascular chamber and migrate to the pericardial cavity, pleural cavity, mediastinum, lung, diaphragm, chest muscles, and the peritoneal cavity. Diagnosis is made using chest radiography and making the

definitive diagnosis with a chest CT. In this case the tip of the lead was observed perforating into the right ventricle and penetrating the parietal pericardium. It is important to notice that detail must go into location and treatment plans when managing perforations which rarely occur this was an unusual presentation where the lead went beyond the ventricular wall, fact that must be taken into account for future cases.

A Preoperative Nomogram for Tumor Regression Grade Following Induction Chemotherapy for Esophageal Squamous Cell Carcinoma

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Introduction: To (1) evaluate the continuous distribution of tumor regression grade (TRG) in resection specimens after induction chemotherapy for locally advanced esophageal squamous cell carcinoma (ESCC), (2) determine the effects of TRG on survival after esophagectomy, and (3) identify preoperative predictors of TRG.

Methods: From June 2001 to October 2012, 212 patients underwent induction chemotherapy followed by esophagectomy for locally advanced ESCC. TRG, assessed as the percentage of residual primary ESCC cells in resection specimens, was classified histologically by pathologists. Random Forest technology was used for data analysis. A nomogram was developed allowing prediction of TRG through use of preoperative clinical factors for patients with clinically locally advanced ESCC who are candidates for treatment with a radical esophagectomy.

Results: Twenty-four specimens (11%) had no residual primary cancer (ypT0), 39 (18%) had 1% to 10% residual cancer, 48 (23%) had 11% to 50%, 101 (48%) had more than 51%. Survival was worse with increasing residual primary ESCC, plateauing at 75%. Greater TRG was associated with worse 3-year overall survival. Better pathologic grade (G), larger number of pack year smoking, fewer cycles of induction chemotherapy, lower level of creatinine, younger age, greater tumor length and clinical T stage were associated with greater TRG.

Conclusions: Less TRG in response to preoperative chemotherapy is associated with a linear increase in survival after esophagectomy for locally advanced ESCC. A nomogram has been developed that can be used to predict TRG. Therefore, for patients with poor TRG, the role of adjuvant therapy needs to be further assessed in an attempt to improve survival.

Histiocytic Sarcoma of Interdigitating Reticular Cells in the Mediastinum – Case Report

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Reticular dendritic cells are present in the germinal center of lymph nodes, with the function of pathogens phagocytation. They present antigens to B and T lymphocytes, acting, among other fronts, in the cellular memory. Histiocytic sarcoma is a rare malig-

nant neoplasm with proliferation of cells with morphological and immunophenotypic characteristics of mature histiocytes derived from dendritic cells. In the mediastinum, histiocytic sarcoma of interdigitating reticular cells (HSIRC) are even more infrequent, with only 2 reports in the literature. Its histological diagnosis is considered a challenge, since it must be differentiated from other causes of mediastinal neoplasms, such as lymphomas, germinal tumors, and even lymph node metastases from carcinoma.

The report is about a male patient, 69 years old, in schedule of radical prostatectomy due to a prostate adenocarcinoma. In his oncologic staging, he underwent chest tomography that demonstrated a mediastinal tumor suggestive of lymph node enlargement in the right paratracheal chain, of 2.8 cm. The patient was submitted to resection, which showed, in histological analysis, a highly pigmented, slightly differentiated fusiform neoplasm and bands of fibrous tissue, without necrosis and with slight atypia. The immunohistochemical panel showed no specific markers of epithelial, vascular, myogenic, neural or melanocytic histogenesis; In addition, CD21 and CD23 were negative, and CD68 positive. Thus, a diagnosis of HSIRC was made. Surgical resection was the only therapeutic modality performed, currently it is under ambulatory follow-up, with no signs of recurrence.

HSIRC is mainly found in lymph nodes, as a localized disease or in disseminated form. It is extremely rare in mediastinal localization. The greatest difficulty reported in this type of sarcoma is its differential diagnosis. Most patients are asymptomatic or have nonspecific symptoms, and imaging is the main diagnostic tool.

Current treatment protocols suggest optimal treatment as surgery alone, without radiotherapy or chemotherapy. However, a few studies described in the literature are not enough to guide unequivocally the treatment of these neoplasms. The patient is being followed up in the outpatient clinic for about 6 months after surgery, with no signs of recurrence.

In conclusion, this is an extremely rare disease, poorly described in the literature, and should be included among the differential diagnoses of mediastinal lesions.

Rare Localization of Distant Metastasized Evans Tumor in the Chest Cavity

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Introduction: We present a patient with a metastatic Evans tumor (low- grade fibromyxoid sarcoma) of the right thoracic cavity. Its origin in the chest cavity was so far described in only four cases [1–2].

Case: The 19-year-old patient was referred with a cervical lymph node swelling persisting for several months and reported night sweats and weight loss. Surgical biopsy showed a spindle cell neoplasia of unknown dignity. Further analysis revealed a balanced 7; 16 translocation (FUS-CREB3L2 fusion gene) which is pathognomonic for low-grade fibromyxoid sarcoma.

Fig. 1. a CT at time of referral revealing tumor masses in the left scapular musculature (diameter 5.4 cm), intrapulmonary lesions in the right upper lung lobe and perihilar with adjacent atelectasis of the upper and lower lung lobe. **b** CT at time of referral illustrating the mass in the left-sided psoas major muscle (diameter 4.5 cm) (for abstract P184).

A staging PET computer tomography (CT) showed a huge mass with low metabolic activity in the entire upper right hemithorax leading to a mediastinal shift and compressing the superior vena cava, besides several distant metastatic lesions.

Because of progressive dyspnea and in lack of other treatment alternatives, the patient underwent tumor resection of all visible and progressing tumor sites in a staged procedure. A right-sided pneumonectomy and removal of the lesions in the anterior mediastinum was followed by the excision of the cervical and inguinal masses. Seven months later, partial resection of the chest wall (3rd and 7th intercostal space) was performed. After complete recovery two months later, the remaining and meanwhile progressive subcutaneous and intrapulmonary lesions on the left side were resected (wedge resection of the lower lobe). Currently, 12 months after initial diagnosis, the patient is under stable condition.

Conclusion: Treatment options for this rare entity, generally showing little response to systemic chemotherapy, and at this progressed stage of the disease, are scarce.

Radical surgical resection and in case of R1 resection adjuvant local radiation therapy is recommended, albeit little scientific evidence exists due to the rare appearance of this disease.

References:

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Fig. 1. (for abstract P185).

P185

Concomitant Intrathoracic Extrapulmonary and Cervical Hydatid Cyst – 10 Year Follow-Up

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Introduction: We present the rare case of concomitant intrathoracic extrapulmonary and cervical hydatid cysts.

Case: A 30-year-old patient presented with a soft palpable mass in the left supraclavicular region. He was referred after two unsuccessful attempts of fine needle aspiration and reported progressive growth of the lesion and increasing pain. Computer tomography revealed 5x9 cm infraclavicular and 7 x 4cm supraclavicular lesions (Fig. 1) but no intrapulmonary lesions.

Thoracoscopic exploration (VATS, video-assisted thoracic surgery) revealed a cystic lesion at the apex of the left hemithorax without contact to the lung (Fig. 2). After cystotomy and removal of the laminated membrane, the left hemithorax was irrigated twice with two liters of 10% povidone-iodine solution (PI-S) as scolocidal agent. Two days later the cervical hydatid cyst was removed via left supraclavicular incision. After application of gauzes soaked with PI-S around the cyst, PI-S was injected into the cyst cavity. Cystotomy was performed and the laminated membrane and daughter cysts were removed. Histopathologic examination revealed echinococcus granulosus. The patient was discharged with a prescription of 10 mg/kg/day Albendazole for three months.

Five years after discharge the patient showed recurrence of the disease at the apex of the left hemithorax, which was again resected (supraclavicular incision and thoracotomy) and the patient discharged with Albendazole. Up to today, five years after recurrence, the patient remained disease free.

Conclusion: To our knowledge this is the first report of an intrathoracic extrapulmonary hydatidosis removed by VATS. The same protection from spillage has been performed as in open techniques with careful aspiration of the cyst fluid, removal of the laminated membrane and irrigation of the chest cavity with a scolocidal agent.

VATS results in lower morbidity and shorter hospitalization with better esthetic results (1). Although in the literature a follow-up of 20 months revealed no recurrence in 3 patients who underwent VATS for pulmonary hydatidosis (2), our patient suffered

Fig. 2. (for abstract P185).

from recurrence of the intrathoracic cyst. Our report shows VATS as surgical option in the treatment of intrathoracic extrapulmonary hydatid disease.

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**Adenoid Cystic Carcinoma of the Distal Trachea:
A Case Report**

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Primary malignant tumors of the trachea are very rare with incidence less than two cases in a million per year and only ten percent of these are adenoid cystic carcinomas. Eighty percent of all tracheal tumors are malignant. Diagnosis is usually late because symptoms mimic other conditions like asthma. The clinical presentation may be dramatic when the airway is almost obstructed and emergency recanalization is necessary. Diagnosis is made by chest computed tomography scan or magnetic resonance imaging. Definitive treatment is surgical resection alone or followed by radiation therapy or radiation therapy alone. Radical resection is accomplished only in about half of all cases because of the submucosal growth of the tumor and limited length of tracheal resection. The role of adjuvant radiation therapy in negative resection margin cases is not clear but all patients with positive resection margin benefit from radiation therapy. We present a rare case of a 43-year-old male patient with primary adenoid cystic carcinoma of the distal trachea treated by emergency bronchoscopic recanalization and resection of the tracheal tumor with end-to-end anastomosis.

tients were studied with respect to the presence of diabetes, coronary artery disease, heart failure, kidney failure, peripheral vascular disease, and other known associated comorbidities. Chi-Square (χ^2), Fisher's exact test, and Student's t-test were used to compare variables, with significance at $p \leq 0.05$.

Results: In this study, 64 patients with diabetes were identified, 11 (17.2%) of whom developed AFib following RAVTS lobectomy. Patients with diabetes were at higher risk of developing of AFib following surgery (OR 2.52, 95% CI 1.15 to 5.50, $p = 0.02$). The average age of diabetics who developed AFib was 72.7 years and 68.4 years for those who did not ($p = 0.07$). Known comorbidities in patients with diabetes did not confer additional risk, including hypertension ($p = 1.00$), hyperlipidaemia ($p = 1.00$), cardiomyopathy ($p = 0.17$), coronary artery disease ($p = 0.27$), and obesity ($p = 0.67$). There was a trend toward increased risk in diabetics with kidney disease, although it failed to reach significance ($p = 0.07$). Being a former smoker was the only independent risk factor identified, as 90.9% of diabetics with AFib were former smokers (OR 10.38, 95% CI 1.24 to 86.95, $p = 0.03$). Pack-years did not increase risk for AFib, with 47.2 pack-years on average being reported in those who developed AFib, while patients without AFib averaged 49.6 pack-years ($p = 0.87$). Furthermore, there was no significant difference in pre-operative percent forced expiratory volume in 1 second of diabetics who did and did not develop AFib (87.0% vs 80.4%, $p = 0.45$).

Conclusions: Patients with diabetes are at higher risk for developing AFib after RAVTS lobectomy. Known comorbidities of diabetes, including obesity, hyperlipidaemia, and kidney disease, did not confer an increased risk for the development of AFib after surgery; however, being a former smoker puts diabetics at 10-times greater risk than current or never smokers with diabetes.

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**Diabetes Predisposes Patients to Atrial Fibrillation
after Robotic-Assisted Video-Thorascopic Pulmonary
Lobectomy**

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Introduction: Pre-existing diabetes has been described as a risk factor for the development of atrial fibrillation (AFib) following non-cardiac surgery. This study aimed to determine if diabetes and associated comorbidities increase the risk of AFib following robotic-assisted pulmonary lobectomy and improve risk stratification of diabetics.

Methods: Excluding patients with preoperative history of AFib, 353 consecutive patients who underwent robotic-assisted video thorascopic (RAVTS) lobectomy by one surgeon from October 2010 to August 2016 were retrospectively analysed. Pa-

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**Effect of Age on Risk for Atrial Fibrillation Following
Robotic-Assisted Video-Thorascopic Pulmonary
Lobectomy**

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Introduction: Aging is a known risk factor for several post-operative comorbidities, including atrial fibrillation (AFib), leading to increased length of stay and mortality. This study was designed to investigate the effect of age and related comorbidities on new-onset atrial fibrillation after robotic-assisted pulmonary lobectomy to better identify patients at greatest risk.

Methods: We conducted a retrospective analysis of 353 consecutive patients without history of preoperative AFib who underwent robotic-assisted video-thorascopic (RAVTS) lobectomy by one surgeon from October 2010 to August 2016. Patients were an-

alysed with respect to age and associated comorbidities, such as hypertension, hyperlipidaemia, and diabetes. Chi-Square (X^2), Fisher's exact test, and Student's t-test were used to compare variables, with significance at $p \leq 0.05$.

Results: The average age of participants who developed post-operative AFib ($n = 33$) was significantly higher, 72.8 years (yrs) vs. 66.4 yrs ($p < 0.001$). There was a decreased risk in patients under 70 yrs, with only 11 (5.3%) developing AFib (OR 0.31, CI 0.14–0.66, $p = 0.002$). By contrast, 22 (15.3%) of the elderly (age ≥ 70 yrs) experienced new-onset A-fib (OR 2.54, 95% CI 1.19 to 5.41, $p = 0.02$). Those under 60 yrs were at least risk (OR 0.10, 95% CI 0.01 to 0.75, $p = 0.02$), and those ≥ 80 yrs were at greatest risk (OR 2.74, 95% CI 1.03 to 7.28, $p = 0.04$). While the elderly in our cohort had a higher rate of many well-described comorbidities, including hypertension, hyperlipidaemia, coronary artery disease, and cardiomyopathy, none of these conferred an increased risk of post-operative AFib. Among those over 70 yrs, only BMI, particularly an obese BMI (≥ 30 kg/m²), led to a higher risk ($p = 0.02$ and $p = 0.003$, respectively). Among the elderly, obese patients developed AFib at 2.3 times the rate of those with normal or overweight BMI's (OR 4.21, 95% CI 1.66 to 10.68, $p = 0.002$). Conversely, only being a former smoker increased the risk of AFib in those under 70 yrs (OR 4.79, 95% CI 1.23 to 18.70, $p = 0.02$). The risk in former smokers was independent of pack-years and duration of cessation prior to surgery. Furthermore, the risk of AFib was not significantly affected by intra-operative complications in either group.

Conclusions: Patients aged 70 years or older are at increased risk of AFib after RAVTS lobectomy, particularly if they are obese. Those under 70 years are at increased risk if they are former smokers.

Results: A total of 374 pts (mean age 67.4 ± 0.5 yr, range 24–87) were included, with 42.5% males vs 57.5% females. Most common histologies were adenocarcinoma (61%) and squamous cell (19%) and neuroendocrine (8.5%) carcinoma. Primary cancers were more common in upper lobes ($p < 0.001$). Neither median estimated blood loss (EBL) nor median operative time differed between upper and lower lobectomies ($p = 0.33$ and $p = 0.53$, respectively). Intraoperative complication rates did not differ between upper and lower lobectomies, except that overall conversion rate to open lobectomy was higher for upper lobectomies (8.2% vs 2.6%, $p = 0.04$), but urgent conversion for bleeding did not significantly differ (3.1% vs 2.6%; $p = 0.77$). Upper lobectomies had higher median chest tube duration (4.0 ± 0.4 days vs 3.0 ± 0.5 days; $p = 0.002$) and median hospital length of stay (LOS; 5.0 ± 0.3 days vs 4.0 ± 0.3 days; $p = 0.001$). Overall postoperative complication rate was higher for upper lobectomies (39.3% vs. 24.8%; $p = 0.006$). Individual complication rates did not differ, except upper lobectomies had more atrial fibrillation (12.5% vs 4.3%; $p = 0.014$), mucus plugging (6.2% vs 0%; $p = 0.006$), and pneumonia (8.2% vs 2.6%; $p = 0.04$). Upper lobectomies resulted in more pts with both pulmonary and cardiac complications (9.7% vs 0.9%, $p = 0.004$), but not more pts with only pulmonary or only cardiac complications (both $p > 0.20$). There was no significant effect on in-hospital mortality ($p = 0.18$) or on 1-year overall survival ($p = 0.87$).

Conclusion: Our study shows that upper lobectomies have higher overall conversion and postoperative complication rates, but not higher in-hospital or 1-year overall mortality. Understanding this difference between upper and lower lobectomies is necessary to effectively counsel pts and to further improve perioperative outcomes after robotic-assisted pulmonary lobectomy.

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Perioperative Outcomes after Robotic-Assisted Pulmonary Lobectomy for Upper Versus Lower Lobe Lung Malignancies

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Introduction: Upper lobectomies have been previously reported to have better outcomes than lower lobectomies after conventional thorascopic or traditional open lung surgery. In this study, we explored whether upper vs lower lobe lung malignancies have different perioperative outcomes and survival after robotic-assisted pulmonary lobectomy.

Methods: We retrospectively analyzed prospectively collected data for all patients (pts) who underwent robotic-assisted pulmonary lobectomy for cancer by one surgeon between Sept 2010 and Aug 2016. We evaluated perioperative outcomes after upper versus lower pulmonary lobectomy.

Poster Walk 5: Epidemiology / Rehabilitation

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Prevalence of Abnormal Spirometry in the General Population of Lausanne According to GLI 2012. The Pneumolau Study

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Chronic respiratory diseases are a significant burden to health care. Using a standard methodology, the BOLD study reported very different prevalences of chronic airway obstruction across a large number of countries. Our study aimed to investigate lung function and prevalence of chronic airway obstruction in the general population of Lausanne, a city of approximately 120'000 inhabitants.

Table 1. Characteristics of the participants, according to questionnaire and spirometry results (for abstract P190)

Questionnaire	%	Normal spirometry	Possible restriction	Chronic obstruction	Reversible obstruction	p value
Smokingstatus						
Never	50.1	94.5	2.8	1.5	1.4	
Former	32.1	91.7	1.8	3.9	2.8	<0.001
Current	17.8	84.0	2.7	10.9	3.5	
Exposure to second hand smoke						
Before adulthood	40.6	92.1	2.6	4.1	1.7	0.608
As adult	52.3	90.3	2.2	5.3	2.7	<0.001
Exposure to other smokes/fumes [§]	17.2	89.1	4.3	4.9	2.6	0.050
Medical diagnosis						
Asthma [§]	5.9	74.5	6.2	14.9	6.8	<0.001
COPD [§]	1.7	53.2	10.6	44.7	2.1	<0.001
Other pulmonary disease [§]	1.4	65.8	21.1	10.5	5.3	<0.001
Previous lung operation [§]	0.7	50.0	25.0	15.0	10.0	<0.001
Chronic symptoms						
Cough [§]	4.6	80.0	6.4	14.4	2.4	<0.001
Sputum production [§]	2.8	68.0	12.0	22.7	4.0	<0.001

Results are expressed as percentage.

Between-group comparisons using chi-square.

[§] Comparison to absence of the condition.

PneumoLaus is a single-centre, cross-sectional study of a random sample of non-institutionalised adults aged 45–85 years from various ethnic backgrounds. It is embedded within the CoLaus cohort investigating since 2003 the occurrence of cardiovascular diseases and their risk factors. Spirometry was performed according to the ATS/ERS guidelines 2005 and interpreted using reference values from the Global Lung Function Initiative (GLI) 2012. If FEV1/FVC or FVC was less than the Lower Limit of Normal (LLN), spirometry was repeated after administrating 4x100 µg salbutamol. Chronic airway obstruction was defined as FEV1/FVC < LLN after bronchodilation (BD). Reversible airway obstruction was defined as FEV1/FVC < LLN before BD and >LLN after BD. Possible lung restriction was defined as FVC < LLN after BD. Respiratory status was obtained by a questionnaire assessing respiratory symptoms, exposure to potential risk factors and respiratory diagnoses.

Between June 2014 and December 2016, 2739 subjects were evaluated. Half (50.1%) were never smokers, 17.8% current smokers and 32.1% former smokers. Questionnaire results are shown in Table 1. Most (91.7%) participants had normal spirometry; 2.1% a possible restriction and 6.2% an obstruction (4.0% chronic and 2.2% reversible). Subgroup analysis showed that 11.1% of current or former smokers had abnormal spirometry results, compared to 5.5% of never-smokers; 6.4% of current or former smokers had a chronic airway obstruction compatible with COPD. Among chronic airway obstructions, 19.4% were found in never-smokers.

This is the first study assessing the prevalence of spirometric abnormalities in Switzerland using GLI 2012 data. It shows an unexpectedly low rate of airway obstruction compared to previous similar studies performed both in Switzerland and in other countries.

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Rehabilitation in Elderly Females with Osteoporosis and Impairment in Pulmonary Function

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Introduction: In elderly females with vertebral osteoporosis (VO) and spinal kyphosis is associated some impairment in pulmonary function. Nearly 10% of lung volume (forced vital capacity) is lost for every thoracic vertebral body collapsed. Increasing kyphosis leads to modest, but predictable, declines in forced vital capacity, as well as other measures of pulmonary function.

These females experience complex disability and significant perturbation of quality of life (QOL). First, we assessed the effects of a 8 week complex outpatient rehabilitation program – RP (pharmacotherapy, educational sessions, breathing techniques and respiratory muscle training, multi-modal exercise and psychological support) on exercise tolerance and QOL. Second, we evaluated the relationship between HRQOL measurements, BMD and the BODE index.

Methods: 38 elderly females with VO and spinal kyphosis, were randomly assigned to a rehabilitation group – RG (n = 20; 68.5 years mean age) and a pharmacotherapy group – PG (n = 18; 69.3 years mean age). Clinical evaluation – body mass index, bronchial obstruction, dyspnoea, exercise (six minute walking distance – 6MWD) (BODE index), the generic HRQOL scale Short Form

Medical Outcomes Study (SF-MOS) and forced vital capacity (FVC) were performed. BMD was measured by dual X-ray absorptiometry in lumbar spine.

Results: After RP, 6MWD variance mean was 42 meters and SF-MOS score had improved with 31%. All females in RG were more satisfied about the overall outcome of their rehabilitative treatment compared with PG patients. We obtained the significant correlations between the mean value of the T-score mean, FVC and generic HRQOL scale SF-MOS score at the beginning and after the RP, and the significant correlations between the BODE index and 6MWD all females.

Conclusions: The impairment and disability in elderly females with VO had a broad dimension. Multi-modal exercise, based on the aerobic exercise, represents the adequate mode of physical training in elderly females with VO. Exercise and maintaining good posture have been important to prevent hyperkyphosis, to improve spine extensor muscle strength and physical functioning, and to be effective for respiratory impairment.

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An Eighth Week Pulmonary Rehabilitation in Patients with Non-Cystic Fibrosis Bronchiectasis – Observational Study

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Bronchiectasis is a suppurative lung disease characterized by wide and distorted bronchi, with daily cough and sputum production and infectious exacerbations. Etiologies and treatments are diverse from lung hygiene with mucolytic agents and physiotherapy, anti-inflammatory agents and antimicrobial agents. International guidelines recommend the inclusion of patients with bronchiectasis in pulmonary rehabilitation (PR) to improve exercise capacity and health-related quality of life (HRQoL).

Purpose: The aim of our study was to analyze the effects of rehabilitation program on quality of life and physical performance (express through 6MWD value – distance walking in 6 minutes) and pulmonary function in patients with bronchiectasis.

Methods: 33 subjects with bronchiectasis and bronchial obstruction with mean FEV1 $\pm$ 50% were assigned to a clinic treatment group (n = 17; 13 males, 4 females; mean age [$\pm$ SD] = 63 $\pm$ 8 years) or an clinical and exercise group (n = 14, 10 males, 4 females; mean age [$\pm$ SD] = 65 $\pm$ 7 years). Subjects in the clinic treatment group received only pharmacological treatment, subjects in the exercise group received an rehabilitation program over an 8-week period (monitoring pharmacotherapy, education, exercise and respiratory muscle training).

Measured outcomes were the distance walked in 6 minutes (6MWD), FEV1, FVC, the generic QoL scale St. George's Respira-

tory Questionnaire (SGRQ). Differences parameter values between groups were tested by ANOVA test.

Results: Both groups showed clinically and statistically significant improvements in 6-minute walk distances and SGRQ scores at 8 weeks; improvements were still evident in both groups at 3 month. By 2 weeks, SGRQ scores had improved by 4 units in the clinic treatment group and by 6 units in the exercise group. 6 MWD had improved in both groups, with 27 $\pm$ 43m in exercise group and 20 $\pm$ 23m in clinical group. Important differences were observed in the mean changes of 6MWD at 8 weeks. At 3 months, both groups were substantially and about equally improved over baseline measurements. Subjects in the exercise treatment group were more satisfied with the overall outcome of their rehabilitative treatment compared with subjects in the clinical group.

Conclusions: Although both groups improved by 8 weeks, subjects in the exercise group achieved larger improvements in 6 MWD values and SGRQ scores. Compared with MID values for 6 MWD in COPD founded in literature, our values of 6 MWD changes are lower.

P193

The Introduction of Step Counters into a Cardiopulmonary Rehabilitation. A Feasibility Study with Descriptive and Statistical Evaluation.

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Introduction: Physical activity in pulmonary and cardiovascular rehabilitation affects mortality, rehabilitation and quality of life. Step counters can increase physical activity. It is still uncertain how study results can be transferred to everyday therapeutic practice.

Therefore the implementation is the aim of this study.

Method: During initial contact with the physiotherapy in the Klinik Barmelweid, patients can be registered by the physiotherapists or are made aware of informative lectures and notices. Informed written consent is given by all patients. They were equipped with a commercial step counter (OMRON HJ-321-E) and instructed in how to monitor their daily activity. The authors chose the following criteria: a long battery life, easy usability and reliability.

In 3 sessions of 15 minutes, patients were instructed on how to handle and evaluate the step counter.

Results: Within three months, 33 patients ($\bar{x}$ 66.6 years, 17 male, $\bar{x}$ CPX 68 watt), have tested the device, averaging 13 days with a stay of 21 days.

Of the patients, 4 rejected the step counter (due to displeasure and a general lack of steps and a lack of motivation), a further three were unable to evaluate the device, and 24 have bought the equipment after their rehabilitation. From the remaining 2, one produced incomprehensible measurement (rollator) while one patient has a step counter installed on his mobile phone. For the evaluation, the first 4 and the last 4 days of the measurement were taken. The difference was 1209 steps (CI 530–1887) and was initially on aver-

Fig. 1. Left: Steps per day during inpatient cardiopulmonary rehabilitation. Right: Correlation between steps and 6 MWT at discharge (for abstract P193).

age 3780 (SD 2190). The correlation to the first and last 6-Min-Walking-Test (6MWT) with the step number was 0.74 resp. 0.80 (both: $p < 0.001$ ***). The delta from the 6MWT to the steps was $r = 0.35$ [0.02–0.63]. A significant correlation was shown in the first 6MWT and the Delta of daily steps: $r = 0.49$ [0.15–0.73] ($p < 0.01$).

Conclusion: Patients have accepted the step counters and evaluation. Therapists were able to give patients a recommendation for daily activity.

The application of the device should be extended for a larger number of suitable cardiac and pulmonary patients. Additionally, further research should be carried out into the sustainability of the intervention after leaving the rehabilitation. It is recommended that the physical activity should be checked after 3 or 6 months.

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Chronic Obstructive Pulmonary Disease Hospitalizations and Emergency Department Visits among Queen Emma Clinic Patients: A Quality Improvement Initiative

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Introduction: There are several known predictors of Chronic Obstructive Pulmonary Disease (COPD) exacerbations. Our clinical observations suggest that among these certain predictors: increasing age, coronary artery disease (CAD), heart failure (HF), diabetes mellitus (DM), and psychiatric diagnoses, may be associated with Emergency Department (ED) visits, hospitalizations, and readmissions among Queen Emma Clinics (QEC) COPD patients.

Methods: All established patients of QEC during the month of July 2015 with a diagnosis of chronic bronchitis, emphysema, asthma, or COPD were identified. A Microsoft Excel spreadsheet was

constructed and populated with patient demographics, including: age, sex, CAD, HF, DM [including hemoglobin A1c (HbA1c)], and psychiatric diagnosis. Outcome measures were respiratory related ED visits, hospitalizations, and readmissions. The observational study period was from July 1, 2015 to June 30, 2016. Univariate analysis of association between potential predictors and ED visits, hospitalizations, and readmissions was performed.

Results: Upon chart review, 587 of 4700 QEC patients (12.5%) were confirmed to have obstructive lung disease. 35% (206/587) had psychiatric diagnoses. 26% (151/587) had DM, and 33.8% (51/152) had HbA1c >8%. 12% (72/587) had CAD while 11% (65/587) had HF. COPD patients with CAD ($p < 0.0001$) or DM ($p = 0.0051$) were more likely to visit the ED and did so during the summer months. COPD patients older than 65 years ($p = 0.008$), with HF ($p = 0.0033$), or DM ($p = 0.0037$) were more likely to be admitted. COPD patients with CAD ($p = 0.029$) were more likely to be readmitted in less than 30 days.

Conclusion: Certain predictors of COPD exacerbations, such as age over 65 years, CAD, HF, and DM are associated with increased ED visits, hospitalizations, and readmissions among QEC COPD patients. Hospitalizations occurred during the hot summer months at the beginning of the academic year. No spike in admissions during the winter flu season was seen. This suggests a successful influenza vaccination program. Our COPD patients with DM as a group were poorly controlled. This may be the result of poor compliance with DM medications. If so, compliance with COPD medications may be poor as well.

Correlations between Smoking Prevalence and the Amount of CO at Foster Care Teenagers

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Introduction: The measured values of CO are directly proportional to the number of cigarettes smoked per day, though there are significant individual variations. Carbon monoxide in exhaled air is most easily monitored biomarker; in the absence of CO in the environment, this is the most well accepted method of measuring the consumption of tobacco.

It is a easily method to determine, asking the smoker to expire in a portable Analyzer, available commercially. CO is expressed in ppm (parts per million), a unit of measurement that can be converted as an equivalent of carboxihemoglobin.

Institutionalized teenagers are more exposed at addictions: smoking, drinking, drug abuse, and this is why we developed a research project on this population. Because of special social conditions, they were systematically excluded from projects and studies.

Methods: A study was conducted based on questionnaires completed by participants. The study population consisted of 156 teenagers institutionalized in foster care system from Mures County. The questionnaire used included questions about tobacco consumption, knowledge of and attitudes towards smoking, and also questions about social statute and passive smoking. Fagerstrom scale was adapted in teenagers. Breath CO value was measured at every respondent.

Results: The study group comprised 156 institutionalized minors (medium age 13.6 ± 2.1). 7.7 % were smokers, 2.6 % ex smokers and 89.7 % nonsmokers. Within the group of smokers, 46.2 % were occasional smokers and 53.8 % daily smokers.

75.5% were from medium school, 24.5% from highschool.

The medium value for breath CO was 1.1 ± 1.35 PPM and 0.61 ± 0.45 % CO. Only 4.7% had CO value over 4.

Conclusions: The results obtained suggest a clear correlation between low percentage of active smokers and low levels of CO (PPM, %). Because of participants' age, smoking history may not be significant and low CO values obtained are related to this issue.

Key Words: CO ppm, smoking prevalence, foster care, teenagers.

Development of an Internet Portal on COPD in Portuguese

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In an era defined by the Internet and the search for information via this mechanism, the authors, after thorough research, considered that there was a gap in this field in relation to the Portuguese language and so in 2015 a website entitled DPOC.PT was created and published which focuses on the disease and is aimed at patients and health professionals.

The authors present data obtained from Google Analytics based on the approximately 18 months of the existence of this website on COPD for Portuguese speaking people. There was also an online survey carried out (among the users of our site) between January and May 2016.

During this period there were about 156,000 page views and 38,000 users.

Of the total number of visitors, 55% were from Portugal and around 29% from Brazil. The main remaining countries were the United States, United Kingdom and Spain.

Most of the visitors were female (68.1%), aged between 25 and 34 years (36.47), followed by the age group of 35 to 44 years.

Of the total of number visits, three-quarters were first time visitors and the rest had already visited this page before. This number increased over the subsequent months.

Just over 16000 visitors accessed through researching sites like Google or Yahoo; the second most common source was social networking sites like Facebook.

The survey was completed by 145 visitors, 80 female and 65 male. About 93.4% of users of the site DPOC.PT said that the constantly updated information had improved their knowledge about the disease. The main reason stated for consulting the site was the need for advice on COPD management (reported by 69.7% of users), followed by information on the consequences of the disease.

The survey respondents were also asked to review our website on a numerical scale of 0–5 based on the following parameters: Quality of Information, Information Quantity, Level of Detail, Site Design and Graphics. The highest grade was obtained in the Quality of Information (4.14) and the lowest was the Level of Detail (3.69).

In addition to these results 89% of visitors said they would recommend this site to others.

Conclusions: After 18 months, the authors are satisfied with the results and plan to continue with this project. Alongside the positive results of the questionnaire, the sustained increase in users and the considerable number of people who return to visit the site seem to suggest that DPOC.PT is helping to answer visitor queries and concerns about COPD.

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Race as a Factor of Providing Care

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Introduction: Health care considers all areas of medical provision, from acute care with life-threatening situations, to end-of-life decisions. Even though multiracial population is involved in the medical field, we have seen that there is a tendency towards race-based care considerations. The Institute of Medicine had reported some evidence and concluded the existence of racial and ethnical disparities. We studied whether healthcare providers considered race as a modifier on the attention given and the difference among physicians, nurses, medical students, and other hospital members.

Methods: An anonymous 30-question survey was conducted in 124 health institutions in 39 different countries (ETHICS study). The questionnaire addressed opinions regarding ethical issues concerning in affording care.

Results: 10,106 surveys were completed. Of respondents, 39.4% (n = 3984) were males, 56.8% (n = 5740) females, and 3.8% (n = 380) did not mention their gender. From all professions, physicians and nurses represented 53% (n = 5354), medical and nursing students were 33.2% (n = 3351) and others 13.8% (n = 1401). When responding to the question “As a healthcare provider, does the care you provide depend on the patient’s race?”, 4.4% of the physician and nurse population (n = 238) agreed that the support offered by them depended on the patient’s race, in comparison with medical and nursing students with 3.5% (n = 118) and other healthcare providers with 4.2% (n = 59); ($p \leq 0.0001$). From the physicians and nurses that answered “Yes” to the question, 63.7% had between 0 and 24 years of experience, and 11.8% had from 25 to 48 years of experience in treating patients; ($p = 0.08$)

Conclusions: Physicians and nurses in our study were most likely to be influenced by the patients’ race, this in contrast to nursing students, medical students, and other clinicians. Physicians and nurses in our study who stated that “race is a factor for how they provide care for their patients” were the ones with fewer years of clinical experience. Further studies are required to determinate the impact of these findings on health care outcomes.

P202

Does Religion Affect the Care Given by Providers of Sexual Offender Patients?

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Introduction: 86 % of the world population is affiliated with a specific religion. Many of our patient rely on spirituality and/or faith for the sake of their wellbeing and/or their loved ones. The purpose of this study was to determine the relation between beliefs and the approach and care to patients in the intensive care unit (ICU) that were identified as a prior sexual assaulter.

Methods: After institutional review board approval, a 30-question survey was conducted among healthcare providers of 124 different health institutions in 39 different countries. The questionnaire addressed opinions regarding ethical issues, religion, spiritualism, and the approach of healthcare providers to specific group of patients.

Results: A total of 10,106 surveys were completed and analyzed. From them, those who answered “No” to the question “You are managing a patient in the ICU when you discover that they have been imprisoned for having sexually assaulted someone. Do you change your approach to this patient?”, 82.5% (n = 3234) were males, and 82.3% (n = 4550) were females. The total of men and women who responded to “Yes” to this question were 17.5% (n = 688) and 18.7% (n = 1044) respectively, of them, the religious belief that was more prevalent to change the approach was Islam in 25.6% (n = 150) of respondents; also, of the 1743 individuals that answered “Yes”, 20.9 % (n = 350) had religious other than Islam, Christian/Catholic and Judaism. This was followed by Judaism in 19.3% (n = 26) and Christian/Catholic in 16.7% (n = 1217), ($p \leq 0.001$).

Conclusion: Religious beliefs in healthcare providers can affect their medical approach to sexual offenders. Healthcare providers with the Muslim faith were more likely to suggest they would care differently for these patients and alter their approach.

Poster Walk 6: Basic Science / Pulmonary Hypertension

P204

Autophagic Dysfunction Is Improved by the Administration of the Endoplasmic Reticulum Stress Inhibitor Trimethylamine-N-Oxide in a Murine Model of Neutrophilic Asthma

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Introduction: Autophagy and endoplasmic reticulum (ER) stress has been considered to be an important regulator of airway inflammation in the pathogenesis of eosinophil-dominant bronchial asthma, but the mechanisms involved in neutrophilic asthma remain not fully understood. In the present study, we assessed the effects of the endoplasmic reticulum inhibitor (trimethylamine-N-oxide, TMAO) on autophagic dysfunction and airway inflammation in the lung tissue of the neutrophilic asthma model (OVA_{LPS}-OVA mice) and in the bronchial epithelial cell model (tunicamycin-induced MLE-12).

Method: The endoplasmic reticulum inhibitor (TMAO) was administered in the neutrophilic asthma model (OVA_{LPS}-OVA mice) and in the bronchial epithelial cell model (tunicamycin-induced MLE-12), and autophagy markers (Atg7, p62 and LC3), ER stress indicators (PERK, ATF4 and CHOP) and inflammation indicators (IL-6, IL-8 and TNF- α) were evaluated via real-time PCR and western blot.

Results: OVA_{LPS}-OVA mice showed increased airway inflammation, activated ER stress and autophagic dysfunction in the lung tissue, but the administration of TMAO reduced expression of ER stress indicators (p-PERK, ATF4 and CHOP), improved autophagic dysfunction (expression of Atg7, p62 and LC3) and decreased expression of inflammation indicators such as IL-6, IL-8 and TNF- α in the lung tissue of OVA_{LPS}-OVA mice. Additionally *in vitro*, tunicamycin-induced MLE-12 exhibited activated ER stress, autophagic dysfunction and increased inflammation response, and the endoplasmic reticulum inhibitor (TMAO) treatment also had a protective impact by regulation of autophagy in tunicamycin-induced MLE-12.

Conclusions: The endoplasmic reticulum inhibitor (TMAO) improves autophagic dysfunction, and decreases airway inflammation in the lung tissue of OVA_{LPS}-OVA mice and in tunicamycin-induced MLE-12, suggesting the effects of autophagy and ER stress on airway inflammation in neutrophil-dominant asthma, which may offer novel opportunities for treatment of neutrophil-dominant asthma.

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Real-Time Exhaled Breath Analysis Identifies Altered Metabolic Signature in Cystic Fibrosis

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Introduction: Lung pathology in cystic fibrosis (CF) is characterized by chronic airway inflammation, often accompanied by bacterial infection and pulmonary exacerbation. A personalized treatment approach is often limited by a lack of non-invasive objective methods assessing current inflammatory processes. New mass spectrometry techniques analyzing exhaled breath might have the potential to better define airway diseases in terms of pathophysiological and clinical phenotyping. We aimed at defining profiles of volatile organic compounds in exhaled breath from patients suffering from CF disease using real-time mass spectrometry.

Methods: In this prospective matched case-control study, 30 patients with CF were recruited from outpatient clinics. Healthy control subjects were matched one-to-one according to age, gender and smoking state. Exhaled breath analysis by untargeted mass spectrometry was performed using secondary electrospray ionization-high resolution mass spectrometry (SESI-HRMS). The primary outcome was the 'CF-specific' exhaled breath pattern, a secondary outcome were correlations between breath features and different blood markers related to inflammatory processes.

Results: Exhaled breath from 30 patients with CF (mean age 26.0 ± 13.0 years, FEV1 $78.0 \pm 27.8\%$ predicted, 6.2 ± 3.0 pack years) and one-to-one matched 30 controls (mean age 27.9 ± 14.0 years, FEV1 $101.5 \pm 6.3\%$ predicted, 5.5 ± 3.0 pack years) was analyzed using SESI-HRMS. 52 features were found to be highly specific (p-value <0.05 / q-value <0.01) to differentiate patients with CF from healthy controls, the two most discriminating features showed a prediction AUROC of 77.1% (CI 62.2%–87.8%) with a specificity of 80.0% and a sensitivity of 63.3%. Metabolites from oxidative stress processes such as fatty acids were found to differ significantly between patients with CF and healthy controls. Furthermore, in patients with CF, 31 and 123 features were found to correlate with the blood concentration of eosinophilic and basophilic granulocytes, respectively.

Conclusion: Breath analysis by real-time SESI-HRMS allows the identification of features discriminating patients with CF from matched, healthy controls within a few minutes. It may also allow to identify subjects with eosinophilic and basophilic inflammation. Real-time mass spectrometry is a powerful and easily applicable method to get new insights into the pathophysiology of CF.

Read-Through Fusion Transcripts in Lung Cancer

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Introduction: Read-through fusion transcripts (RTFTs) are special chimeric RNAs resulting from the splicing of exons from two adjacent genes leading to aberrant protein products. Fusion genes with oncogenic activity have been identified in various cancers (e.g. leukemia, prostate cancer), providing new families of prognostic markers. RTFTs have not been investigated in an exhaustive manner in lung cancer. Genome-wide microarray profiling and whole-genome sequencing provide powerful tools for the systematic screening of fusion transcripts. The aim of our study was to develop a new methodology for the identification of RTFTs derived from exon array data. This methodology was applied to a lung cancer data set in order to determine the frequency and clinical relevance of this phenomenon in lung cancer.

Material and Methods: Data from the SAKK 19/05 trial investigating the safety and efficacy of combined targeted therapies in advanced non-squamous non-small cell lung cancer were investigated. 42 bronchoscopic biopsies were taken at baseline and mRNA extracts were profiled using Affymetrix Human 1.0 ST exon arrays. Exon array data were analyzed using correspondence analysis with spatial constraints (MULTISPATI-CA). This method takes into account the chromosomal location and orientation of exon-level and intergenic probesets in order to detect local spatial similarities between adjacent genes reflecting the presence of putative RTFTs.

Results: MULTISPATI-CA identified a series of strongly auto-correlated adjacent genes. It included gene clusters (e.g. SERPIN superfamily), open reading frames (C1orf189, CXorf30) and known RTFTs (WFDC6). RTFTs were typically found in a small proportion of patients (<10%) and included adjacent genes playing important roles in various aspects of carcinogenesis (SERPINI2), tumor suppression (KCNRG) and cancer mutagenesis (APO-BEC4). The fusion transcript combining Prominin 1 (PROM1), a gene involved in cell proliferation/apoptosis part of the signalling pathway "Transcriptional misregulation in cancer", with fibroblast growth factor binding protein 2 (FGFBP2) was significantly associated with patients' overall survival (HR: 0.76 [0.63–0.9255]; $p = 0.006$).

Conclusion: MULTISPATI-CA was successfully used to identify putative RTFTs in lung cancer. The candidates were clinically relevant and could constitute new prognostic and therapeutic markers.

Multi-Walled Carbon Nanotubes Exposure in Healthy and Chronic Obstructive Pulmonary Disease

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Rationale: WHO predicts that COPD will become the third leading cause of death worldwide by 2030. A number of recent epidemiological Studies has shown increased adverse pulmonary health effects in people suffering from COPD following exposure to particulate matter. Furthermore, the production nanomaterials for many applications is rapidly progressing. The risks of occupational exposures at working places where engineered nanoparticles, such as multi-walled carbon nanotubes (MWCNTs) are processed, have received limited attention to date. The aim of the current study is to assess potential risks for people suffering from COPD exposed to MWCNTs at the working place, using sophisticated *in vitro* and *in vivo* models.

Methods: Primary human bronchial epithelial cells from healthy and chronic obstructive pulmonary disease (COPD) patients were grown *in vitro* at the air-liquid interface (ALI). Cells were exposed to aerosolized MWCNTs resulting in two concentrations deposited onto the cell surface (0.12 µg/cm²; 0.4 µg/cm²). Differentiation, epithelial integrity, pro-inflammatory status and viability were monitored 24h after exposure using LSM, TEM, LDH analysis, ELISA and real-time qPCR.

For *in vivo* experiments C57BL/6 mice were treated over 4 weeks by Elastase and LPS in order to establish a COPD model. Mice were exposed to 18.75 µg/ml or 37.5 µg/ml of MWCNTs by intranasal instillation. Frequency, phenotype and function of immune cell populations in the respiratory tract were monitored following exposure to MWCNTs.

Results: Differentiation and epithelial integrity in *in vitro* cultures was maintained after exposure to MWCNTs as visualized by LSM. TEM micrographs showed that MWCNTs were localized extra- and intracellular and the data revealed that neither release of LDH, RNA expression nor the secretion of pro-inflammatory cytokines was triggered by MWCNTs.

COPD was successfully established in C57BL/6 mice and preliminary data showed no major activation of immune cells, such as DC's or macrophages.

Conclusions: Our *in vitro* model represents an appropriate tool to investigate effects of nanomaterials on the human respiratory tract. Realistic occupational dosage of MWCNTs did not cause any adverse effects in cells from healthy or COPD donors *in vitro*. The *in vitro* findings require confirmation in the *in vivo* model, before conclusions regarding health effects of MWCNTs in persons with COPD may be drawn.

Nicotine Exposure during Gestation and Lactation Affects Cell Proliferation and Lung Volume during Lung Development in Mice

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Introduction: To ensure adequate gas exchange lung undergoes through different phases of development. Oxygen exchange becomes functional during alveolar phase characterised by septation of existing air sacs and microvascular maturation. Lung development can be affected by several genetic and environmental factors such as cigarettes smoke (CS). Epidemiological studies showed that exposure to CS during lung development can have an immediate effect, as low birth weight and impaired lung function at birth, but can also manifest later in life making the offspring more susceptible to cardiovascular diseases, obesity and diabetes. The main addictive component of CS is nicotine that can freely cross placenta and accumulate in mother's milk. Since detrimental effects of nicotine are well described, the mechanism of action of long term effect are still vague. Therefore, the aim of this study is to investigate the effect of nicotine during lung development, regarding the processes of cell proliferation and apoptosis during alveolar phase. Since the alveolar phase occurs after birth in mice, we took advantage of this model for our study. We exposed mice to nicotine in drinking water, during gestation and lactation, and collected pups at postnatal day (PND) 2, 8 and 16. The concentration used is 200 mg/L which corresponds to a medium to heavy smoker. Pups' lungs were further processed for gene and protein expression and stereological analysis.

Results: Nicotine exposure affected lung gene expression at PND2 with strong upregulation of cell cycle related genes and downregulation of genes involved in immunity. These genetic changes translated in increased cell proliferation from 16 to 25% detected at PND8 ($p < 0.001$) and increased septal surface and increased lung and parenchymal volume at PND16. Further analysis of individual cell type showed an increased percentage of alveolar epithelial cells (AEC) type I and decreased number of endothelial cells.

Conclusions: Our results show an increased cell proliferation of AEC type I cells, upon nicotine exposure, resulting in an increased lung and parenchymal volume and septal surface. At the same time, total number of vessels appears to be decreased. Do these early consequences affect lung function and how do they translate in changes detected in early infancy such as increased bronchial hyperreactivity or in the adulthood such as lung fibrosis and COPD is something we would like to pursue in our study.

P209

Effect of Normobaric Hypoxia on Pulmonary Hemodynamics in Patients with Precapillary Pulmonary Hypertension

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Introduction: Patients with precapillary pulmonary hypertension (PH, pulmonary arterial or chronic thromboembolic pulmonary hypertension, PAH/CTEPH) may experience disease deterioration upon exposure to a hypoxic environment during air travel or altitude sojourns due to hypoxic pulmonary vasoconstriction.

Table 1. (for Abstract P209)

	PAH/CTEPH (n = 20)		Intermediate (n = 7)		Controls (n = 12)	
	FiO ₂ 0.21	Mean Change 95% CI with FiO ₂ 0.16	FiO ₂ 0.21	Mean Change 95% CI with FiO ₂ 0.16	FiO ₂ 0.21	Mean Change 95% CI with FiO ₂ 0.16
Heart Rate, bpm	70 ± 9	4 (1 to 7)*	78 ± 12	3 (0 to 6)	68 ± 9	5 (2 to 9)*
mPAP, mmHg	40.5 ± 12.2	2.6 (-0.1 to 5.2)	23.9 ± 4.2	0.7 (-3.5 to 4.9)	16.7 ± 1.7	1.7 (-0.2 to 3.6)
Cardiac index, l/min/m ²	2.6 ± 0.7	-0.04 (-0.3 to 0.2)	5.2 ± 1.9	0.04 (-0.5 to 0.6)	3.2 ± 0.9	-0.1 (-0.4 to 0.1)
PVR index, WU	6.1 ± 3.3	0.7 (-0.2 to 1.7)	1.3 ± 0.4	0.04 (-0.5 to 0.6)	1.8 ± 0.7	0.6 (0.1 to 1.0)*
SaO ₂ (%)	93.9 ± 3.5	-7.4 (-12.2 to -2.6)**	95.7 ± 2.8	-4.4 (-10.0 to 1.1)	97.3 ± 1.5	-4.9 (-7.8 to -2.0)**
PaO ₂ (kPa)	9.3 ± 1.6	-2.5 (-3.4 to -1.6)***	10.4 ± 1.7	-2.7 (-5.2 to -0.3)*	10.7 ± 1.4	-3.3 (-4.5 to -2.1)***
PaCO ₂ (kPa)	4.6 ± 0.5	-0.3 (-0.5 to -0.1)*	4.8 ± 1.9	-0.6 (-1.4 to 0.1)	4.4 ± 1.0	-0.2 (-0.7 to 0.3)

mPAP: mean pulmonary artery pressure; PVR: pulmonary vascular resistance; SaO₂: arterial oxygen saturation; PaO₂: partial pressure of oxygen; PaCO₂: partial pressure of carbon dioxide. Note: Data are given as mean ± SD. Within group differences * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Between group differences in the changes upon exposure to hypoxia were not statistically significant.

We investigated the effect of breathing a hypoxic air mixture on pulmonary hemodynamics and blood gases in PH in comparison with unaffected controls.

Methods: Patients scheduled for diagnostic right heart catheterization had hemodynamic assessments under ambient air (FiO₂ 0.21) and after 10 min of breathing nitrogen-enriched air (hypoxia FiO₂ 0.16). Patients were stratified according to their mean pulmonary arterial pressure (mPAP): PH (mPAP ≥25mmHg, pulmonary artery wedge pressure (PAWP) ≤15mmHg), unaffected controls (patients undergoing RHC for evaluation of dyspnea with mPAP <20 mmHg) and intermediate (mPAP 20–24mmHg).

Results: 20 patients with PH (12 females, 8 PAH, 12 CTEPH; mean ± SD age 63 ± 14y), 12 controls (12 females, age 63 ± 7y) and 7 patients from the intermediate group (3 females, age 66 ± 12y) were included. PaO₂ significantly decreased in all groups upon exposure to hypoxia (see table 1). However, hypoxemia was not accompanied by significant changes in mPAP or cardiac index in any group. Unexpectedly, pulmonary vascular resistance significantly increased in the control group. The test was well tolerated by all participants.

Conclusions: Our data suggest that a short-term exposure to a moderately reduced FiO₂ in patients with PAH/CTEPH associated with chronic hypoxemia in sea level conditions seems not to further exacerbate derangements in pulmonary hemodynamics. Whether the hemodynamic effects of a short hypoxic challenge are in concordance with the response to prolonged hypoxia remains to be determined.

underlying liver conditions were cirrhosis of unknown origin, portocaval shunt, biliary atresia, and cavernoma of the portal vein. 3 patients suffered with dyspnea and 1 had no cardiopulmonary symptom. The mPAP was 39.7mmHg (range 30–48) and the indexed mean pulmonary vascular resistance (PVRi) was 10.0 Wood units (range 4.5–18.5). The 1st and 2nd patient, one in functional class (FC) III and one with no cardiopulmonary symptom, were initially treated by combination therapy consisting of macitentan, an endothelin receptor antagonist (ERA) and tadalafil, a phosphodiesterase-5 inhibitors (PDE5i). Both showed significant improvement of hemodynamic profiles allowing discussion for OLT. The 3rd patient was in FC IV and treated by triple combination therapy with ERA, PDE5i and intravenous prostacyclin (epoprostenol). Under this treatment, PoPH improved dramatically (50% PVR decrease and mPAP decreased from 48 to 32mmHg) and the patient underwent OLT. Epoprostenol was withdrawn 9 months after OLT and PoPH is now controlled (FC I) under ERA, PDE5i and selexipag, an oral agonist of the prostacyclin pathway. The 4th patient underwent a surgical mesocaval shunt for a cavernoma of the portal vein. 7 years later, he was in FC III with mildly elevated PVRi. He was bridged to liver transplantation by a ERA treatment. OLT was performed and PoPH is now almost resolved (mPAP decreased from 30 to 20mmHg).

Conclusion: Outcome of pediatric PoPH in the modern era may be largely improved when managed at an expert center offering PH and OLT multidisciplinary management. Further studies are needed to better define the pronostic and treatment in this population.

P210

Modern Management of Portopulmonary Hypertension in Children: Experience of an Expert Center

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Introduction: Portopulmonary hypertension (PoPH) is a rare but serious complication of portal hypertension or portosystemic shunting. PoPH management may require orthotopic liver transplantation (OLT) but this procedure is contraindicated in patients with severe hemodynamic impairment. There are only few reports describing PoPH management and outcome in children.

Methods: We describe our series of children with PoPH. Diagnostic workup was performed according to the current international guidelines and precapillary pulmonary hypertension (PH) was confirmed by right heart catheterization. All cases were discussed by our multidisciplinary PH program team. Patient data was collected via chart review.

Results: 4 patients were identified in our pediatric center from 2013 to 2016, with a mean age of 15years old (range 13–18). The

P211

Pulmonary Perfusion Changes after Balloon Pulmonary Angioplasty (BPA) for Chronic Thromboembolic Pulmonary Hypertension (CTEPH)

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Introduction: Balloon pulmonary angioplasty (BPA) is a treatment option for inoperable chronic thromboembolic pulmonary hypertension (CTEPH) or persisting pulmonary hypertension (PH) after pulmonary endarterectomy (PEA). Dual-Energy Computed-tomography (DECT) is an innovative and robust technology that allows the assessment of lung perfusion changes. The purpose of this study was to evaluate pulmonary perfusion changes after BPA by DECT.

Methods: Twenty segmental BPAs were performed in 6/7 inoperable patients and 1/7 patient with persisting PH after PEA (years: 70 ± 11; mPAP: 38 ± 3 mmHg; PVR: 5 ± 4 UW). We evalu-

ated vascular permeability, pulmonary perfusion and pulmonary venous return using a 4-point scale (from 1: normal to 4: absence) on the pulmonary angiography before and after BPA.

DECT was performed prior and 3 months after BPA. Vascular permeability was rated using the same 4-point scale. For the lung perfusion study, iodine parenchymal concentration (C_{Lung} , ug.cm-3) was measured and normalized by the left atrial iodine concentration (C_{LA}).

Results: After BPA, we observed a significant increase in vascular permeability, pulmonary perfusion and pulmonary venous return on the pulmonary angiography (median score from 3 to 2; $p < 0.0001$, for all parameters). One patient presented a transitory desaturation after BPA with spontaneous resolution. No other complication was reported. At 3 months follow-up, a significant increased perfusion on DECT in treated segment was observed ($C_{\text{Lung}} / C_{\text{LA}}$ from 21 ± 4.9 to 44 ± 9.8 ; $p = 0.003$); this corresponded to a mean 107% $C_{\text{Lung}} / C_{\text{LA}}$ increase. However no significant vascular permeability changes were observed (median score from 2 to 2, $p = 0.175$).

Conclusions: Improved pulmonary perfusion was observed immediately after BPA on the angiography, confirmed 3 months later on DECT. Pulmonary perfusion assessed by DECT may be a non invasive indicator of BPA treatment effect.

P212

MRI Derived Global Right Ventricle Diastolic Strains Correlate with MPAP in CTEPH Patients

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Introduction: Feature tracking is a new technique allowing measurement of right ventricular strains and strain rates from cardiac cine magnetic resonance imaging (MRI), based on the detection of image pattern motion during the cardiac cycle. This present work uses feature tracking MRI to investigate the modification of the right ventricle diastolic function in patients with Chronic Thromboembolic Pulmonary Hypertension (CTEPH).

Methods: Thirteen patients with suspected CTEPH were assessed by right heart catheterization (RHC) and cardiac MRI, including standard cine acquisitions during breath-hold. 4C, right and left 2C and short-axis views were used for feature tracking analysis. Global right ventricular longitudinal, circumferential and radial strain and strain rates were correlated with the mean pulmonary artery pressure (mPAP) measured during the RHC. Systolic, E and A decelerations (corresponding respectively to the early diastolic filling and to the atrial contraction) were measured from the descending slopes of the global longitudinal strain rates (in $\%.\text{ms}^{-2}$) (Figure 1).

Results: CTEPH was confirmed in 11 / 13 patients. The mPAP was 30.3 ± 15.2 mmHg (11–66 mmHg). Feature tracking was successful in all the patients, but in 2 patients (further excluded from the analysis) it was not possible to separate the E and A waves. Representative examples of peak strain maps and curves of the

Fig. 1. Representative peak longitudinal, radial and circumferential strain maps of the right ventricle derived from feature tracking cine MRI in a patient with a normal mPAP (for abstract P212).

Fig. 2. Examples of global right ventricular longitudinal strain and strain rate in patients with a normal pulmonary pressure (upper row) and with a mild pulmonary hypertension (lower row). The strain rate curves demonstrated clearly the S (systolic), E (early) and A (atrial) waves with the corresponding decelerating slopes (in red) (for Abstract P212).

right ventricle are shown in Figures 1 and 2. Peak diastolic circumferential strain rate ($R^2=0.58$, $p = 0.01$) and the E deceleration ($R^2=0.48$, $p = 0.03$) but not systolic strain indices were significantly correlated with mPAP.

Discussion and Conclusion: The correlation between the RV diastolic function and the mPAP in CTEPH patients could reflect subclinical compensatory hypertrophy of the RV wall following chronic pressure overload. This study suggests a strong potential of feature tracking cardiovascular MRI to diagnose and monitor patients with pulmonary hypertension.

P213

Severity of Pulmonary Hypertension Correlates with Patients' Daily Physical Activity

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Introduction: The main symptom of pulmonary arterial and chronic thromboembolic pulmonary hypertension (PH, PAH/CTEPH) is impaired exercise tolerance leading to reduced daily activity and quality of life. The aim of this study is to analyze daily physical activity in patients with PAH/CTEPH and to correlate it with pulmonary hemodynamics.

Methods: Incident patients with PAH/CTEPH had hemodynamics assessed by right heart catheterization (RHC) and activity monitoring by SenseWear worn at the upper arm for approximately one week. The 6-minute walking distance (6MWD) and New York Heart Association functional were assessed. Pearson Correlations and regression analysis between activity parameters and hemodynamics were calculated.

Table 1. Pearson correlations between activity parameters and hemodynamics (n = 21) (for Abstract P213)

	Average METs	Low (<3METs)	Moderate (3–6METs)	Steps/day	Active Energy expenditure/day
6MWD	0.643**	−0.545*	0.604**	0.840**	0.457*
NYHA	0.114	−0.285	0.192	−0.047	0.271
mPAP	−0.194	0.255	−0.342	−0.089	−0.340
PAWP	−0.303	0.348	−0.411	−0.228	−0.480*
CO	0.245	−0.365	0.544*	0.228	0.516*

Abbreviations: 6MWD: 6 minute walking distance; NYHA: New York Heart Association functional class; mPAP: mean pulmonary arterial pressure; PAWP: pulmonary arterial wedge pressure; PVR: pulmonary vascular resistance; CO: Cardiac output; MET: Metabolic equivalent units (1MET is 3.5ml O₂/kg/min); * p < 0.05, ** p < 0.01.

Table 2. (for Abstract P213)

Dependent variable = cardiac output, l/min	Univariable analysis			Multivariable model		
	coefficient	95% CI	P	coefficient	95% CI	P
Sex (female = 0, male = 1)	−0.5	−2.3 to 1.2	0.532			
Age, years	0.04	−0.01 to 0.09	0.103			
Average METs	1.25	−1.1 to 3.6	0.284			
Low (<3METs)	−0.004	−0.009 to 0.001	0.104			
Moderate (3–6METs)	0.009	0.002 to 0.016	0.011	0.008	−0.01 to 0.025	0.382
Steps/day	0.000	0.000 to 0.000	0.169			
Active Energy expenditure/day	0.000	0.000 to 0.001	0.017	0.000	−0.001 to 0.001	0.850

n = 21 patients. Independent variables with p < 0.05 in the univariable analysis were included into the multivariable analysis. The multivariable model was adjusted for the two variables listed, R² was 0.297, P < 0.042. CI = confidence interval. MET: Metabolic equivalent units (1MET is 3.5ml O₂/kg/min).

Results: Twenty-one patients (9 females, median (IQR) 57 (40; 69) years, mPAP 44 (34; 54) mmHg, cardiac output (CO) 5 (4.0; 6.3) l/min, 6MWD 397 (271; 590) m, steps/day 2373 (1206; 8391)) were included. Eleven patients had a sedentary lifestyle (<5000 steps/day), nine were moderately active (5000–10'000 steps/day) and one very active. Hemodynamic parameters and the 6MWD correlated with activity parameters (Table 1, 2).

Conclusion: Everyday life activity correlates with hemodynamic disease severity and hospital-based exercise assessments by the 6MWD thus rendering it a promising outcome measure for use in clinical practice and research.

P214

Right-to-Left Shunt in Patients with COPD at High Altitude – A Randomized, Placebo-Controlled Trial with Dexamethasone

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Objective: To study the prevalence of right-to-left shunts (RLS) in patients with COPD traveling to altitude with and without dexamethasone prophylaxis. We hypothesized that hypobaric hypoxia would increase RLS and dexamethasone would be preventive.

Methods: Lowlanders with COPD, GOLD 1–2, SpO₂ >93%, were randomized to Dexamethasone (4mg, bid) or placebo, start-

ing one day before ascent from 760m and during a 3-day-stay at 3200m, Kyrgyzstan. Resting and saline contrast echocardiography were performed at 760m and after the first night at 3200m. Shunt was defined by visible bubbles in the left atrium and classified as intracardiac (within 3 cardiac cycles) or intrapulmonary.

Results: Of 87 patients (84% male, mean $\pm$ SD age 57.0 ± 8.8 , BMI 25.1 ± 4.0 kg/m², FEV₁ $88.6 \pm 21.5\%$ pred, SpO₂ $94.7 \pm 2.1\%$) 39 were assigned to placebo, 48 to dexamethasone. In the placebo group 19/39 patients (49%) had RLS, 11 of these intracardiac; in the dexamethasone group 23/48 patients (48%) had RLS, 13 of these intracardiac ($p = \text{NS}$ placebo vs. dexamethasone). 12 patients in the placebo and 17 in the dexamethasone group developed new or changed from intrapulmonary to intracardiac RLS at altitude (760m vs 3200m, $p = 0.018$ resp. 0.011 , $p = \text{NS}$ between groups). The prevalence of RLS at 3200m was 30/39(77%) in the placebo and 36/48(75%) in the dexamethasone group ($p = \text{NS}$). Multivariate regression analyses indicated that a higher increase in systolic pulmonary artery pressure (SPAP) but not treatment allocation was an independent predictor of new RLS development at 3200m. Independent predictors of SPAP were altitude, dexamethasone, FEV₁, age and new/changed RLS.

Conclusion: In lowlanders with mild COPD, travelling to 3200m significantly increases the prevalence of RLS. Dexamethasone treatment does not prevent this. An increase in SPAP may be a cause or a consequence of the development RLS at altitude.

P215

Effect of Repeated Exposure to Very High Altitude on Lung Function in Healthy Lowlanders

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Objective: To study the effects of repeated exposure to very high altitude on lung function in lowlanders.

Methods: 21 healthy lowlanders, aged 18–30 y, started from 520 m to undergo 2 sojourns of 6 days each at the ALMA observatory, Chile (spending 6 hours/day at 5050m, nights at 2900m), separated by a 1-week recovery period at 520m. Pulse oximetry (SpO₂), spirometry and sniff nasal inspiratory pressure (SNIP), were assessed.

Results At 520 m, and during the first sojourn at 5050 m, day 1 and 6, median (quartiles) SpO₂ (%) was 98 (97; 98), 79 (75; 84) and 84 (81; 85), $P < 0.05$ day 1 at 5050 vs. 520m and vs. day 6, respectively; forced vital capacity (FVC, %predicted) was 95 (88; 100), 91 (84; 95) and 91 (88; 96), $P < 0.05$ day 1 at 5050 vs. 520 m and $P = \text{NS}$ day 1 vs. day 6 at 5050 m; ratio of forced expiratory volume in 1 second to FVC (FEV₁/FVC) was 0.85 (0.82; 0.89), 0.88 (0.84; 0.92) and 0.89 (0.86; 0.93), $P < 0.05$ day 1 at 5050 vs. 520 m and $P = \text{NS}$ day 1 vs. day 6 at 5050 m; SNIP (mbar) was 105 (87; 123), 90 (71; 102) and 90(66; 104), $P < 0.05$ day 1 at 5050 vs. 520 m and $P = \text{NS}$ day 1 vs. day 6 at 5050 m. During the second sojourn,

SpO₂ was higher but spirometry variables were similar to values during the first sojourn.

Conclusions: Exposure to very high altitude decreased FVC, which may be related to reduced inspiratory muscle strength. Six days of acclimatization at 5050m and re-exposure after a low altitude recovery period did not change spirometry and sniff nasal inspiratory pressure although acclimatization increased SpO₂.

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P216

Real-life Data on the Medical Therapy of Pulmonary Arterial and Chronic Thromboembolic Pulmonary Hypertension

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Introduction: Combination therapy has been recommended in the latest guidelines for pulmonary hypertension (PH) in 2015 for patients with pulmonary arterial hypertension (PAH) who do not achieve therapeutic goals in terms of symptoms, exercise capacity and hemodynamics. For patients with inoperable chronic thromboembolic pulmonary hypertension (CTEPH) or residual PH after pulmonary endarterectomy (PEA) medical treatment with specific vasodilators is advised, too. This study analyses the drug-treatment and outcome of a real-life cohort of PAH and distal CTEPH patients.

Methods: PAH-patients and patients with distal CTEPH who had a visit at the UniversityHospital Zurich during the last year were analysed in terms of demography, clinical data, medication and therapeutic goals.

Results: 146 prevalent PH patients were included, 108 PAH (64% idiopathic; 36% associated) and 38 distal CTEPH. The mean follow-up was 65.8 ± 48.3 months ($\pm$ SD). 75% of the patients with PAH were treated with endothelin receptor antagonists (ERA), 12% with prostanoids, 55% with phosphodiesterase type 5 inhibitor (PDE-5-I) and 10% with soluble guanylate cyclase stimulator (sGC). 43% were on double and 10% on triple combination therapy. Distal CTEPH patients were treated with ERA (47%), prostanoids (3%), PDE-5-I (18%) and sGC stimulator (42%), with 16% on double and 3% on triple combination therapy. Demographics and clinical data are shown in table 1.

Conclusions: In this real-life cohort of prevalent PAH and distal CTEPH patients, a stabilisation or improvement of therapeutic goals was found under PAH-targeted therapy. Patients with PAH are more likely to have a double combination therapy, whereas patients with CTEPH are mainly treated with a single drug. Whether more aggressive combination therapy would further improve goals also in lower risk classes remains to be determined.

Table 1. (for Abstract P216)

	PAH; diagnosis	PAH; prevalent visit	CTEPH; diagnosis	CTEPH; prevalent visit
Number of patients (female)	108 (62)	108 (62)	38 (55)	38 (55)
Age, years	53.4 ± 19.2	58.6 ± 17.9*	64.2 ± 13.1	69.0 ± 13.5*
BMI, kg/m ²	25.9 ± 6.0	26.0 ± 5.6	28.3 ± 6.2	28.0 ± 5.5
NYHA class	2.8 ± 0.7	2.5 ± 0.8*	2.9 ± 0.7	2.4 ± 0.8*
6MWD, m	452 ± 124	470 ± 142	464 ± 127	469 ± 129
NTproBNP, ng/ml	898 ± 1234	612 ± 897	1097 ± 1391	625 ± 759
Cardiac index, l/min/m ²	2.7 ± 0.8	–	2.7 ± 0.6	–
mPAP, mmHg	42.2 ± 14.9	–	38.6 ± 10.3	–

Demography and clinical data of prevalent patients with PAH and distal CTEPH given as mean ± SD or number (%); Abbreviations: PAH: pulmonary arterial hypertension; CTEPH: chronic thromboembolic pulmonary hypertension; BMI: Body mass index; NYHA: New York Heart Association; 6MWD: 6-minute walk distance; NTproBNP: N-terminal pro-brain-natriuretic peptide; mPAP: mean pulmonary arterial pressure; * p < 0.001 versus diagnosis.

P217**Extravascular Lung Water in Healthy Lowlanders during Repeated High Altitude Exposure**

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Introduction: High altitude pulmonary edema (HAPE) is a life-threatening condition associated with increasing extravascular lung water (EVLW). In healthy individuals, we investigated 1) whether EVLW is observed upon acute exposure to very high altitude; 2) changes in EVLW over a one-week stay at altitude; and 3) the effect of re-exposure on EVLW to the same altitude.

Methods: EVLW was assessed in twenty-one healthy lowlanders (living <800m, mean ± SD age 25 ± 4 years, FEV1 96 ± 12% predicted) by lung ultrasonography and quantified as lung comets during two consecutive sojourns to the ALMA Observatory (Atacama, Chile). Participants slept at 2900m and drove 45-minutes by car to 5050m on six consecutive days and stayed there for 6–8 hours. Measurement took place at low altitude (LA1; Santiago, 520m), and after the first and the sixth night at 5050m (HA1 and HA6, respectively). This cycle was repeated following an identical protocol, after 7-days rest at LA (*i.e.*, cycle 2). ClinicalTrials.gov [NCT02760186].

Results: The median numbers (Q1;Q4) of lung comets in cycle 1 were 0 (0; 0), and 1 (0; 3.5) and 7 (3; 10) in LA, HA1 and HA6 (LA *vs.* HA1 and HA6; HA1 *vs.* HA6; p < 0.01). In cycle 2, lung comets were 1 (0; 2), 2 (0.5; 3) and 12 (7.5; 13) (LA1 *vs.* HA6; HA1 *vs.* HA6; both p < 0.01). Comparing the two cycles, a difference was found between LA and HA6 (p < 0.01).

Conclusions: In healthy lowlanders acutely exposed to hypobaric hypoxia, EVLW is increased after the first night, further increases until after the sixth night and is still present after return to low altitude. Repeated exposure after a break at lowland reveals

even more pronounced EVLW accumulation. This may have repercussions for individuals who engage in repetitive ascent to altitude for occupational purposes.

P218**Assessment of Mean Pulmonary Artery Pressure with 4D Flow MRI**

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Introduction: A robust non-invasive method to estimate increased mean pulmonary artery pressure (mPAP) is needed. Recently, a 2D velocity encoding MRI study has shown that vortex duration in the pulmonary artery (PA) was related to mPAP (Reiter, Radiology, 2015; 275(1): 71). This present study investigated the potential of 4D flow MRI to assess mPAP.

Methods: Thirteen patients with suspected Chronic Thromboembolic Pulmonary Hypertension (CTEPH) were assessed by right heart catheterization (RHC) and cardiac MRI, including a 4D phase contrast sequence. Streamlines were reconstructed in the pulmonary artery and the duration of the vortical blood flow, defined as closed concentric ring-shaped curves parallel to the pulmonary artery (PA), was measured as a % of the cardiac cycle. The vortex duration was compared to the RHC mPAP, right ventricular volume (RVV), PA diameter and PA distensibility.

Results: CTEPH was confirmed in 11 / 13 patients. The mPAP was 30.3 ± 15.2 mmHg (11–66 mmHg). On the 4D flow data, vortex was difficult to assess on the first trial but after a learning curve, reproducibility was excellent with an ICC between vortex duration

Fig. 1. Examples of 4D flow streamlines in a sagittal plane centred on the pulmonary trunk in 2 CTEPH patients with a mild pulmonary hypertension (left) or with a normal pulmonary pressure (right). In the patient on the left, the pulmonary trunk (between both arrows) was dilated with a flow showing a vortex by comparison with the laminar flow in the patient on the right (for Abstract P218).

Fig. 2. Vortex duration measured on the 4D flow images in the pulmonary trunk was significantly correlated with the mPAP (for Abstract P218).

measurements of 0.93. Vortex duration correlated excellently with mPAP with $R^2 = 0.75$, $p < 0.005$ and outperformed all the other parameters (RVV: $R^2 = 0.0026$, $p = 0.87$; PA diameter: $R^2 = 0.29$, $p = 0.087$; PA distensibility: $R^2 = 0.09$, $p = 0.32$).

Discussion and Conclusion: Vortex duration derived from 4D flow MRI was the most promising MRI parameter to assess PA pressure. Further work should include the development of automated method to facilitate the vortex duration measurement.

Poster Walk 7: Infection / Lung Cancer

P219

Screening for Active Tuberculosis in an Urban Shelter for Homeless in Switzerland: A Prospective Study

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Introduction: Whereas high risk groups such as asylum seekers are systematically screened for tuberculosis (TB) upon entry in Switzerland, this strategy does not apply to homeless despite a po-

tentially elevated risk of TB. Geneva City Social Services operate shelters for homeless each winter. Shelters are underground facilities with 10 to 20-bed rooms. Every year, $\approx$ 1000 persons are accommodated. Geneva Health and Social Authorities implemented a collaborative project to screen for active TB in homeless. We aimed to assess 1/acceptability of the screening program and 2/prevalence of TB in this group.

Methods: Prospective study targeting all homeless registering for shelter accommodation in Geneva during the winter of 2015. Applicants were proposed a questionnaire-based screening (www.tb-screen.ch) available in 32 languages, combining written, visual and audio formats to optimize usability, to explore epidemiological and clinical risk factors for active TB. Participants with a positive score ($\geq 10/26$) underwent diagnostic procedures at Geneva University Hospital (clinical assessment, chest X-ray, checked by trained pulmonologists and radiologists). This is standard procedure for asylum seekers in Switzerland since 2006. A combined strategy was used to enhance retention among subjects with a positive score (reminders, free medical care, 20 CHF vouchers for local supermarket)

Results: Overall, 726/832 (87.3%) homeless accepted the screening procedure. Participants originated from 75 countries, 62% from medium to high TB incidence countries. Only 11% had health insurance. Most homeless were young male migrants without access to care. Male gender (adjusted OR: 2.14; 95% CI: 1.27–3.62), age below 25 years (aOR: 4.16; 95% CI: 1.27–13.64) and short duration of homelessness (aOR: 1.75; 95% CI: 1.06–2.87) were predictors of acceptance. Median value of scores was 4 (0–18); positive scores ($n = 30$; 4.1%) were associated with originating from a high incidence country, with a trend for smoking. None of the 24 who underwent further testing had active TB. Surveillance 3 months after study termination did not identify any incident case among homeless in Geneva.

Conclusions: TB screening in homeless shelters was well accepted. The participants' profile and the null TB prevalence highlight the diversity of homeless groups in Europe and the variability of their TB risks. These findings emphasize the need for tailoring preventive and screening strategies to local context.

P220

So You Have a Typical Pneumonia... with MAC?

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MAC is primarily a pulmonary pathogen that affects individuals who are immunocompromised. *Mycobacterium avium* is the isolate in more than 95% of patients with AIDS who develop MAC infections. In the United States, MAC infection is considered a non-reportable infectious disease. A 2011 CDC surveillance in Houston and Atlanta, reported an incidence of 1 case per 100,000 persons/yr. Song et al (2006) found approximately 24–59% of cases occurred in immunocompetent persons without predisposing factors.

This is a case regarding a 73-year-old retired aircraft engineer with a PMH of subdural hematoma, prostate CA (TURP & radiation), melanoma, and PE. He is a former tobacco user who quit 40 years ago. No prior chronic steroid or immunosuppressive therapy, nor any exposure to TB. He returned from Arizona with a non-productive cough. He visited his son who returned from China with an URI. Imaging revealed a LLL infiltrate, and was initially treated for community acquired pneumonia. 1 month later, imaging revealed worsening infiltrates and was positive for *Mycoplasma pneumoniae*. Broncho-alveolar lavage was positive for MDR MAC. TB quantiferon and MTB RNA was negative. Rifampin, ethambutol, and clarithromycin was administered for 3 months. Follow up CT showed resolving consolidation, however, there was development of bilateral miliary nodules. A repeat bronchoscopy and cultures were found to be negative.

Disseminated MAC disease is typically associated with defective cellular immunity. The main risk factor for MAC infection in immunocompetent patients is underlying lung disease, ie. bronchiectasis, pneumoconiosis, and prior tuberculosis. Dhillon et al (2000) postulates that this may be due to voluntary cough suppression. This results in stagnation of secretions which creates an environment suitable for growth of the organisms (aka Lady Windermere syndrome). This case should illustrate that MAC can have an unusual presentation, and clinicians should go beyond imaging and history to pursue the diagnosis.

P221

Time to Diagnosis in Patients Treated for Tuberculosis in the Geneva Area: A Pilot Study

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Introduction: Geneva has an incidence of tuberculosis (TB) which is 2.0 x above national average, owing to its cosmopolitan population: 85% of TB cases in Geneva are foreign-born. A retrospective study in our area estimated time from onset of symptoms to diagnosis to be 2.1 ± 3.1 months (range 0–12, $n = 252$); 10% had no symptoms at diagnosis. No clinical or socio-demographic characteristics were predictive of this delay. This study aimed to further explore factors impacting on time to diagnosis in TB.

Methods: Prospective semi-structured interviews of patients admitted to our hospital or treated by our outpatient TB center, as close as possible to diagnosis, exploring social and educational background, languages spoken, symptoms, and events leading to diagnosis. When required, interviews were performed with professional interpreters.

Results: 50 patients, 31 male, aged 33 yrs (median, range: 16–83), originating from 34 countries in Europe (28%), Asia (16%), Africa (46%) or Latin America (10%), speaking 26 different languages, having lived in Switzerland for 62 (14–315) months, were included. 24% were active smokers, 8% had HIV. For 19 subjects (38%) knowledge of French was either nil or very poor. 24% were undocumented migrants, 9 (18%) asylum seekers; 42% had no

medical insurance; 32% were unemployed. TB was pulmonary in 28 cases (56%) and extra-thoracic in 22 (44%). Patients first consulted at a public dispensary for general medicine (n = 17, 34%), an emergency ward (n = 13, 26%), a private dispensary for general medicine (n = 5, 10%), or another structure (n = 15, 30%). Median reported delay between occurrence of symptoms and diagnosis was 2.6 months (0–52). Patients had a median of 2.0 medical visits (1–7) before diagnosis. Factors mentioned by patients which may have delayed medical consultation were: no medical insurance (24%), fear of financial consequences (16%), of losing job (12%), or of being expelled (4%). Most patients (51%) knew how TB was transmitted; 43% had been exposed to TB; 97% knew that treatment was effective, but 41% were afraid of dying, and 25%, of never healing from TB.

Conclusions: In the Geneva area, origin, social status, poor knowledge of French, absence of medical coverage, fear of financial consequences, losing job, or expulsion were factors which may have impacted on delay to diagnosis. Most patients consult public or private dispensaries or emergency wards: awareness of TB must be reminded in these structures.

P222

Practices Regarding Isolation for Non-MDR Pulmonary Tuberculosis: A TB-NET Survey of Specialists from 44 Countries

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Introduction: The few studies addressing the issue of contagiousness of tuberculosis (TB) after treatment has been started suggest that transmission occurs mainly, if not exclusively, before treatment is initiated. Despite this observation, isolation is a common procedure for patients hospitalized for pulmonary smear positive (S+) TB, or even S- TB. Practices vary from country to country, or even within a given country, showing the lack of consensus and evidence on this topic. Isolation is a difficult experience for patients, many of whom, in Switzerland, are recent immigrants. This study aimed to document isolation practices among mostly European countries using a survey procedure implemented by the TB-NET network of TB experts (clinicians and scientists) (<http://www.tb-net.org/>)

Methods: After acceptance by the TB-NET scientific committee, a questionnaire was sent by E-mail to all members of the TB-NET network. The questionnaire asked about the origin, profession and involvement in TB of the respondent, and included a multiple choice questionnaire about care of patients with S- or S+ pulmonary TB. Results presented concern S+ patients with low suspicion of MDR-TB.

Results: 118 questionnaires were retrieved (102 from European countries), from pulmonologists (59%), infectious disease specialists (23%), other physicians (13%), and biologists/researchers (5%). 77% of respondents worked in a public hospital, 15% in a public outpatient structure, the remaining 8% in private structures.

With regards to patients with S+ Pulmonary TB and low suspicion of MDR, practices reported included: isolation (74%) or patient sent home for treatment (26%). Subjects isolated were sent to a general hospital (15%), a specialized ward or hospital (47%) or a specialized ward in a negative pressure room (38%). Default duration of isolation was: ≤15 days (11%); first 2 weeks of treatment (14%); 15–30 days (7%); until sputum samples became negative (49%); until samples became culture negative (12%); until completion of intensive phase of treatment (6%). Similar disparities were found for subjects with S- pulmonary TB.

Conclusions: Disparities concerning isolation for pulmonary TB in countries with comparable health care systems are a subject of concern because of the impact of isolation on the patients' well-being, and the lack of evidence justifying the procedure. This should encourage a reflexion and consensus statement at an international level.

P223

Tuberculosis. Medico-Social Approach in Canton of Vaud, Switzerland

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Introduction: According to the World Health Organisation (WHO) more than 9.600.000 people suffered from tuberculosis (TB) worldwide in 2014. With 550 patients declared to the federal office of public health per year, Switzerland (CH) is a low prevalence country (incidence 6,5 cases/100.000). The canton of Vaud (VD) declares around 65 cases per year. TB often affects vulnerable populations with low financial resources, mainly asylum seekers (AS). Social protection with universal health coverage policies (UHCP) are essential tools for treatment (Tt) success. Like other cantons in CH, VD performs an integrated patient care approach including UHCP and social protection. In this study we aim to determine Tt outcomes in our TB population in VD and to look if WHO objectives are achieved.

Methods: We performed a retrospective observational study, looking into the files of TB patients that were declared in VD between Jan 2010 and Dec 2013. Preliminary results are presented in this abstract including demographic data, Tt outcomes and number of social interventions. Data of 2014 and microbiological data will be updated soon.

Results: Between 2010 and 2013, data were collected from 318 patients. We counted 195 men (61%) and 123 women (39%). The mean age was 38 years (all included) and 67 (swiss only). Foreign born patients accounted for 76% mainly africans (26%), european (18%) essentially portuguese (11.6%) and eastern european (15%). Pulmonary TB affected 71.7% of patients, extra-pulmonary TB 28% and both 16%. We found 270 patients that completed successfully the TB Tt (90.3%) 11 deaths (3.7%) and 18 patients (6%) unsatisfy-

ing outcomes. Among these, 2 tt interruptions (0.6%), 1 Tt failure (0.4%) and 15 transfers (5%). Tt success in culture positive patients was very good (89.9%). Tt success among asylum seekers (AS) was very high (92.5%). Tt success among Swiss patients was less good (81%). We explain this because of a much older population with comorbidities and more deaths among the Swiss. Most of the AS in VD (76%) were treated at the antituberculous dispensary (DAT). Direct observed therapy (DOTs) was applied in 82% of patients followed at the DAT. A social assistant was hired in 2011, since then a number of 147 social interventions were performed.

Conclusions: Global TB Tt outcomes in VD are very good and accomplish the objectives of WHO. Social interventions and DOTs are essential tools in achieving these goals.

P224

Comparison of Clinical Outcomes and Radiographic Characteristics between Smear Negative (Clinically Diagnosed) and Smear Positive (Bacteriologically Diagnosed) Pulmonary Tuberculosis with Category I (2hr/4hr) Treatment at Cagayan Valley Medical Center: A Pilot Study

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Introduction: Pulmonary tuberculosis (PTB) is the sixth leading cause of morbidity and mortality in the Philippines. The country is ninth highest TB-burden country in the world. The estimated incidence rate of tuberculosis in the Philippines is 275 per 100,000 population.

Method: We conducted a prospective cohort study to compare the clinical and radiographic outcomes of smear positive and smear negative PTB patients receiving Category I treatment. All patients (19 years old and above) who were bacteriologically confirmed through smear microscopy and clinically diagnosed with PTB were included.

Results: 14 smear negative and 10 smear positive patients met the inclusion criteria and consented. In the smear positive group, the middle aged population had the highest frequency (30–39) compared to the smear negative group where the senile population (60 years and above) had the highest frequency. Majority of the respondents were male, married, college level, non-smoker, unemployed and have no co-morbidities. As to clinical variables such as fever, chest pain, dyspnea and cough; they showed a decreasing trend on both smear positive and smear negative group. However, the chest pain, dyspnea and radiologic characteristics were not statistically significant (p value >0.05) on all follow-up. Meanwhile, the fatigue scale mean value of the subjects in the smear positive after the 4th month was significantly higher (32.80) than the subjects in the smear negative. The weight gain among smear positive group compared with the smear negative group was statistically significant (p value <0.05).

Conclusion: We found that there were significant decrease in the easy fatigability & cough of smear positive patients along with significant changes in their quality of lives and weights. However, the chest pain & dyspnea did not show significant changes, but showed a decreasing trend. In comparison to the smear negative group, there were significant changes in the chest pain, dyspnea, easy fatigability and cough. The radiographic characteristics showed an increasing frequency in the number improving outcomes.

P225

Evaluation of Antimicrobial Therapy in the ICU – Fluid Overload or Pneumonia?

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Introduction: Pneumonia is a potentially life-threatening infection routinely treated with antimicrobial therapy. Chest radiography is a noninvasive approach used to evaluate and diagnose pneumonia and fluid overload. Patients with radiographic evidence of fluid overload without clinical symptoms of pneumonia are often misdiagnosed and treated with antimicrobial therapy. We conducted a retrospective chart review to evaluate the inappropriate use of antimicrobial therapy in critically ill patients with fluid overload or congestive heart failure (CHF) misdiagnosed as pneumonia.

Methods: Retrospective random chart review of 11 patients on antimicrobial therapy with abnormal chest x-ray admitted into the intensive care unit was conducted. The primary outcome was to determine number of cases with fluid overload or CHF with no radiologic or clinical evidence of pneumonia managed with antimicrobial therapy. Patients on antimicrobial therapy for documented infections other than pneumonia were excluded. Antimicrobial therapy was evaluated for appropriateness, based on radiographic evidence, clinical data, and presentation. Based on radiographic evidence, patients were categorized into two groups: Group A [pneumonia group], and Group B [fluid overload, CHF, or pleural effusion]. Descriptive analyses were conducted for the study population in terms of mean $\pm$ SD, or percentages.

Results: Mean patient age, duration of antimicrobial therapy and hospital length of stay were 71.27 ± 7.35 years, 7.45 ± 3.88 , and 8 ± 4.78 days respectively. Mean body temperature and white blood cell count were $37.1^\circ\text{C} \pm 0.6$, and $16.57 \times 10^3 \mu\text{L} \pm 4.65$ respectively. Based on our evaluation, 45% were classified as Group A and 55% as Group B. In Group A, 20% of patients had positive sputum culture with multi-drug resistant *E. coli*, mean B-type natriuretic peptide (BNP) was $289 \text{ pg/mL} \pm 227$. Mean duration of antimicrobial therapy in Group A was 10 ± 4.5 days. Group B patients had negative sputum cultures with mean BNP $1130.5 \text{ pg/mL} \pm 1150$. Mean duration of antimicrobial therapy in Group B was 7 ± 2.3 days.

Conclusions: Our results demonstrate 55% inappropriate deployment of antimicrobial therapy in patients with CHF, or fluid

congestion misdiagnosed as pneumonia. Appropriate interpretation of radiographic evidence and critical clinical assessment is warranted in the use of empiric antimicrobial therapy in this population.

P226
Systemic Lupus Erythematosus with Apparently Acute Onset with Respiratory Failure Caused by Mixed Infection (Klebsiella and Pneumocystis Jiroveci)

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Introduction: Systemic lupus erythematosus (SLE) is an autoimmune disease with variable presentation and onset. Pleuropulmonary involvement is common and sometime wears an acute onset with infections overlay favored by the characteristic disimmunity.

Methods: Case report of a SLE with apparently acute clinical onset with respiratory failure caused by a mixed pulmonary infection.

Results: A 50 year-old male patient with a history of chronic glomerulonephritis (cause unknown), hypertension and obesity was hospitalized in Pulmonology Clinic for rest dyspnea, productive cough, wheezing, facial and legs edema, malar rash, fever, oliguria, tachycardia. CT highlights acute lung injury with multiple “ground glass” areas, bilateral pleural effusion, and pericarditis. Echocardiography: pericarditis, dilated right ventricle and pulmonary hypertension. Spirometry: severe mixed ventilatory dysfunction and hypoxemia. Laboratory investigation: anemia (Hb-7.7g%; Hct-24%), leukocytosis, low blood proteins (4.6g%), fibrinogen 540mg%, complement C3 (39mg%), dyslipidemia, hepatocytolysis, hyperuricemia, high blood urea. Initially, seric immunology was negative (antinuclear antibody Ab-ANA, rheumatoid factor, anti-cardiolipin Ab, antiglomerular basement membrane Ab, anti-

HIV Ab). Urine: proteinuria 2.19g/24 hours, 50 erythrocytes/μl. The patient refused kidney or other biopsy. Bronchoscopy allowed bronchoalveolar lavage (BAL) and found ANA Ab positive, presence of Candida species, Gram negative bacteria, cysts of Pneumocystis jiroveci. The diagnostic of the SLE with apparently acute onset and Pneumocystis pneumonia was based on the presence of bilateral infiltrates, pleural effusion, pericarditis, anemia, and malar rash, positive ANA in LBA, nephropathy with impure nephrotic/nephritic syndrome, decreased blood complement C3. We started corticoids, antibiotics, oxygen therapy, bronchodilators, anti-fungal and anti-parasitic drugs, statins, antihypertensive and anticoagulants. The evolution was rapidly favorable.

Conclusion: Immunodepression existent in SLE was the risk factor for a complex infection in an unknown SLE case. In front of a chronic glomerulonephritis we have to consider an autoimmune disease. Multidisciplinary diagnostic methods in critical patients (bronchoscopy with BAL, bacteriology for common and opportunistic germs, immunology, and computed tomography) could establish the diagnosis in a seronegative complicated SLE.

P227
Comparison of Clinical Profile of Patients with ALK-Positive and EGFR-Positive Non-Small Cell Lung Adenocarcinoma in an Indian Population

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Introduction: EML4- ALK and EGFR are the major driver mutations in the pathogenesis of Non Small Cell Lung Cancer (NSCLC).

Methods: A retrospective observational study was done. The goal was to establish the clinical profile of patients with EML4 – ALK and EGFR mutation independently, to aid in early identification and provide early targeted therapy.

Table 1. (for Abstract 227)

	EML4- ALK Mutation	EGFR Mutation
Mean age	45 years (± 11SD) (n = 21)	55.1 years (± 13.2SD) (n = 22)
Gender		
Male	52.4%	69.6%
Female	47.6%	30.4%
Smoking Status		
Non-smokers	81	72.7
Smokers	19	27.3
ECOG Score 0–1	57.1%	84.2%
ECOG Score ≥2	42.9%	15.8%

Table 2. (for Abstract 227)

	EML4- ALK Mutation	EGFR Mutation
Stage		
IIIB	2 (9.5%)	0
IVA	18 (85.7%)	18 (78.3%)
Metastasis sites		
Brain	8 (44.4%)	2 (10%)
Bone	8 (44.4%)	4 (20%)
Chief complaints on presentation		
Cough	76%	57.1%
Dyspnea	67%	33.3%

Results: 44 patients with Non Small Cell Lung Adenocarcinoma were studied out of which 21(47.7%) were detected EML4-ALK-positive and 23(52.3%) were EGFR-positive.

ALK mutation was associated with mean age 45 (± 11 SD) years, male predominance (52.4%), non-smokers (81%), 42.9% had ECOG ≥ 2 on presentation, cough and dyspnea (76% and 67% respectively) as major presenting complaints, stage IV disease in majority (85.7%) with Brain and Bone (44.4% each) as the most common sites for metastasis.

EGFR mutation was associated with mean age 55.1 years (± 13.2 SD) (n = 22), male predominance (69.6%), non-smokers (72.7%), lower ECOG score on presentation (84.2% with ECOG < 2) (n = 19), cough (57.1%) and anorexia (52.4%) as major presenting complaints, stage IV disease in majority (78.3%) with Liver (20%) and Bone (20%) as the most common sites for metastasis.

Conclusions: In comparison with EGFR mutation, ALK mutation was associated with lower mean age and higher ECOG score on presentation, and higher rates of brain and skeletal metastasis.

P228

Systematic Review of Lung Cancer Screening Trials with Low Dose Computed-Tomography: 2017 Update

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Introduction: Lung cancer is the leading cause of death among all cancers and is the third most common cancer in both men and women. Previous studies have shown that low dose CT (LDCT) screenings resulted in more unnecessary thoracotomies and ultimately offered no compelling data for or against LDCT screenings. This systematic review of randomized controlled trials is trying to determine whether new data was for or against lung cancer screening.

Method: Using the PubMed Library, we searched “low dose CT lung cancer screening” with criteria “controlled clinical trial” and

“randomized controlled trial”. We set our article date limit from 01/01/1990 to 12/31/2016. We also referred to the Cochrane Systematic Review 2013 and followed up with smaller ongoing studies in Europe. From our search, we will be discussing the Lung Screening Study, the MILD trial, the DANTE trial, DEPISCAN study, the National Lung Screening Trial (NLST), the DANISH trial, the ITALUNG trial, and the UKLS pilot.

Results: We included eight trials in this review, seven of which are lower powered studies that found no significant decrease in mortality in patients with lung cancer when using low-dose CT. However, the national lung screening trial (NLST) published in 2011 with 53,454 participants found a significant decrease in death from lung cancer when screened with low-dose CT compared with chest x-ray screening.

Conclusions: Overall, data from the high-powered NLST suggests a significant decrease in lung cancer mortality in high-risk patients when screening with LDCT. However, we await results from the NELSON trial to confirm this conclusion. There are also other factors which need to be taken into account when electing to undergo screening such as, cost-effectiveness, psychological consequences, radiation exposure and unnecessary invasive procedures.

P229

Diffuse Idiopathic Pulmonary Neuroendocrine Cell Hyperplasia (DIPNECH) – A Rare Syndrome Masquerading as Metastatic Carcinoma

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Introduction: DIPNECH is a rare syndrome characterized by hyperplasia of pulmonary neuroendocrine cells (PNEC). It can present as an incidental finding on imaging or the cause of chronic obstructive pulmonary disease. We report a case of DIPNECH found incidentally on imaging in an asymptomatic patient.

Case: A 70 year-old woman with hepatitis C cirrhosis and hypertension was evaluated for right lower lobe opacity of the lung seen on screening imaging done for hepatocellular carcinoma. She had no pulmonary symptoms. CT chest revealed a spiculated mass-like opacity in the superior segment of the right lower lobe measuring 2.1 x 1.5 cm with multiple sub-centimeter bilateral pulmonary nodules, thought to represent metastatic disease. The right lower lobe nodule was Positron Emission Tomography (PET) avid with a standardized uptake value (SUV) of 5.9. Transbronchial biopsy was nondiagnostic. Subsequently, she underwent video assisted thorascopic surgery (VATS) with lung biopsy of the 2.1cm nodule as well as one of the sub-centimeter nodules. The pathology confirmed several carcinoid tumorlets located with peribronchial/peribronchiolar distribution and positive immunoreactivity for neuroendocrine cell, suggestive of DIPNECH. Surveillance imaging three months later showed no new nodules.

Discussion: DIPNECH was recognized by the World Health Organization in 1999 as a preinvasive lung lesion associated with carcinoid tumor formation. DIPNECH can be characterized in

CT chest

PET image

Fig. 1. CT chest and PET image (for Abstract 229).

various forms including diffuse proliferation of scattered neuroendocrine cells, small nodules, or linear proliferation. PNEC hyperplasia, with progressive narrowing and obstruction of small airways can lead to obstructive bronchiolitis. Pulmonary function testing with an obstructive pattern and imaging with mosaic attenuation and multiple small nodules are suggestive of DIPNECH. Definitive diagnosis is made by pathology. Management of DIPNECH is predominantly close surveillance. The role of surgical resection is not clearly defined. Management of symptoms with

corticosteroids, bronchodilators, and somatostatin analogues has been reported, but there are no definitive guidelines. The 5 year survival rate is 80–90%.

Conclusion: Only about 100 cases of DIPNECH have been reported in the literature. It is likely that more cases will be detected in the future with increased lung cancer screening. At present it is unknown if aggressive management of these patients has more harm or benefit.

Decreasing Hospital Stay by Adopting the Short Term Hospitalization System for Lung Cancer Diagnosis

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In the Respiratory Center of Seoul National University Bundang Hospital, there is no standardized process for the patients diagnosis with lung cancer. So the average time of diagnosis after admission is 4.5 days and the average waiting time before admission is also 3.2 days. In addition, dropout rate before admission is about 16%. The aim of this study is to analyze the effects of applying short term hospitalization system with standardized processes in terms of the patient's cost and length of hospital stay in lung cancer diagnosis.

After analyzing all process and the performing of joint conference in whole lung cancer center, set up the new protocol for diagnosis of lung cancer and build up the critical pathway and then designated the short term sickbed and assigned the sickbed to the patients diagnosed with lung cancer. Applied this system from September 2015 and analyzed the effects before 1 year and after 1 year of the application. The main comparative indicators are average length of hospital stay, the turnover ration of short term bed, the dropout rate for admission, the average waiting time for hospitalization and the actual number of inpatient.

Compared with the period of application for 1 year, the average length of hospital stay is decreased 2.2 days from 4.5 days ($p \leq 0.0001$). The dropout rate for admission and the average time of wait for hospitalization are respectively decreased to 5%, 1.5 days. The turnover ratio of short term bed is increased to 1.24 from 0.09. In addition the actual number of inpatient also increased 11% compared to the non-application period.

With the results of this study, the short term hospitalization system for the patients diagnosed with lung cancer is established and standardizes process is applied in Respiratory center. So with the effects of shortening the hospital stay, we can expect the improvement of customer satisfaction and it can create more sales and profit. After this system application, we also need regular and periodical follow-up management by continuous monitoring and feedback.

Poster Walk 8: Interstitial Lung Disease / ICU / Pediatrics

Respiratory Breathing Patterns and Cough in Idiopathic Pulmonary Fibrosis: Awake, Asleep and Over Time

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Background: Idiopathic pulmonary fibrosis (IPF) leads to a restrictive lung defect that has impact on daytime and nocturnal breathing patterns. In this pilot study we assessed the course of day- and nighttime respiration, oxygenation parameters and cough over a period of nine months and differences between wakefulness and sleep in IPF patients.

Methods: 24-hour respiratory polygraphies (RP) (Nox T3, Nox Medical) and pulmonary function tests (PFT) were performed at 1, 2, 4, 8 and 9 months. RPs were manually analyzed and subdivided into periods of assumed wakefulness and sleep. Cough-events were counted manually from the audio-track. Cough-index, oxygenation parameters (SpO₂, mean extent of desaturation, desaturation index), respiratory rate and heart rate were assessed for differences between wakefulness and sleep. The first and the last RP were compared to identify changes of these parameters over nine months. Statistical analyses were performed with paired Wilcoxon signed rank tests.

Results: Ten IPF patients (9 male, median age 68 years (IQR 60.8–76.3) with 40 valid 24-hour RPs were included. Nine patients (90%) received antifibrotic treatment. Cough was more prevalent during wakefulness with a median cough-index of 14.9/h (IQR 11.6–17.5) and 1.6/h (IQR 1.3–2.6) in sleep, $p = 0.0020$. Oxygenation parameters showed no difference, while respiratory- and heart rate were, as expected, significantly elevated during wakefulness (RR wakefulness 28.8/min (IQR 25.6–30.8), RR sleep 19.8/min (IQR 17.4–22.0), $p = 0.0039$. Despite stable PFTs over nine months, the elevated respiratory rates (RR) increased further during wakefulness (baseline RR median 26.0/min (IQR 20.3–28.1), nine months RR median 35.7/min (IQR 31.8–42.4), $p = 0.0312$) and sleep (baseline RR median 20.1/min (IQR 17.3–21.0), nine months median 21.1/min (IQR 20.2, 23.0), $p = 0.0312$). The other investigated respiratory parameters remained stable.

Conclusion: Cough is very prominent during the wakefulness, but rare during sleep. Respiratory rate might be a potential objective follow-up parameter to identify disease progression despite otherwise stable lung function parameters. Further studies with a larger sample size and longer follow-up period are needed to evaluate its usefulness.

P232**Prevalence of Lung Cancer in Combined Pulmonary Fibrosis and Emphysema: A Single Center Experience***E. Nasim, T. Moua*

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Introduction: Combined pulmonary fibrosis and emphysema (CPFE) is a distinct under-recognized lung disease characterized by upper lobe emphysema and lower lobe pulmonary fibrosis [1]. Both emphysema and idiopathic pulmonary fibrosis (IPF) are described conditions associated with the development of lung cancer [2]. Lung cancer has been identified in 4.4% of IPF cases with the annual incidence of lung cancer arising in chronic obstructive lung disease previously reported at approximately 1% [3, 4].

Methods: We performed a retrospective cohort study of consecutive adult patient population seen at our tertiary care hospital from 2000–2016. Using the electronic medical record, 301 cases of CPFE were identified and reviewed for interval development of lung cancer.

Results: Our CPFE patients were predominantly male and active or prior smokers. The prevalence of lung cancer was 8.3 % (n = 25). Non-small cell lung cancer was more common (84%, n = 21) with the predominant histological cell type being squamous cell in 52% of cases identified (n = 13).

Conclusion: We report one of the largest single center CPFE cohorts noting a lung cancer prevalence of 8.3%, higher than previously reported in both IPF and COPD alone.

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P233**A Case Report: Interstitial Lung Disease in Vietnamese Children with SFTPC, SFTPB Gene Mutation***L. Diem*

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Introduction: Interstitial lung disease (ILD) caused by gene mutations is rare disorder in children. These are the first two cases with SFTPC, SFTPB gene mutations in Viet Nam. Early corticosteroid treatment seem to be efficacious.

Method and Objective: To describe clinical features, genetic patterns and the outcome of two patients suffered from ILD carrying the SP-C, SP-B gene mutations in Children's Hospital 1.

Results: There were a 3 year-old girl and a 6 month-old boy, born in term, hospitalized with recurrent and severe pneumonia. Of note, the patients have got poor response with high dose and multiple antibiotic therapies (Fluoroquinolones, Vancomycin, Clindamycin and even with anti TB regimen). Chest CT showed widespread patchy ground glass opacities and subpleural parenchymal micronodule for them. Lymphocytic interstitial pneumonia is the result of their lung biopsy. Regarding genetic patterns, the girl detected the c.428C>T (p.Thr143Ile) exon 5 in SFTPB gene sequencing (de novo) while parents were not mutation carriers and asymptomatic. And the boy found the c.218T>C (p.Ile73Thr) exon 3 of gen SFTPC gene sequencing on baby and his father.

Consequently, both were treated by corticosteroid: methylprednisolone 2 mg/kg/day per IV 2 days, then prednisone 2mg/kg/day per oral 4 weeks. At 3 years of age, the girl is still on treatment, with no respiratory symptoms. However, the boy was not improved after 58 days treatment.

Conclusions: This report highlights the importance of screening for SFTPC, SFTPB gene mutations in children with ILD of unknown etiology. SFTPC gene mutation can be hereditary.

P234**Clinical Practice of Idiopathic Pulmonary Fibrosis Patients in a Swiss ILD Reference Center***S. Guler¹, P. Zumstein¹, S. Berezowska², A. Pöllinger³, T. Geiser¹, M. Funke¹*

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Background: Idiopathic pulmonary fibrosis (IPF) is the most prevalent form of idiopathic interstitial pneumonias (IIPs), a heterogeneous group of interstitial lung disorders of unknown origin. Management strategies differ substantially in IPF and non-IPF IIPs. This makes meticulous diagnosis of IPF essential. Patients' characteristics and clinical practice often differ from available study reports. Critical appraisal of current practices is possible by analysis of registries and aims to improve patient care.

Methods: We analyzed retrospectively all IPF patients included over two years at baseline and after 6 months and describe our prospective registry. We assessed risk factors, comorbidities, medication, symptoms, physical examinations, lung functional tests, chest CT scan, other diagnostic procedures and current therapy.

Results: Forty IPF patients were included for baseline and 24 for longitudinal analysis. Age ranged from 43 to 85 years (median 70 years) and 98% of our IPF patients were male. Mean forced vital capacity (FVC) was 65% and 61% predicted at inclusion and at follow up respectively (average 6 months FVC loss of 140ml) irrespective of any treatment. At baseline 35% and at follow-up 42% received oxygen therapy. All initial azathioprine treatments were stopped, but 17% were still treated with N-acetylcysteine at follow-up. In 33% of patients antifibrotic medication was established at baseline, 79% had antifibrotic medication after 6 months.

Discussion: We found similarities of our IPF population to other registry cohorts, but remarkably fewer women. Possibly IPF may be underdiagnosed in women in our region. FVC impairment in our cohort was more severe and mortality prediction poorer than in clinical trials, which may indicate that the patients of our cohort were diagnosed at a later stage.

Conclusion: Local and national registries for rare diseases like IPF contribute to the characterization of the IPF population of the specified area, to the study of the course of disease under current compliance with diagnostic and treatment guidelines and to appreciate local epidemiological particularities.

P235

Serum VEGF-D Level as a Diagnostic Biomarker of Lymphangioleiomyomatosis in Clinical Practice

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Introduction: Lymphangioleiomyomatosis (LAM) is a rare cystic lung disease (CLD) affecting almost exclusively adult women and occurring sporadically (S-LAM) or in association with tuberous sclerosis complex (TSC-LAM). LAM is currently considered as a low-grade metastasizing neoplasm. Vascular endothelial growth factor D (VEGF-D) is a lymphangiogenic growth factor produced by LAM cells which promotes their migration and proliferation. Serum VEGF-D concentration is increased in about 70% of patients with LAM, correlates with disease severity and treatment response to mTOR inhibitors, and has proven to be a useful diagnostic biomarker to distinguish LAM from other CLD, thus obviating the need for confirmatory lung biopsy in 10% of cases. A VEGF-D level of >600 pg/ml identifies LAM among other CLD with a sensitivity of 84% and a specificity of 98%, whereas a threshold of >800 pg/ml has a sensitivity of 73% and a specificity of 100%.

Method: Since VEGF-D testing was implemented in our hospital at the end of 2015, we measured serum VEGF-D concentrations by quantitative sandwich enzyme immunoassay technique (ELISA) in 15 non-transplanted patients with definite or probable

LAM (3 of which treated with mTOR inhibitors), 11 patients without LAM (5 TSC, 1 Birt-Hogg-Dubé syndrome, 2 Sjögren's syndrome, 1 pulmonary Langerhans cell histiocytosis and 2 CLD of unknown origin), and 10 healthy controls.

Results: Median serum VEGF-D concentrations were significantly higher in LAM (median 655 pg/ml, interquartile range IQR 528–1138) than in patients without LAM (median 232 pg/ml, IQR 205–304) and in healthy controls (median 363 pg/ml, IQR 300–475; $P < 0.001$). A VEGF-D level of >800 pg/ml identified LAM with a sensitivity of 37% and a specificity of 100%, whereas a threshold of >600 pg/ml showed a sensitivity of 62% and a specificity of 95%. By ROC analysis, a cut-off level of >520 pg/ml appeared to be the optimal threshold in our cohort for discriminating LAM from other groups with a sensitivity of 80% and a specificity of 95% (AUC 0.937, 95% CI 0.802–0.991).

Conclusions: In line with existing data, this preliminary analysis confirms that serum VEGF-D concentration is a useful diagnostic biomarker of LAM. A threshold of >520 pg/ml enables to detect LAM with a sensitivity and specificity of 80% and 95% respectively.

P236

Thinking of Lymphoma? But What about Abdominal Sarcoidosis?

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Sarcoidosis is systemic disorder of unknown cause, affecting multiple organs that is characterized by non-caseating granulomas. In the US, sarcoidosis occurs mostly in the third to fifth decades of life; and a lifetime risk in African Americans of 2.4% compared to 0.85% in Caucasians (Dumas, 2016). Lung involvement is most common and the major cause of death. When it comes to extra pulmonary involvement, specifically the GI tract, the liver and spleen are the most commonly affected sites. However, there has been one other case report of sarcoidosis with just abdominal lymphadenopathy without liver and splenic involvement.

We present a 69-year-old Caucasian female with a history of Type 2 DM and hypothyroidism, who complained of a 2-week history of gait instability. Metabolic panel indicated hypercalcemia at 15.3, and CT imaging revealed enlarged mediastinal, hilar, abdominal and mesenteric nodes; the largest being the subcarinal node at 2.7cm. No cranial or dermatologic abnormalities were noted. PTH and Vit D levels were low, which was suspicious for underlying malignancy. She underwent an EBUS with FNA, and pathology revealed non-necrotizing granulomas along with mature lymphocytes. Flow cytometry was negative for non-Hodgkin lymphoma; as well as TB and other cultures were negative for infection. Interestingly, she was worked up 3 years prior for abdominal lymphadenopathy and painless jaundice. ERCP brushings from the common bile duct were negative. CT guided biopsy of one of the retroperitoneal lymph nodes revealed mature lymphocytes.

The diagnosis of sarcoidosis is commonly established on the basis of clinical and radiologic findings supported by histologic

findings. The presence of noncaseating granulomas is the pathologic hallmark of sarcoidosis. One must also be careful to rule out other causes of noncaseating granulomas such as several other infectious agents (e.g. Tuberculosis, Histoplasmosis, brucellosis and Toxoplasmosis), occupational and environmental exposures (e.g. beryllium, talc, and fungi), autoimmune disorders (e.g. Wegner's granulomatosis and primary biliary cirrhosis), and neoplasia (e.g. lymphoma and solid tumors) (Newman et al, 1997). From this case, the yield from an FNA using both CT and EBUS modalities, as well as flow cytometry, could safely exclude neoplastic causes. It is with this thought, that should the clinician encounter such patients, it would be prudent to keep sarcoidosis within his/her differential list.

P237

Pleuroparenchymal Fibroelastosis in a Previously Healthy Woman

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Pleuroparenchymal fibroelastosis (PPFE) is a rare disease characterized by a fibrosing process affecting the pleura and the subpleural lung parenchyma, with a predilection for the upper lobes. The etiology of PPFE is unclear at this juncture, about half of cases are felt to be idiopathic. It usually shows a progressive clinical course and has a poor prognosis. There is currently no specific therapy, but in progressive cases, lung transplantation may be required. Authors will present a clinical case.

A 74 year-old nonsmoking lady was referred to the respiratory outpatient clinic for persistent chest X-ray infiltrates. Five months earlier, she was admitted to a medical ward for community-acquired pneumonia, with a good clinical response to antibiotics, but non-resolving imaging findings. She had no relevant past medical history or occupational exposures, but lived in a farm, and was in contact with a dog and some sheep.

At observation she denied any respiratory complaints and had normal breath sounds and a room air oxygen saturation of 98%. Her chest x-ray showed worsening bilateral apical opacities. Lung function tests revealed a restrictive limitation with low diffusion capacity (vital capacity of 60% predicted and diffusion capacity of 59% predicted).

A Chest CT was ordered, and showed fibrotic residual infiltrates in the apex of both lungs, with traction bronchiectasis and a possibly malignant 2.5 cm nodule with a radiologist's recommendation for biopsy, which showed non-recent fibrosis and lymphocytes in the bronchiolar walls. Follow-up discussion in a multidisciplinary meeting led to suspicion of PPFE and a review of the biopsy, including staining for elastin using PAS and silver. This led to the identification of a pattern of fibrosis with an elastin rich matrix, compatible with PPFE. The patient remained asymptomatic and declined steroid treatment. Referral for lung transplantation was not considered due to her advanced age. She is currently under surveillance and under consideration for pirfenidone treatment.

Although PPFE is a rare disease, advances in its recognition will probably lead to more frequent diagnoses, and improved knowledge. In our case, the discussion of this complex patient in a multidisciplinary team meeting was instrumental for the correct diagnosis. This report illustrates how an elevated suspicion index is fundamental for the diagnosis of PPFE and a multi-disciplinary discussion may facilitate this.

P238

Preserved Lung Parenchyma of Idiopathic Pulmonary Fibrosis Patients has Increased Expiratory CT Densities – A Sign for Increased Alveolar Collapsibility?

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Introduction: Idiopathic pulmonary fibrosis is a progressive lethal chronic lung disease with still unclear pathogenesis. Usual interstitial pneumonia is typically found on CT scan in peripheral basal areas with otherwise preserved lung structure. Alveolar collapse and consequent induration is thought to lead to fibrotic transformation of lung tissue. We thus analyzed preserved lung tissue during expiration in CT scan if it differs from other diseases or controls.

Methods and Materials: The study was approved by the local ethics committee. We retrospectively assessed a total of 43 patients (15 patients with IPF, 13 patients with COPD/Emphysema, 15 controls without lung abnormalities) with CT in in- and expiration in a standard-dose protocol at 120 kV and 100 kV acquired on two different CT-scanners, Siemens SOMATOM Definition Flash and Philips Brilliance 64, which were performed for routine clinical work-up. Densitometry of unaffected lung tissue was performed in all lung lobes with a ROI of 15 mm diameter on soft-tissue kernel reconstruction during in- and expiration.

Results: Absolute values for density (HU) were similar in preserved lung parenchyma of lower lobes during inspiration comparing controls to IPF patients (t-test $p = 0.132$). During expiration there was significant difference between these groups with IPF patients exhibiting higher densities compared to controls (student's t-test $p < 0.001$). One-factor ANOVA analysis yielded significant difference in attenuation changes between in- and expiration of unaffected lung parenchyma between all subject groups in all lung lobes ($p < 0.001$). In IPF, highest differences in densities were observed in preserved lung tissue of the lower lobes. In COPD the density remained rather equal in the entire lung.

Conclusion: High CT-attenuation changes between in- and expiration in IPF patients are higher than in COPD/emphysema or controls without lung abnormalities. Higher density differences might indicate a correlate for alveolar collapse of unaffected lung tissue in IPF. Alveolar collapse contributes to fibrosis by the mechanism of collapse induration. Our observation strengthens this pathophysiological explanation for fibrogenesis.

P239

Diagnostic Potential of MMP-1 and SP-A as Biomarkers to Distinguish Chronic Hypersensitivity Pneumonitis from Idiopathic Pulmonary Fibrosis

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Introduction: Hypersensitivity pneumonitis (HP) is an inflammatory interstitial lung disease caused by a wide variety of organic particles. In general, the diagnosis of chronic HP represents a challenge for clinicians that need to use a constellation of clinical, laboratory, radiographic and pathological data to assess a confident diagnosis. Importantly, the clinical features cHP can be indistinguishable from those observed in idiopathic pulmonary fibrosis (IPF).

Objective: To determine whether serum levels of surfactant protein A (SP-A) and matrix metalloprotease-1 (MMP-1) may help to differentiate cHP from IPF.

Methods: This was a cross-sectional study including patients with IPF (n = 31), cHP (n = 31) and 17 healthy subjects. SP-A and MMP-1 serum levels were determined by ELISA and were evaluated for the differential diagnosis between HP and IPF, and also correlated with values of pulmonary function tests at diagnosis.

Results: MMP-1 and SP-A were significantly elevated in cHP compared with the other two groups. MMP-1 (HP = 11.7 ± 14 ng/ml versus FPI = 16 ± 20.7 ng/ml, $p < 0.001$) and versus Controls = (0.4 ± 0.3 ng/ml, $p < 0.0001$), ANOVA between groups <0.0001 . SP-A (HP = 74 ± 30 pg/ml versus FPI = 54 ± 20 pg/ml, $p < 0.02$) and versus Controls = (35 ± 6 pg/ml, $p < 0.0001$), ANOVA between groups <0.0001 . There was no correlation between MMP-1 or SP-A levels with the abnormalities in pulmonary function tests.

Conclusions: Our findings indicate that patients with cHP display the highest concentration of MMP-1 and SP-A which may be useful biomarkers to distinguish it from IPF.

P240

Risk of Pneumothorax due to Air Travel in Pulmonary Lymphangioleiomyomatosis

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Introduction: Pulmonary lymphangioleiomyomatosis (LAM) is a rare disease affecting almost exclusively women and characterized by abnormal proliferation of smooth muscle cells (LAM cells) in the lungs, kidneys and axial lymphatics. In the lungs, LAM cell proliferation lead to the development of multiple thin-walled cysts resulting in the gradual onset of respiratory insufficiency and frequent pneumothorax (PT). Air travel (AT) could further increase

the risk of PT in LAM through rupture of subpleural cysts induced by changes in atmospheric pressure in aircraft cabin.

Method: To assess whether AT increases the risk of PT in LAM, we performed a retrospective survey of women members of European LAM patient associations. Data were collected through a questionnaire comprising the detailed description of PT episodes, including dates, affected side, and therapeutic modalities, as well as a list of AT after disease onset. A post-flight PT was defined as a PT diagnosed by a physician ≤ 30 days after AT. Flights performed after lung transplantation were withdrawn from the analysis.

Results: A total of 145 women responded to the survey. Their mean age was 48 ± 12 years. The annual incidence of PT since first symptoms attributable to LAM and since LAM diagnosis was 7% and 5% respectively (versus 0.006% in the general women population). 77 patients with evaluable data performed a total of 194 AT. A PT occurred within 30 days after AT in 5/77 patients, of which one had bilateral PT. The probability of PT within 30 days after AT was 5/194 (2.6%) per patient and 6/388 (1.5%) per lung. As compared to the 30 days before AT, the incidence of PT per lung was significantly higher during the 30 days after AT (RR 6, CI 1.02–113).

Conclusions: The incidence of PT in LAM appears extremely elevated as compared to general women population. The occurrence of PT was significantly increased within 30 days after AT as compared to the 30 days before AT, suggesting that AT per se could be a risk factor for PT occurrence in LAM.

P241

Validation of APPS Tool to Predict Mortality in Moderate and Severe Acute Respiratory Distress Syndrome

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Introduction: A prediction tool that was developed by Villar et al. in Spain called 'APPS' tool was shown to accurately predict in-hospital mortality in moderate and severe Acute Respiratory Syndrome (ARDS) patients on lung-protective ventilation. A simple

Table 1. Significant variables in univariate analysis (for Abstract 241)

Variable	Score	Significance
Age	4.86	0.041
Peep at 24 Hours	5.762	0.016
Driving Pressure at 24 Hours	4.240	0.039
FIO2 AT 24 HOURS	5.052	0.025
Gender	4.209	0.04
Apps Score at 24 Hours	10.891	0.001

Table 2. Multivariate regression analysis (for Abstract 241)

Variable	B	S.E.	Wald	df	Sig	Exp
Peep at 24 Hours	-0.043	0.132	0.108	1	0.742	0.958
Driving Pressure at 24 Hours	-0.144	0.104	1.919	1	0.166	0.866
Fio2 at 24 Hours	-0.021	0.024	0.761	1	0.383	0.980
Gender	0.085	0.748	0.013	1	0.910	1.088
Apps Score at 24	-21.026	8123.919	0.000	1	0.998	0.000

9-point score that utilized the variables of age, PaO₂/FiO₂ ratio and Plateau pressure measured at 24 hours after diagnosis of ARDS divided patients into groups of low, moderate and high mortality risk. We have attempted to validate APPS tool to correlate mortality in a cohort of ARDS patients at a tertiary care hospital in the US.

Methods: Retrospective chart review was done to identify patients with moderate and severe ARDS (according to the Berlin definition) managed in medical and surgical ICUs of a tertiary care hospital over a 3-year period. APPS score was calculated for each patient and the relation of the score to in-hospital mortality was assessed by performing both univariate and multivariate regression analyses.

Results: In total, 63 patients with moderate and severe ARDS were identified who were managed with ARDSnet protocol and lung protective ventilation strategy. All-cause in-hospital mortality was 44.4%. Mortality for each APPS risk category was found to be 0% (0/17), 56.1% (23/41) and 100% (5/5) for low, moderate, and high mortality risk groups respectively. During univariate regression analysis, APPS score was found to be statistically significant factor for in-hospital mortality ($p = 0.001$). However, after adjusting for other variables like BMI, plateau pressure, driving pressure during multivariate analysis APPS score was no longer significant to suggest mortality. ($p = 0.998$)

Conclusions: An attempt at retrospective validation of APPS score to predict in-hospital mortality in moderate and severe ARDS patients, identified by Berlin criteria, at a tertiary hospital in the US demonstrated no significant association between APPS score and in-hospital mortality by multivariate analysis.

P242

Concurrent Validity of Sequential Organ Failure Assessment versus Systemic Inflammatory Response Syndrome Score for Patients in the Intensive Care Unit

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Introduction: The Third International Consensus Definitions for Sepsis and Septic Shock updated the definition of sepsis to match the former definition of severe sepsis and the screen used to assess sepsis from systemic inflammatory response syndrome (SIRS) to the sequential organ failure assessment (SOFA) and quick SOFA (qSOFA) score. We reviewed ICU patients at our institution to determine the impact of changing our usual assessment for sepsis.

Methods: Retrospective chart review of 21 patients in the ICU with confirmed or suspected infection in October 2016 was conducted. Physician orders for anti-infectives and cultures were used as a surrogate for suspected infection. Surgical patients were excluded to avoid confounding results. SIRS, SOFA, and qSOFA scores were calculated at each assessment and lab result. Concurrence was assessed for both SOFA and qSOFA with regards to SIRS by the incidence of simultaneous positive scores and the lag time between positive scores. The time between first positive result for each score was measured when one score showed a negative result before concurrence. The lag time between positive results when concurrent and the time between first positive results were assessed using descriptive statistics.

Results: Concurrent positive SOFA-SIRS and qSOFA-SIRS scores were observed in 16/21 and 15/21 patients respectively. A positive SOFA score preceded a positive SIRS score in 9/16 patients (mean 5.67 ± 3.24 hours); positive SOFA followed positive SIRS in 5/16 patients (mean 3.9 ± 6.47 hours). A positive qSOFA score preceded a positive SIRS score in 1/15 patients (0.5 hours); positive qSOFA followed positive SIRS in 7/15 patients (mean 13.73 ± 5.32 hours). 3/16 patients had a first positive SIRS before concurrence with SOFA (mean 21.28 ± 24.74 hours) and 8/15 patients had a first positive SIRS before concurrence with qSOFA (mean 6.67 ± 4.53 hours).

Conclusions: Both SOFA and qSOFA show some concurrence with SIRS in ICU patients. SOFA tends to show a positive result before SIRS, and could be used as an early warning for sepsis. These data should be correlated with clinical outcomes to determine impact on patient care.

P243

Reliability and Utility of the Ramsay Sedation Scale for Dosing Sedatives in Critically Ill Intubated Patients

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Introduction: Titratable palliative sedation (TPS) is the use of sedative therapeutic agents to ameliorate unendurable and refractory distress via reduction in patient consciousness. TPS can be adjusted based on objective and subjective data: vitals, labs, Ramsay Sedation Scale (RSS) and Richmond Agitation-Sedation Scale (RASS). Inappropriate dosing, including oversedation from variability in clinician assessment of sedation scales, can contribute to significant negative clinical outcomes. We assessed inter-rater reliability (IRR) and its correlation to variations in dosing to determine whether additional training in sedation scale assessment is necessary at our community institution.

Method: This was a prospective study evaluating sedation in ICU-mechanically ventilated patients without neurogenic abnormalities. Non-nursing healthcare professionals conducted independent sedation assessments using the RSS and compared their assessments to those charted by the nursing staff. Data obtained from the patients' chart included: demographics, Ramsay Score, past medical history, diagnosis, and BMI. Post-analysis, non-nursing healthcare professionals' scores were classified into three categories: equal to, higher than, or lower than those charted by nursing staff.

Results: There were 56 random RSS assessments conducted in 28 patients with a mean age of 63.2 +/- 10.7 years (range 38–82) and a mean BMI of 30.8 +/- 11.6 (range 15–77). 15/28 (53.6%) patients had a diagnosis of respiratory failure or pneumonia. Other diagnoses included CHF (3), seizures (3), AVR (1), SBO (1), drug overdose (2), cardiac arrest (2), and UTI (1). Non-nursing healthcare professionals' assessments were compared to nurses' and observed to be equal in 34%, higher in 57%, and lower in 9% of the cases. Of the 56 assessments, the average RSS score non-nursing healthcare professionals assigned was 4.9 +/- 1.58 while the nurses' charted average was 3.39 +/- 1.04; a mean difference of 1.54, 95% CI (1.03–2.03) $p < 0.0001$.

Conclusions: In our study both non-nursing healthcare professionals and nurses had equal RSS ratings in only 34% of the assessments conducted. Without proper education the RSS may not be a reliable tool for sedation assessment in a community institution; improper use may result in oversedation of critically ill patients.

Clinical Implications: Frequent nursing education is needed to ensure appropriate use and optimization of the RSS at our institution.

P244

Serum YKL-40 Levels may Help Distinguish Exacerbation of Post-infectious Bronchiolitis Obliterans from Acute Bronchiolitis in Young Children

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Introduction: The children with post-infectious bronchiolitis obliterans (PIBO) are frequently hospitalized with acute exacerbation, but clinical differentiation of PIBO exacerbation from ordinary bronchiolitis is often challenging, which may result in treatment delay and chronic lung function impairment. We aimed to examine whether serum YKL-40 and growth factors could be markers for PIBO exacerbation.

Methods: Thirty-seven children admitted with acute exacerbation of PIBO were enrolled. Diagnosis of PIBO was based on clinical history of acute respiratory infection followed by persistent airway obstruction and characteristic findings in high-resolution computed tomography. Serum levels of YKL-40, vascular endothelial growth factor (VEGF), transforming growth factor (TGF)- $\beta 1$ and platelet derived growth factor (PDGF)-BB were measured. The mediators were also examined in the children admitted with acute bronchiolitis serving as positive controls (N = 30) and in age-matched controls (N = 20).

Results: Only YKL-40 levels were found to be significantly higher in PIBO patients with exacerbation compared with bronchiolitis patients and showed a positive correlation with the severity of disease before diagnosis of PIBO.

Conclusion: Our results suggest that YKL-40 might be involved in the pathogenesis of PIBO and measuring serum YKL-40 levels might help distinguish exacerbation of PIBO from ordinary acute bronchiolitis in young children.

P245

Six Minute Walk Test in Children Six to Eighteen Years Old with Bronchial Asthma

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Background: Methods for assessing asthma control include symptom severity score and spirometry. As spirometry is expensive, requires patient cooperation, and not readily available, six minute walk test (6MWT) as a simple tool can be an option to assess asthma control.

Objective: The aim of this study was to determine if 6MWT compared with spirometry can be used as a monitoring tool and assess asthma control in patients with persistent asthma.

Methods: This prospective cohort study included patients 6 to 18 years old with persistent bronchial asthma. Spirometry and 6MWT were conducted at the start of the study and one month after treatment. Results were presented as mean +/- SD and com-

parison of data between the two tests were computed by means of student t-test. The correlation of 6MWT with spirometry were calculated using Pearson's correlation coefficient. A p-value <0.05 was considered statistically significant.

Results: A total of 62 out of 70 patients with persistent bronchial asthma completed the study. The 6MWT between patients with controlled and partly controlled/uncontrolled asthma at baseline were not significant ($p > 0.05$), but the 6MWT among patients with partly controlled/uncontrolled asthma improved significantly upon achieving control after one month of treatment ($p < 0.009$). There was a significant ($p < 0.02$) positive correlation of the 6MWT with forced expiratory flow ($r = 0.29$) and a significant ($p < 0.03$) negative correlation of the 6MWT with post-bronchodilator forced expiratory volume in one second ($r = -0.28$). There was no significant correlation between the 6MWT and other spirometry indices ($p > 0.05$).

Conclusions and Recommendations: The 6MWT may be used as a monitoring tool in children with bronchial asthma. More studies are recommended to further verify and support its use in patients with asthma.

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Exhalomics SESI-MS Feasibility Study with Infants and Young Children for Early Detection of Cystic Fibrosis Inflammation and Infection

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Introduction: Early and often subclinical pulmonary infection and pronounced neutrophilic inflammation are major contributors to CF-related morbidity. There is a causal relationship between high airway neutrophil elastase activity and the development of bronchiectasis. Early detection of disease and disease-associated complications is crucial for implementing timely therapeutic measures to reduce disease burden and improve prognosis. Secondary Electrospray Ionisation Mass Spectrometry (SESI-MS) is an extremely efficient sensing method for ionizing compounds in exhaled breath allowing extending number of breath compounds resulting in increased specificity.

Fig. 1. Children Tidal Breathing SESI-MS(for abstract 246).

Method: We developed a sampling device for the use in non-cooperative children with tidal breathing and facemask. The device was optimized for real-time, sensitive analysis by introducing a temperature, humidity and flow controlled air supply. A feasibility study was done with 20 children (age range 3–12y), 9 stable CF and 11 healthy. All children performed 6 measurements with tidal breathing and facemask (TBFM) and single breath manoeuvre via mouthpiece (SBMP).

Results: The success rate was 100% for TBFM but SBMP analysis was not feasible for 3 children of age 3y, 4y and 6y. The average features per measurement in positive mode were 713 for SBMP and 702 (–2%, SD11%) for TBFM. Molecules were detected in the range of $m/z = 50–320$ with intensities up to $5E+4cps$ for SBMP and $7E+4cps$ for TBFM. Data analysis is on-going with a set of 28 breath biomarkers (amino acids, fatty acids and aldehydes) which were detected and identified during previous exhalomics studies. Our preliminary results reveal comparable number of features and intensities between TBFM and SBMP.

Conclusions: Breath exhalomics studies with SESI-MS are feasible in children from 3 years of age. Measurements by TBFM and SBMP resulted in similar number of features and intensities. Therefore, SESI-MS with adapted sampling device can be applied in young non-cooperative children.

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