Eastern Pulmonary Conference
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All Scientific Posters will be on display in the South Ballroom Foyer and Ponce de Leon 5 & 6, Friday, October 1st and Saturday, October 2nd, 2021. Authors of these presentations are requested to be at their poster to discuss their work on Friday from 10:00-11:15AM and Saturday from 9:15 – 10:30 AM.

Not for CME

Treprostinil, an EP-2 agonist, decreases lung fibroblasts extra-cellular matrix production through enhanced c-AMP intracellular accumulation.

S. Orfanos MD[1], G. Cao, BT. Deeney, A. Ravi, R A Panettieri , Jr., MD

Introduction: Idiopathic pulmonary fibrosis (IPF) has a prevalence of 495 cases per 100 000 in adults 65 and older, there exists limited treatment options. Recently a randomized controlled trial of inhaled treprostinil in patients with pulmonary hypertension secondary to interstitial lung diseases showed a decrease in the number of exacerbations. We posit that treprostinil, which markedly increases cAMP levels, alters lung fibrosis biomarkers in human lung fibroblast (HLF).

Methods: HLF isolated from non-IPF human lungs were pre-treated with increasing doses of treprostinil, formoterol or isoproterenol to increase cAMP levels prior to stimulation with TGF-β. TGF-β stimulation represents an evoked phenotype for fibrosis. Protein production was then measured using immunoblot analysis and cAMP levels measured using an ELISA. Experiments were performed in multiple cell lines.

Results: Tresprostinil significantly inhibited extracellular matrix production including collagen 1A1 and plasminogen activator inhibitor (PAI-1) induced by TGF-β. Surprisingly, formoterol had little effect on TGF-β -induced collagen 1A1 and PAI-1 levels. Treprostinil induced significantly more accumulation of cAMP in HLF than isoproterenol or formoterol. cAMP accumulation within the HLF following treprostinil treatment decreased phosphorylation of AKT, a substrate of PI3 kinase activation, and increased phosphorylation of HSP-20, a substrate for protein kinase A activation, that alters cytoskeletal remodeling important in cell migration and shortening.

Conclusion: Treprostinil decreases extracellular matrix production from TGF-β-stimulated HLF this is associated with increases in cAMP and phosphorylation of HSP-20. These data support that targeting the cAMP/protein kinase A pathways through EP-2 or HSP-20 activation may provide therapeutic benefit in patients with IPF.

1

Are shorter distances comparable to six-minute walk distance when evaluating patients with cardiopulmonary disease

Samantha Gillenwater MD, Miquel Gonzalez MD, Morvarid Zandiyeh MD, Rajaganesh Rajagopalan MD, John Woytanowski MD, Jinesh Mehta MD

Introduction: The six minute walk test (6MWT) is a standard and validated method to assess cardiopulmonary status in outpatient setting routinely used to keep track of a patient's condition overtime. 6MWT is reported as distance walked in meters or feet and patient's dyspnea is reported modified Borg dyspnea scale before and after. Standard method of reporting is the 6 minute walk distance (6MWD). The deficiency of the test includes dynamic measurements of distances at various points of the test to determine when the patient's physical endurance tails off.

Methods: Prospective observational, single center study was conducted at the outpatient department of pulmonology at Cleveland Clinic Florida. Adult patients undergoing a 6MWT as part of their usual clinical management were studied. American Thoracic Society (ATS) guidelines were followed while performing the 6MWT. Respiratory therapist documented the distances walked at two, three, four, five, and six minute mark without interrupting the patient's walk. Pearson correlation coefficient was utilized to assess the association between 6MWT and 5MWT, 4MWT, 3MWT, as well as 2MWT, in addition, the plots of 6MWT against 5MWT, 4MWT, 3MWT, and 2MWT were conducted. To predict greater than 90th percentile of 6MWT, between 10th and 90th percentile of 6MWT, and less than 10th percentile of 6MWT, Youden method was performed to determine the cutoff values for minute mark, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were also calculated for each cutoff distance.

Conclusion: There were significant linear relationship between 6MWT and 5MWT, 4MWT, 3MWT, as well as 2MWT, and thus shorter time walk distances may be used instead of 6MWT. Our goal will be to use this information to cater testing for patients if the goal cutoff is met and stop the walk prior to the six minutes.

2

Change in patterns of hospitalization for influenza during COVID-19 surges

Sindhaghatta Venkatram , Anuhya Alapati, Arundhati Dileep, Gilda Diaz-Fuentes

Background: Hospitalization due to influenza has been stable in recent years. In March 2020, New York was an epicenter for coronavirus disease 2019 (COVID-19). Because influenza and COVID-19 present similarly, there were serious concerns that coinfection of these viruses would burden the healthcare system. We compared incidence and outcomes of patients hospitalized with influenza before and during COVID-19 (seasons 2017–2021).

Methods: We conducted a retrospective study evaluating hospitalized patients with influenza. Four influenza seasons were evaluated, 2017–2021, pre- and during COVID-19 pandemic. We compared incidence of influenza and clinical outcomes across the seasons.

Results: We found 412 patients hospitalized due to influenza in the study period; 394 had influenza, and 18 had both influenza and COVID-19 infections. Demographics across the four influenza seasons were comparable; the cohort was predominantly female (61%) and had an average age of 60 years old. Comorbid conditions were common. No outcome differences were found for patients with influenza when comparing influenza seasons prior to and during the COVID-19 pandemic. The mortality for the entire cohort was 6.5%. During the COVID-19 pandemic, there were 18 (4.4%) influenza patients coinfected with COVID-19 and 32 (7.8%) patients with bacterial super infection. Predictors of mortality in patients with influenza included presence of shock, heart failure, bacterial pneumonia, and use of mechanical ventilation. Coinfection with COVID-19 did not increase mortality.

Conclusion: We observed a significant decrease in the incidence of hospitalization due to influenza during the COVID-19 pandemic. Clinical presentations and outcomes for patients with influenza remain stable. Being aware of possible increased mortality for patients with both influenza and bacterial pneumonia is important. Although coinfection with COVID-19 did not increase mortality in influenza patients, identifying the specific virus responsible for infections has major therapeutic implications.

3

Worsening radiographic edema is associated with ICU admission and 30-day mortality in adult patients hospitalized with COVID-19

Daniel Kotok, Christine Girard, Jose Rivera Robles, Andrew Kim, Shruti Shettigar, Allen Lavina, Samantha Gillenwater, Anas Hadeh

Background: Severity of radiographic abnormalities on chest X-rays (CXR) in patients with COVID-19 has been shown to be associated with outcomes, but whether the evolution of radiographic edema in hospitalized patients with COVID-19 predicts need for ICU admission and mortality has not been rigorously studied. We sought to evaluate this question using a well-validated scoring system (the Radiographic Assessment of Lung Edema [RALE] score) using data over 6 months from a large, multi-hospital healthcare system including all adult (age >= 18) patients.

Methods: We collected CXRs over a 5-day period from patients hospitalized with diagnosis of COVID-19 between March and September 2020. CXR periods were defined as baseline (day of admission), early (1-2 days after admission) and late (3-5 days after admission). Need for ICU admission, mechanical ventilation and mortality at 30 days from admission were obtained from the charts. Two independent reviewers quantified radiographic edema using the RALE scoring system.

Results: 392 patients were identified (median age 62, 50% female). Inter-rate agreement for RALE score was excellent (interclass correlation coefficient = 0.87, 95% CI 0.83 - 0.90, $p < 0.0001$). 82 (21%) patients had a normal (RALE = 0) CXR on admission. Patients with a higher RALE score were more likely to require ICU admission (Figure 1) and had higher 30-mortality (Figure 2) at all time periods. An increase of 6 or more in RALE score from baseline to early period was associated with need for ICU admission (OR 5.1, 95% CI [1.71 – 17.3], $p = 0.002$) and 30-day mortality (OR 4.4, 95% CI [1.55 – 13.3], $p = 0.003$) even after adjustment for baseline hypoxemia, age and history of diabetes.

Conclusions: The RALE score is highly reproducible and easily implementable in adult patients presenting hospitalized with COVID-19. Early increase in RALE score is associated with 30-day mortality and need for ICU admission, suggesting that worsening pulmonary edema may be an independent negative prognostic marker in adult patients with COVID-19.

4

Understanding the role of transbronchial cryobiopsy in the diagnosis of interstitial lung disease at Cleveland Clinic Florida

John R. Woytanowski MD, Samantha Gillenwater MD, Sajive Aleyas MD, Ihab Alshelli MD, Nydia Martinez MD

Background: The diagnosis of interstitial lung disease (ILD) is challenging and relies on clinical history, radiographic and laboratory findings and, quite often, histology. Transbronchial cryobiopsy (TBLC) has emerged in recent years as an alternative to traditional forceps biopsy in the diagnosis of ILD; it has shown promise due to both a superior yield relative to forceps and less morbidity relative to surgical biopsy, however, the diagnostic concordance rates with surgery vary widely. Guidelines in recent years have advocated for a multidisciplinary (MDD) approach as the gold standard in the diagnosis of ILD, and many centers have adopted TBLC as part of their workup. We aimed to understand how TBLC has impacted the MDD at our institution.

Methods: Retrospective chart analysis was performed on all adults (18+) who underwent TBLC at Cleveland Clinic Florida from 1/1/2015 - 5/1/2020. A total of 23 subjects were enrolled. Each patient was presented at least once at our multidisciplinary discussion – the majority were presented after TBLC, however, some were presented both before and after biopsy. We noted whether the pathology was adequate and able to provide a differential diagnosis, whether the MDD utilizing the cryobiopsy was able to come to a consensus diagnosis, and whether the MDD led to a change in therapy.

Results: A histologic differential diagnosis was provided in 73.9% (17/23) of cases. A consensus diagnosis among MDD was able to be achieved in 78.3% (18/23) of cases, while 21.7% (5/23) were still labeled as undifferentiated interstitial disease. The MDD resulted in a change of therapy in 54.5% of cases (12/22). None of our subjects were subsequently referred for surgical biopsy.

Conclusion: The rate at which cryobiopsy was able to provide pathologic differential diagnoses is similar to cited studies, as is our rate of achieved consensus diagnoses among multidisciplinary discussion utilizing TBLC findings. Our study is limited but we believe that transbronchial cryobiopsy has definitively contributed to the consensus diagnoses achieved; one particularly interesting finding was that treatment was modified in more than half of cases upon review of biopsy results. Moving forward, we plan to follow the model of other centers and screen each patient in MDD prior to performing TBLC. The study is ongoing and should prompt other centers to evaluate the utility of TBLC within their MDD.

5

The cost-saving analysis for use of procalcitonin and inflammatory markers in covid-19 ventilator-associated pneumonia

Andrew Kim MD, Amy Van MD, Jinesh Mehta MD

Introduction: Procalcitonin has been used to differentiate between bacterial infections and other inflammatory processes in COVID-19. Furthermore, procalcitonin has been shown to be associated with up to a fivefold risk of severe infection in COVID-19. In the ProVAP study, procalcitonin was used to diagnose ventilator-associated pneumonias (VAP) and to increase the number of antibiotic-free days. The goal of this study is to observe if procalcitonin use is associated with decreased duration of antibiotics with potential cost savings. Additionally, secondary objectives include if procalcitonin use is associated with ventilator changes, inflammatory markers, and mortality.

Methods: In this retrospective study, 51 patient records were selected based on the diagnosis of positive SARS-CoV-2 by PCR test and patients requiring mechanical ventilation in the ICU. Lab values were obtained based on inciting events concerning for VAP in the setting of ventilator associated events (VAE) or sputum collections.

Results: There was no significant difference in those who received antibiotics between the procalcitonin cohort and non-procalcitonin cohort (64% v 52%). The average duration of antibiotics was not statistically significant for vancomycin (2.2d v 1.8d), piperacillin-tazobactam (5.6d v 4d), azithromycin (2.7d v 2.5d), or meropenem (3d v 3.3d), between the procalcitonin and non-procalcitonin groups, respectively. Interestingly, the procalcitonin group was treated with a longer duration of antibiotics overall, even though it was not statistically significant. Secondary outcomes were similarly not significant for ventilator changes for FiO2 (59% v 66%) or PEEP (10.9 v 10.7); nor was it significant for inflammatory markers including WBC (15.1 v 13.1), d-dimer (4353 v 5691), ferritin (735 v 757), and CRP (13.3 v 11.4), between the cohorts. Lactic acid was statistically significantly lower in the procalcitonin group (1.8 v 3,1, p=0.01). Overall 30-day mortality was also significantly lower for the procalcitonin group (45% v 76%, p=0.02), though there was no significant difference in 90-day mortality between the groups (63% v 76%).

Conclusion: The use of procalcitonin did not have a significant correlation with duration of antibiotic use, ventilator changes, or inflammatory markers. However, the procalcitonin group did have a lower lactic acid and 30-day mortality, showing evidence that lactic acid may be a predictor of short-term mortality in COVID-19 mechanically-ventilated patients. Overall, the cost of daily inflammatory markers was approximated to be $377 and would result in a summated price of $19,227 daily based on these 51 patients, without reduction of antibiotic usage.

6

Use of ROX index in COVID-19 patients on high flow nasal cannula: Look beyond the 12-hour window

Rajaganesh Rajagopalan, Jenaken Dev, Astrid Carrion-Rodriguez, Allen Lavina, Christopher Bodden, Kelsey Mowery and Jared Piotrowski.

Introduction: The use of High Flow Nasal Cannula (HFNC) is the standard of care for patients with Acute Hypoxemic Respiratory Failure secondary to COVID-19 pneumonia, who require a higher Fraction of Inspired Oxygen (FiO2) than deliverable by a Nasal Cannula or a simple Face Mask. The ROX Index was developed to predict the need for Invasive Mechanical Ventilation among patients receiving HFNC therapy [1,2]. The Ideal time to Intubate patients with Acute Hypoxemic Respiratory Failure due to COVID-19 pneumonia receiving HFNC support is unclear. Our goal was to validate the cut-offs and time points mentioned in the original ROX Index study[1] in COVID-19 patients requiring HFNC.

Methods: Chart review was performed to include patients with RT-PCR confirmed COVID-19 pneumonia, between 03/2020 to 03/2021, who required HFNC for ≥ 12 hours and required at least FiO2 0.8 via HFNC at some point during their hospitalization.

Results: 53 patients (34 Males (64.2%) and 19 females (35.8%)) fulfilled our inclusion criteria. The baseline characteristics of the study population are outlined in Table 1. The ROX score cut-offs and their ability to predict Intubation at 2,6 and 12 hours is outlined in Table 2. The Inflammatory makers on admission and their peak values during the hospitalization course are listed in Table 3. 45.3% of the patients did not require intubation compared to 54.7% who were Intubated. There was a significant difference in the number of hospitalization days between the Intubated and the non-Intubated patients, 38.4 days vs. 13.7 days (p< 0.001 by Mann-Whitney U test). 58.5% survived until hospital discharge vs. 41.5% who did not survive. The study was limited by its sample size and patient heterogeneity.

Conclusion: The ROX score at 2,6 and 12 hours has limited ability to predict the need for intubation in COVID-19 patients. We created a model with a ROX score cut-off of 3, which had improved specificity at the cost of sensitivity and resulted in an ROC curve with AUC that was not statistically significant compared to the original ROX study. The AUC of the ROC curve values indicate that the 2, 6 and 12 hour time points analyzed in the original study may not be applicable for COVID-19 patients.

7

Revised retrospective analysis comparing Wells score versus Revised Geneva score in patients who underwent CT pulmonary angiogram in the ED.

Miquel Gonzalez MD, Samantha Gillenwater MD, Rajaganesh Rajagopalan MD, Allen Lavina MD, Rafael Miret MD, Morvarid Zandiyeh MD, Felipe Martinez MD, Jinesh Mehta MD.

Rationale: Pulmonary embolism (PE) is a differential diagnosis for some of the most common presenting complaints in the ED, such as chest pain and dyspnea. The fear of missing a pulmonary embolism can often lead to clinical gestalt based ordering of CT Pulmonary Angiogram (CTPA). Our goal was to retrospectively compare the Wells score versus Revised Geneva (rGeneva) score on all patients who underwent a CTPA in the ED between October 2018 to October 2019 at Cleveland Clinic Florida Weston Hospital.

Methods: 1749 consecutive CTPA studies done between October 2018 - October 2019 at Cleveland Clinic Florida were chart reviewed for Pulmonary Embolism, D-dimer level, Wells score and rGeneva score. 86 patients were excluded due to indeterminate CTPA findings. The primary objective was to compare the Wells score and the rGeneva score in conjunction with D-dimer levels with regard to sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV). McNemar test was used to compare sensitivity and specificity between the tests.

Results: Low risk Well's score (< 2) had 71.1% sensitivity, 69.3% specificity,15.4% PPV and 96.8% NPV for pulmonary embolism. Low risk rGeneva Score (< 4) had 75.4% sensitivity, 41% specificity, 9.2% PPV, 95.5% NPV. The ROC curve AUC (area under the curve) was 0.757 for Wells score and 0.678 for rGeneva score. Among 1103 patients with a low risk Wells score who underwent CTPA, 35 patients had PE. Among 662 patients with a low risk rGeneva score who underwent CTPA, 29 patients had PE.

The patients with low probability of PE based on Wells score and rGeneva score were then stratified for D-dimer levels. 495 of the 1103 patients (44.9%) with a low risk Wells score had D-Dimer testing, In this sub group, 14 patients had PE (14/495), all with D-dimer > 500 resulting in 100% sensitivity, 100% NPV, 10.6% specificity and 3.2% PPV. 338 of the 662 patients (51.1%) with low risk rGeneva had D-dimer testing, in this sub group 14 patients had PE (14/338) with one patient having D-dimer level < 500. This resulted 92.9% Sensitivity, 97.2% NPV, 10.8% specificity and 4.3% PPV. McNemar test was used to compare sensitivity and specificity of low-probability Wells + negative D-dimer to low-probability rGeneva + negative D-dimer. Wells + D-dimer had a statistically significant higher sensitivity for predicting a negative CTPA than (0.96 vs 0.92 with p-value of …

*Full abstract presented during the poster session

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Ventilator-associated pneumonia in COVID-19 patients correlates with elevation in procalcitonin and d-dimer in setting of ventilator associated events and sputum production

Amy Van MD, Andrew Kim MD, Jinesh Mehta MD

Introduction: Ventilator-associated pneumonia (VAP) in mechanically-ventilated patients with COVID-19 have been difficult to diagnose. Inflammatory markers such as procalcitonin have been extensively reviewed as a harbinger of severe disease in COVID-19. However, it is undetermined whether trending of inflammatory markers in mechanically-ventilated COVID-19 patients is useful to identify VAP, initiate treatment, or de-escalate treatment. The goal of this study is to determine if initial intubation, ventilator-associated events (VAE), or sputum collection was associated with elevations in inflammatory markers, procalcitonin, or organism identified on cultures.

Methods: 287 patients were enrolled in this retrospective study based on inclusion criteria of admission to ICU with a diagnosis of COVID-19 and mechanical ventilation. Data was analyzed into three cohorts: initial intubation, VAE, and sputum collection. Within each group, laboratory markers associated with each inciting event were compared to admission values with a two-tailed t-test.

Results: The initial intubation cohort revealed a significant difference in WBC (11.2 vs 8.1, p=0.01). There were no significant differences in FiO2, PEEP, procalcitonin, d-dimer, ferritin, or CRP. In the VAE cohort, there were significant differences in FiO2 (76 vs 52, p=0.002), PEEP (12.6 vs 9.6, p=0.02), WBC (14.1 vs 7.2, p=0.006), d-dimer (4144 vs 881, p<0.001), and CRP (10.4 vs 16, p=0.049). There were no significant differences in procalcitonin and ferritin. In the sputum collection cohort, there were significant differences in WBC (16.8 vs 7.7, p<0.001), procalcitonin (2.95 vs 0.65, p=0.01), and CRP (10.2 vs 15.8, p=0.047). There were no significant differences in FiO2, PEEP, d-dimer, or ferritin. A notable finding is that the VAE cohort identified a cultured organism 83% of the time, while the initial intubation cohort was 35%, and sputum collection cohort was 38%.

Conclusion: In this COVID-19 VAP study, all three cohorts had an associated rise in WBC. VAE was associated with a rise in d-dimer, while sputum culture collection was associated with a rise in procalcitonin. Interestingly, VAE is suggestive of VAP with an identified organism 83% of the time. Furthermore, d-dimer had an association with VAE and positive organism identification. Lower CRP in both VAE and sputum collections cohorts may be due to longer use of steroids at the time of the inciting event. Ultimately, this data suggests a role for d-dimer and procalcitonin in identifying events associated with a VAP.

Clinical utility of combined biomarker model to manage indeterminate pulmonary nodules

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Introduction: Although the number of lung cancers diagnosed annually remains relatively constant, the incidence of pulmonary nodules is ever increasing. The current management of patients with indeterminate pulmonary nodules (IPNs) is often associated with high rates of invasive procedures, repeated Ct scans associated with high cost and morbidity. Patients presenting with indeterminate pulmonary nodules (IPNs) undergo high rates of invasive, costly and morbid procedures.

Hypothesis: We developed an improved prediction model for pulmonary nodule diagnosis, based on a combination of the Mayo model, high sensitivity CYFRA 21-1 and radiomics. We hypothesized that our biomarker strategy would reduce the number of invasive procedures

Methods: We extracted from the electronic medical record the number of procedures performed between initial nodule detection on chest CT and final diagnosis in a cohort of 180 patients presenting with IPNs. The follow up procedures were CT contrast/non contrast, PET scan, Bronchoscopy, BAL, Microbiology – Sputum and Fungal serology, trans-thoracic needle biopsy/Wedge resection or Lobectomy. To test the clinical utility of the prediction model, the clinical management in the intermediate risk group based on the Mayo model was compared to the hypothetical management based upon our combined biomarker model, where low risk patients would undergo surveillance CT and high-risk patients would undergo. Total time to diagnosis was also calculated.

Results: Among 180 patients, 125/180 (69%) were malignant and 55/180 (31%) were benign after a minimum of 2 year follow up. The Mayo model was used to classify high, low, intermediate risk. 30/54(56%) of the patients with benign nodules underwent invasive procedures including bronchoscopy or surgical resection (47 procedures total). Using our risk model 8/30 would have been suggested for surveillance CT, reducing invasive procedures by 12 (26%). 66/125 (53%) of the patients with malignant nodules were classified at intermediate risk by Mayo model. Of these, our risk model would have taken 24/66 (36%) straight for biopsy. For these 24 cases, time to diagnosis would have been reduced by an average of 69 days.

Conclusions: Our study suggests Integration of clinical, blood, and imaging biomarkers improves the noninvasive management of IPNs upon current clinical practice, potentially reducing the rate of unnecessary invasive procedures while shortening the time-to-diagnosis.

A pleural plaque, multifocal consolidations, and markedly elevated inflammatory markers hinted towards the atypical: A case of ARDS and septic shock secondary to legionella pneumophila

Lewjain Sakr MD, Allen Lavina MD, Jinesh Mehta, MD

Introduction: *Legionella pneumophila* is an aerobic gram-negative intracellular bacillus that is a common and increasing cause of community acquired pneumonia (CAP) in the United States (1). Infection with *Legionella pneumophila* often causes mild illness and often has extrapulmonary involvement (2). We present a case of a patient without a known history of lung disease who presented with *Legionella pneumophila* pneumonia with rapid development of acute respiratory distress syndrome and shock. We highlight key findings that could potentially point healthcare providers towards the diagnosis of *Legionella pneumophila* more promptly.

Case Presentation: An 83-year-old female presented to the emergency department with weakness and nonproductive cough followed by loose stools and worsening shortness of breath. Upon arrival, the patient was febrile, hypertensive, with oxygen saturation of 90% on room air. The patient was noted to have new onset atrial fibrillation with rapid ventricular response. Baseline labs were significant for an elevated creatinine, lactic acid, white blood count, and markedly elevated inflammatory markers. X-ray of the chest suggested multifocal pneumonia with the presence of calcified pleural plaques and multifocal consolidations. Empiric antibiotics, fluid resuscitation, and agents to control the patient's heart rate were initiated. The patient's condition deteriorated rapidly requiring intubation for worsening respiratory failure and vasopressor support the day following admission. Further work-up revealed Legionella infection and the patient was maintained on the appropriate antibiotics. The patient's condition gradually improved. She was extubated with the plan to discharge to a skilled nursing facility.

Discussion: *Legionella pneumophila* is a common cause of community acquired pneumonia that is usually undiagnosed leading to life-threatening patient outcomes (1). Legionella infection triggers an immune-mediated reaction that can lead to severe acute pulmonary disease requiring admission to the intensive care unit (2). People with compromised host defenses are at an increased risk of infection with *Legionella pneumophila* (3).

*Full abstract presented during the poster session

A rare case of ticagrelor induced diffuse alveolar hemorrhage (DAH)

Jose D. Rivera, MD. Sadaf Afraz, MD. Amy Van, MD. Miquel Gonzalez, MD. John Woytanowski, MD. Anas Hadeh, MD.

Introduction: Diffuse Alveolar Hemorrhage (DAH) is a life-threatening condition characterized by chest x-ray infiltrates, hypoxemia and anemia that requires a bronchoalveolar lavage (BAL) for diagnosis. Although the differential diagnosis for DAH is very broad and drug-induced DAH is well-established, there are only a few cases in the literature of Ticagrelor induced DAH. – (Yilmaz, et al.,2018, Sajjad et al., 2021). We will present a case of a patient who was diagnosed with DAH following a left heart catheterization (LHC) and Ticagrelor administration.

Case presentation: 80-year-old male with history of hypertension, hyperlipidemia, coronary artery disease (post 6 stents) who presented with chest pain. The patient was started on a heparin drip, aspirin and Ticagrelor. A left heart catheterization was performed and drug-eluting stent was placed in the circumflex. At this time the heparin drip was discontinued. Later that day a rapid response was called due to hemoptysis, epistaxis and hypoxemia. Chest X-ray showed new airspace infiltrates. Patient was intubated given worsening respiratory status with a differential diagnosis of DAH vs acute pulmonary edema. Trial of diuretics did not improve his oxygenation. Evaluation for common causes of DAH was negative. The patient had no systemic symptoms consistent with vasculitis. Rheumatologic workup was negative and there was no evidence of renal or hematologic disease or disseminated intravascular coagulopathy. Coagulation labs were within normal limits. The patient had been on heparin for 4 hours and at no point was partial thromboplastin time supratherapeutic. BAL was performed and the diagnosis of DAH was confirmed on serial lavages. Ticagrelor was considered to be the most likely etiology of DAH. The medication was stobbed and the patient's hemoptysis improved. The patient was subsequently started on Plavix without recurrence of the hemoptysis. Unfortunately, he had a second coronary event and expired a few days later.

Discussion: DAH is a disease of the lung microcirculation most commonly associated with autoimmune or hematologic diseases. Given high morbidity and mortality of patients with DAH, a high degree of suspicion is imperative to recognize it and make an early diagnosis. Prompt withdrawal of offending agents, guided treatment and supportive care is needed to improve prognosis of patients. In this case, all other workup was negative making Ticagrelor induced DAH the mostly likely etiology. Standard therapies such as immunosuppressives and/or steroids are often used empirically, although their efficacy is unknown. Further research is necessary to identify the best management of Ticagrelor induced DAH. As usage of the drug increases, it is important to consider Ticagrelor induced DAH in the appropriate clinical setting as prompt withdrawal of the agent may improve outcomes.

Bronchoalveolar carcinoma in a patient with chronic silica exposure: Exploring the effects of hazardous components involved in clay court tennis maintenance

Melaine Lanza, M.D., Anas Hadeh, M.D., and Adrian Michael Lorenzana, M4

Abstract: The effect of chronic crystalline silica exposure on lung health is a well-studied topic within the occupational health and safety industry. Respirable crystalline silica is a hazardous particulate often found amongst construction, mining, oil and gas extraction, stone countertop, and foundry workers. A less explored topic is the carcinogenic effect associated with long term exposure and inhalation of crystalline silica dust involved in clay tennis court maintenance. Here, we present a case of a patient who developed well differentiated adenocarcinoma with lepidic growth, formerly known as bronchoalveolar carcinoma, after four years of exposure to clay dust.

Introduction: Silica dust exposure in the workplace and its association with pulmonary silicosis, particularly in construction, mining, oil and gas extraction, stone countertop, and foundries, is a well-studied topic in the occupational health and safety community. A less studied topic in relation to chronic silica exposure in the workplace is the development of lung cancer associated with long term inhalation of crystalline silica dust. An environment not frequently explored for silica dust exposure in occupational health and safety case studies is the clay tennis court. Clay material used in tennis courts in the United States, is composed of respirable crystalline silica, otherwise known as quartz. Although it only composes > 1% of manufactured clay composition, it has potent carcinogenic effects in small quantities upon prolonged and repeated exposure. Here, we present a case of a patient who developed well differentiated adenocarcinoma with lepidic growth, formerly known as bronchoalveolar carcinoma, after four years of exposure to the dust from tennis court clay.

Case Presentation: A 59-year-old male with a past medical history of recently diagnosed Stage IV adenocarcinoma of the lung (T4N0M1a) and mycobacterium avium complex pneumonia presented to the emergency department with worsening dyspnea and a productive cough. On presentation, the patient required 6 liters supplemental oxygen via nasal cannula. The CT chest revealed extensive bilateral mid to lower lung predominant peripheral consolidative airspace opacities with septal thickening and scattered nodular opacities concerning for viral pneumonia versus progression of malignancy. Covid 19 was ruled out. The patient was admitted and started on empiric antibiotic therapy for presumed pneumonia with azithromycin, zosyn and vancomycin. He reported productive cough, of foamy whitish sputum for the past five months which led to his initial outpatient workup…

*Full abstract presented during the poster session

Ventricular assist device for acute right ventricular failure secondary to acute pulmonary embolism

Carla Williams, M.D., Anshika Singh, M.B.B.S. (M.D.), Breana Carroll, D.O., Vishal Patel, D.O.

Introduction: Massive pulmonary embolism (PE) can have deadly consequences, including acute right ventricular (RV) failure. Current management of acute RV failure secondary to PE is intravascular resuscitation, inotropic agents, thrombolysis, and or thrombectomy. However, RV failure refractory to the management above may respond to mechanical circulatory support. Unfortunately, evidence surrounding safety and efficacy is sparse. Here we discuss a positive patient outcome after using a catheter-based ventricular assist device for cardiogenic shock in the setting of massive PE to facilitate RV recovery.

Case description: A 69-year-old woman presented to the emergency department for syncope that occurred two days after left knee arthroscopy. On admission, she developed acute hypoxemic respiratory failure and became pulseless. ACLS was initiated, and the patient was intubated for airway protection. A bedside echocardiogram revealed a severely enlarged and hypokinetic RV with septal flattening strongly suggestive of a massive PE. During CPR, she received systemic tissue plasminogen activator (tPA), along with an unsynchronized shock (200 J) until ROSC was achieved. A left femoral central line was placed for pressor support. She required norepinephrine, vasopressin, and epinephrine drips to maintain a mean arterial pressure > 65. A Flo Trac device was placed to monitor cardiac output (CO), and dobutamine was started to sustain CO greater than 4L/min. A formal echocardiogram confirmed severe RV dilation and severely depressed RV systolic function. CT chest 9 hours after tPA administration demonstrated right upper, bilateral lower lobe segmental, and subsegmental filling defects indicative of pulmonary emboli with residual disease. Due to the high bleeding risk status post tPA, the patient was not eligible for extracorporeal membrane oxygenation. A pulmonary artery catheter at the bedside measured a pulmonary artery pressure (PAP) of 33mmHg. With an elevated PAP without significant clot burden and ongoing shock state with multiorgan failure, the decision was made to place a right-sided ventricular assist device within the first 24 hours. The patient's CO was monitored closely with serial transthoracic echocardiograms every 24-48hrs. Fluid and nutritional status were optimized. All pressor support was weaned after three days except dobutamine (3 mcg/kg/min). The flow (P-level) was also weaned down, and the RV assist device was removed on day nine after a repeat echocardiogram showed normal global RV systolic function. She was successfully extubated to CPAP on day twelve, then weaned down to oxygen via nasal cannula.

*Full abstract presented during the poster session

Not irritable bowel syndrome: Answer hides in the lungs

Anshika Singh, M.B.B.S. (M.D.), Carla Williams, M.D., Sankalp Patel, D.O., David H. Lindner, D.O. , Mustafa Akbiek, M.D.

Introduction: Neuroendocrine tumors (NET) are slow-growing malignancies that arise from neuroendocrine cells found predominantly in the gastrointestinal tract, pancreas, and lungs. NET of the lung or bronchopulmonary carcinoid (BPC) comprises less than 2% of primary lung tumors. Presenting symptoms include cough, wheezing, flushing, and airway disease or bronchial obstruction signs such as hemoptysis, pleuritic pain, atelectasis, and dyspnea. However, a significant proportion of patients are asymptomatic. The rare incidence and variable presentation of NET can often cause a delay in diagnosis, leading to poor quality of life for patients.

Case presentation: A 30-year-old female was referred to the gastroenterology clinic for a second opinion on chronic diarrhea alternating with constipation for the past three years. She had several episodes of non-bloody diarrhea up to seven times a day, along with fecal incontinence followed by constipation with associated weight loss, chronic fatigue, abdominal cramps, and non-bloody emesis up to four times a day. Extensive gastrointestinal workup was inconclusive. Somewhat serendipitously, a primary lung carcinoid tumor in her left lung base was found on CT enterography. A chest CT characterized it as a 3.2 x 3.0 cm lobular solid mass in the peripheral lower lobe of the left lung. PET-CT from skull base to mid-thigh showed avid uptake of fluorodeoxyglucose (FDG) in the nodule. No other FDG avid pulmonary nodule was seen. No FDG uptake was noted in the head, neck, abdomen, pelvis, or musculoskeletal system. After CT-guided biopsy, immunostains were diffusely positive for pancytokeratin, synaptophysin, CD56, TTF-1 in the tumor cells and less than 1% positive for Ki-67, consistent with typical NET carcinoid along with low mitotic count and no evidence of necrosis. The tumor was resected via video-assisted thoracoscopic surgery (VATS), which led to the resolution of her symptoms and a remarkable improvement in her quality of life.

Discussion: BPC accounts for only 1-2% of all lung malignancies diagnosed in adults. The predominance of GI symptoms in a patient with BPC in the absence of any respiratory symptoms is very rare. The severity of this patient's diarrhea is also unexplained by just a borderline elevation of her 24-hr urine 5-HIAA levels. Centrally located BPC causes hemoptysis, stridor, pleuritic pain, or post obstructive pneumonia. The peripheral location of the nodule explains the absence of these respiratory symptoms in our patient…..

*Full abstract presented during the poster session

A rare case of *Aspergillus* empyema thoracis as a complication of COVID-19 pneumonia

Veronica Williams, DO; Marc Diamond, MD

Introduction: Aspergillus is a ubiquitous mold that manifests as a wide range of clinical disease, the majority of which is attributable to Aspergillus fumigatus. Although there have been recorded cases of coronavirus disease-associated invasive pulmonary aspergillosis, aspergillus empyema thoracis remains an exceedingly rare entity altogether, with no documented reports specifically in association with antecedent COVID-19 pneumonia. We report this case in view of the exceptional rarity of pleural *Aspergillosis* occurring in an otherwise healthy individual with no lung pathology prior to COVID-19 infection.

Presentation of Case: A 68 year old female with history of hypertension, hyperlipidemia and recently diagnosed COVID-19 infection from an ER visit one week prior presented to a community hospital with progressive shortness of breath and hypoxemic respiratory failure, for which she was treated with tocilizumab, steroids, ceftriaxone and azithromycin due to concerns for bacterial superinfection. She did not receive remdesivir due to the time course of initial symptom onset.
Her hospital course was complicated by hydropneumothorax requiring multiple tube thoracostomies for persistent right pneumothorax. Pleural fluid analysis was exudative and grew aspergillus fumigatus, and she was subsequently started on voriconazole and broad spectrum antibiotics. Initial sputum cultures were negative however repeat tracheal aspirates obtained while intubated grew mycobacterium avium complex, which resulted post-mortem. There was no history of diabetes or immunosuppressed state prior to admission. No obvious bronchopleural fistula was identified on imaging or bronchoscopy. She experienced a protracted hospitalization with severe COVID-19 ARDS and was inevitably transferred to a tertiary care facility for refractory hypoxemia with brief administration of pulmonary vasodilator for salvage therapy with no improvement despite optimal vent settings and empiric coverage for fungal lung infection. She was not deemed a candidate for transplant or ECMO due to factors including severity of critical illness, active infection, and age. She ultimately experienced cardiopulmonary arrest and expired on hospital day 46.

Discussion: Pleural *Aspergillosis* is a rarely reported disease. Overall, fungal infections comprise less than 1% of all pleural effusions, however it is associated with a high risk of mortality. Unlike the pulmonary forms of the disease, pleural *Aspergillosis* is not more common in immunocompromised individuals, and the majority of reported cases of pleural *Aspergillosis* have been in the presence of underlying lung pathology such as tuberculosis, or prior surgical procedure such as bronchopulmonary fistulas, pleural drainage or lung resection. The architectural distortion caused by ARDS due to COVID-19 pneumonia may serve as a predisposing factor for pleural aspergillosis.

*Full abstract presented during the poster session

A case report of pulmonary hypertension secondary to a hiatal hernia

Rafael Miret, MD. Samantha Gillenwater, MD. Miquel Gonzalez, MD. Jinesh P Mehta, MD. Franck Rahaghi, MD.

Introduction: Few case reports have been published showing manifestation of hiatal hernias on echocardiography studies, mostly due to the mass effect of the hernia on the left atrium. However patients rarely present with symptoms suggestive of cardiac etiology. We present a case showing an increase in pulmonary artery pressures due to the effects of the hiatal hernia and subsequent stabilization of echocardiographic changes after surgical correction of the hernia.

Case Presentation: A 54-year old woman presented with intermittent shortness of breath on exertion. The patient's dyspnea was exacerbated by large meals and lying flat. Her medical history included degenerative joint disease, gastroesophageal reflux disease (GERD), hypercholesterolemia and hypertension. Patient had a seven year history of tobacco use. Her list of medications include Tramadol, Meloxicam, Nexium, Effexor, Atenolol and multivitamins. Physical exam unremarkable save for moderate scoliosis. Chest X-ray reported no acute pulmonary findings with moderate hiatal hernia. VQ scan and stress test were negative. CT chest reported a large hiatal hernia containing the fundus and part of the body of the stomach above the diaphragm.

A transthoracic echocardiogram (TTE) revealed normal left ventricular cavity, with an ejection fraction of 60%, stage 1 diastolic dysfunction, mild dilation of the right ventricle, 1+ mitral regurgitation, 2+ tricuspid regurgitation and a right ventricular systolic pressure of 50 mmHg. Pre- and post-meal echocardiograms were performed both before and after corrective surgery for the hiatal hernia to estimate changes in mean pulmonary artery pressure (mPAP). Before correction of hiatal hernia, the resting mPAP was 31-36 mmHg and the post meal mPAP was 40-45 mmHg. After surgical correction of hiatal hernia by Nissen fundoplication, patient reported a resolution of symptoms. Follow up pre- and post-meal TTE showed mPAP of 31 mmHg and 35 mmHg respectively.

Discussion: Although right heart catheterization (RHC) has been established as the gold standard in the diagnosis of PH, echocardiography is an accepted diagnostic instrument for assessment of right heart function and dimension. mPAP has been found to be highly accurate for the initial diagnosis of PH and is helpful in identifying patients who should be referred for RHC[2-3]. Hiatal hernia is a common entity characterized by the displacement of the gastroesophageal junction and part of the stomach into the mediastinum. Most patients are asymptomatic. Symptomatic patients typically present with refractory GERD.

*Full abstract presented during the poster session

Enoxaparin-associated spontaneous hemothorax: A case report

Morvarid Zandiyeh MD, Lewjain Sakr MD, John Woytanowski MD, Miquel Gonzalez MD, Samantha Gillenwater MD, Justin Dolan MD

Introduction: Spontaneous hemothorax in the context of enoxaparin use is a rare clinical entity. There are only two previous reports implicating low-molecular-weight heparin as a potential cause of spontaneous hemothorax (1, 2). Our report highlights a rare case of life-threatening spontaneous hemothorax in a patient receiving enoxaparin therapy for hypercoagulable syndrome.

Case Report: A 50-year-old male with JAK2 positive essential thrombocytosis with multiple episodes of deep venous thrombosis and pulmonary embolisms on enoxaparin presented to the emergency department with syncope. Upon arrival, the patient was hemodynamically unstable with an oxygen saturation of 88% on room air. Baseline labs showed an elevated creatinine, lactic acid, white blood cell count, and low hemoglobin. A computed tomographic (CT) scan of the chest showed marked opacification of the left hemithorax with heterogenous density indicative of hemothorax. Reversal of anticoagulant effects was attempted with protamine. The patient underwent two chest tube placements and was subsequently intubated for worsening respiratory failure. Immediate fluid and blood resuscitation, vasopressor support, and broad-spectrum intravenous antibiotics were initiated due to undifferentiated nature of the shock at that time. Cardiothoracic surgery was consulted, and he underwent a left thoracotomy with evacuation of 3 liters of blood. No active source of bleeding was identified. As bleeding stabilized, anticoagulation with heparin was resumed and transitioned to low-dose enoxaparin. However, patient's condition worsened gradually and a repeat CT scan of the chest was consistent with recurrent hemothorax. He underwent a second thoracotomy with evacuation of 3 liters of blood with no overt source of bleeding. As the patient stabilized, he was again transitioned to low-dose enoxaparin with the plan to gradually escalate in outpatient setting.

Discussion: Spontaneous hemothorax due to anticoagulant therapy is extremely uncommon. Despite the advantages associated with enoxaparin, the risk of bleeding remains present especially in patients with risk factors including advanced age and renal insufficiency (3). Our patient presented with an elevated creatinine and severe shock, which further worsened his kidney function and could have contributed to the second episode of spontaneous hemothorax after resuming enoxaparin following the initial thoracotomy. Given the paucity of cases of spontaneous hemothorax in patients with enoxaparin therapy and this patient's initial vague symptoms present a diagnostic challenge for early identification of spontaneous hemothorax.

*Full abstract presented during the poster session

A rare infection following COVID 19 pneumonia treatment

Kishankumar Patel MD, Yelixa Santos Roman MD, Gustavo Lagrotta DO, Christian Almanzar-Zorilla MD, Hector Vazquez MD

Introduction: Cryptococcus neoformans is an opportunistic fungus which causes severe meningoencephalitis in immunocompromised individuals. Multiple cases of secondary infections have been reported following infection with COVID 19 virus. We present a case of severe cryptococcal meningoencephalitis four months after diagnosis and treatment of COVID 19 Pneumonia.

Description: A 75-year-old Caucasian male with medical history of COPD, Benign Prostatic Hypertension, and Hyperlipidemia was admitted for worsening dyspnea. He had been previously hospitalized four months ago, treated with Remdesivir and Decadron 6 mg daily for 10 days and was discharged on oxygen therapy. Upon admission he was noted to have fibrotic changes on CT imaging and was started on empiric azithromycin and ceftriaxone, and methylprednisolone 40 mg twice daily for an acute COPD exacerbation. He had a negative COVID 19 PCR this admission. However 3 days after his admission, a rapid response was called for altered mental status. He had a GCS of 7 on arrival. He was emergently intubated due to agonal breathing and risk of aspiration. Ventriculomegaly was evident on Brain MRI. A Lumbar Puncture revealed high protein, 100% mononuclear cells, and 1:1280 Cryptococcus antigen titers. CSF culture was positive for Cryptococcal neoformans. He received liposomal Amphotericin, Flucytosine, serial lumbar punctures and a lumbar drain. However, his course was complicated by prolonged mechanical ventilation, Pseudomonas pneumonia and persistent encephalopathy warranting a tracheostomy, gastrostomy tube and long-term care placement.

Discussion: Cryptococcal species are prevalent in soil rich in bird droppings. Patients with impaired cellular immunity are prone to infections like meningoencephalitis via inhalation of spores. Upon literature review we found 3 cases of COVID 19 and Cryptococcal coinfection - two of which were a kidney transplant patient with cirrhosis, and a patient who received tocilizumab. Although our patient had no such exposures, the use of steroids may suppress T-cell function. Additionally, COVID 19 infection has been postulated to cause direct T-cell immune dysfunction thus highlighting the importance of continued vigilance for secondary infections following COVID 19 infection and treatment.

Under the bridge: A case of myocardial bridging

Aimee Almanzar, M.D., Michele Iguina, M.D., Sherard Lacaille, M.D., Ilde Lee, M.D.

Introduction: Myocardial bridging is a congenital entity in which a portion of the coronary artery is tunneled intramuscularly under a "bridge" of myocardium, usually found during cardiac catheterization or in autopsies. The cause has not been well identified. We present the case of a young lady, who is one of three identical triplets, diagnosed with a myocardial bridge.

Case Presentation: A 49-year-old with history of hypertension and hypothyroidism presented to the emergency department with flu-like symptoms and chest pain radiating to her left arm, which she attributed to the COVID-19 vaccine administered six days prior to presentation. She had EKG with ischemic changes and elevated troponins. 2D echocardiogram showed normal ejection fraction. Coronary computed tomography angiography was unremarkable. She underwent cardiac catheterization and was found to have myocardial bridge and subsequently had sternotomy with unroofing of the myocardial bridge.

Discussion: A myocardial bridge is usually a benign entity but can occasionally cause myocardial ischemia. Most cases involve the left anterior descending artery. They may differ in depth and length of encasement and may be exacerbated by age, heart rate, left ventricle hypertrophy, and presence of atherosclerotic heart disease. Management depends on clinical and objective signs of ischemia and focuses on relieving potential triggers. Medical management includes beta-blockers or calcium channel blockers. Invasive management includes stent placement, coronary artery bypass graft, or myotomy in patients who failed conservative management. More research is required to identify a genetic origin of this anomaly in order to provide adequate counseling for patients.

Vanishing lung syndrome: A rare presentation of a young male with giant bullous emphysema

Gustavo Lagrotta, DO., Pamela Viera DO., Yelixa Santos, MD., Hector Vazquez, MD.

Introduction: Idiopathic giant bullous emphysema, also known as vanishing lung syndrome, is a progressive and irreversible condition characterized by giant bullae which commonly occupy the upper lobes and at least one third of the hemithorax.

Case Presentation: We present the case of a 27-year-old male with significant past medical history of extensive marijuana use and HIV who arrived to our facility with shortness of breath and an oxygen saturation of 60% at home as noted by the paramedics. He reported productive cough, subjective fevers, chills, watery diarrhea, and a 30 lbs. weight loss in 2 months. He had not been complaint with his prescribed anti-retroviral therapy as he preferred to utilize natural remedies. On arrival, he appeared cachectic with temporal wasting. He had tachycardia, and decreased breath sounds on auscultation. Computed tomography (CT) of the chest revealed hyper inflated lungs with thin-walled cystic disease predominantly in the para mediastinal region and upper lobes, along with bilateral ground-glass opacities and lower lobe consolidation. Laboratory testing revealed a CD4 count of 17 cells/mm3, an HIV RNA viral load of 198,174 copies/mL, and a negative rheumatoid and autoimmune panel. A bronchoscopy with bronchi-alveolar lavage was non diagnostic.

Discussion: While vanishing lung syndrome remains a rare presentation, there has been documented associations between this medical condition and chronic tobacco and marijuana users, COPD, alpha-1-anti-trypsin deficiency, and HIV. In subjects who smoke marijuana, the pathological changes of emphysema occur at a younger age (approximately 20 years earlier) than in tobacco smokers. The mechanism for this pathological process remains unclear. HIV infection also confers an increased risk for emphysema, with studies showing an accelerated progression towards emphysema in HIV-positive individuals who smoke. Initial evaluation must include testing to rule connective tissue disorders, autoimmune disorders, and alpha-1-antitrypsin deficiency. CT of the chest helps distinguish giant bullae from a pneumothorax. Periodic reassessment of symptoms, pulmonary function tests, exercise tests, and chest radiograph is appropriate. Optimization of medical therapy and supportive care (eg. bronchodilators, inhaled glucocorticoids, vaccinations, supplemental oxygen, and pulmonary rehabilitation) is crucial. Refractory dyspnea, is ultimately treated with bullectomy.

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An Almost missed diagnosis of Myasthenia Gravis.

Tracey Topacio DO

Myasthenia Gravis (MG) features fluctuating skeletal muscle weakness and true muscle fatigue, approximately 15% of patients present with bulbar symptoms such as dysphagia [1]. The most serious symptom of MG is respiratory muscle weakness that leads to impending respiratory failure called myasthenic crisis (MC). Discussed here is a case of a geriatric female who was initially diagnosed with functional decline and failure to thrive who presented with sudden onset
acute hypercapnic respiratory failure and was found to be in myasthenic crisis. An 83-year-old female with a past medical history of atrial fibrillation and hypothyroidism initially presented for loss of appetite, difficulty swallowing, and generalized weakness for 2 months. She had associated weight loss, watery diarrhea, and dysuria. Home medications include amiodarone, diltiazem, levothyroxine, and warfarin. She denied a history of tobacco use. Vitals showed a temperature of 97.7 F, heart rate of 74 bpm, blood pressure 147/46, respiratory rate 16 breaths per minute, SpO2 of 99% in room air. Physical exam showed a frail appearing female with bitemporal wasting, bilateral ptosis, dropped neck, normal oropharynx, a grade 2 systolic murmur, lungs were clear to auscultation bilaterally with shallow breaths. Labs were remarkable for leukocytosis. Urine culture was positive for E.coli, Stool was positive for Clostridium difficile. She was treated with Ceftriaxone and oral Vancomycin. Chest XR was unremarkable. CT chest showed small bilateral pleural effusion, bilateral lower lobe and right
upper lobe atelectasis, and prominent chronic interstitial markings. Video fluoroscopy showed no aspiration. One week into the hospitalization, she was found to be lethargic and saturating in the 70% in 2L nasal cannula. ABG showed acute hypercapnic respiratory failure and was placed on BiPAP and was eventually weaned off. Measure of her vital capacity (VC) showed 0.45 L which is 7.7 ml/kg for her weight. She was then transferred to the ICU and was subsequently intubated. The
following day, serology for acetylcholine receptor antibodies were positive, confirming her diagnosis of MC. She was treated with IVIG for 5 days and was extubated after 4 days. Two days later, she was re-intubated after having another episode of acute hypercapnic respiratory failure. She was then treated with plasma exchange and started on glucocorticoids. Unfortunately, she was not able to be weaned off the vent and required a tracheostomy for prolonged weaning.

Myasthenia gravis can occur at any age, however peaks in 20-30s in females and 60-80 in males [2]. This case shows that MG can be a missed diagnosis in the geriatric population as patients can appear frail due to global deterioration with age….

*Full abstract presented during the poster session

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A rare cause of empyema: Translocation of a hepatic abscess

Polina Gaisinskaya, MD, Viraj Shah, MD, Christopher Gebara, MD

Empyema caused by transdiaphragmatic extension of pyogenic liver abscess is a very rare complication of liver abscess. Risk factors, transmission route, treatment methods and prognosis have seldom been discussed in the literature. We present a patient who presented in septic shock secondary to a liver abscess which translocated through the right hemidiaphragm and progresse

74-year-old female with diabetes and cholangiocarcinoma status post multiple abdominal surgeries presented with several days of increasing generalized weakness, malaise and fatigue associated with intermittent right upper quadrant abdominal pain, nausea, and anorexia. She was tachycardic, hypotensive on admission and abdominal CT scan with contrast revealed a fluid collection of the liver concerning for abscess as well as a large right sided pleural effusion. The patient was admitted to the intensive care unit and underwent a right sided thoracentesis as well as interventional radiology abscess drainage. Cultures from both studies wound up growing Klebsiella Oxytoca. She underwent hepatic drain placement and VATS decortication with pleurodesis for empyema due to translocation of hepatic abscess, and ultimately required hospice care.

This rare complication requires prompt recognition as well as intervention to prevent systemic compromise and subsequent rapid deterioration as seen in our case. Few cases have been reported in the literature, but prompt source control and antibiotic administration are crucial in such cases. Further studies evaluating surgical versus interventional radiologic source control may better aid in predicting outcomes in rare scenarios such as ours.

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Recurrent spontaneous pneumothorax in a peri-menopausal woman

Alexandra Lacqua MD, Christopher Gebara MD, Bernardo Reyes MD

The diagnosis of thoracic endometriosis includes endometriosis within the pleural surfaces, lung parenchyma, or on the diaphragm. Catamenial pneumothorax, a recurrent spontaneous pneumothorax, is one of the most common forms of thoracic endometriosis. However, it is often misdiagnosed as simple pneumothorax. Catamenial pneumothorax is typically seen in premenopausal women, 30 to 40 years of age, within 72 hours of menstruation. First line treatment is usually medical management, however with failure of treatment or recurrence of disease, surgical treatment with video-assisted thoracoscopic surgery provides definitive therapy. Additionally, post operative chronic hormonal suppression therapy may reduce recurrence. In our case, we present a 55 year old peri-menopausal woman with a history of endometriosis and spontaneous pneumothorax requiring chest tube placement two weeks prior, who presented with pleuritic chest pain. Additionally, it was noted that a few days prior to presentation, the patient had completed a menstrual cycle. The patient was subsequently found to have recurrent spontaneous pneumothorax. VATS pleurodesis was preformed revealing fenestrations in the tendinous portion of the diaphragm and right middle lobe of the lung. Biopsy of diaphragmatic tissue revealed endometriosis, confirming the diagnosis of catamenial recurrent pneumothorax. Our patient was further managed with a gonadotrophin releasing hormone antagonist for chronic suppressive therapy. Our case strengthens the importance of considering the diagnosis of thoracic endometriosis syndrome in premenopausal and peri-menopausal women of all ages with recurrent pneumothorax in order to provide appropriate management and treatment regimens.

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Interstitial lung disease as a presenting manifestation of anti-PL7 antisynthetase syndrome

Viraj Shah MD, Priya Patel MD, Polina Gaisinskaya MD, Katherine Reano MD

Introduction - Antisynthetase syndrome (ASyS) is a rare multisystemic autoimmune disease clinically manifested most often by interstitial lung disease, myositis, and arthritis. ILD is one of the most common clinical features and a major contributor to morbidity and mortality in ASyS.

Case Presentation - 57-year-old female patient with no significant past medical history presented to the ER with a chief complaint of progressive dyspnea and lower extremity weakness for the past 3 months. Patient's oxygen saturation on presentation was 87% on room air. Physical exam revealed bilateral crackles on auscultation. Bilateral lower extremities (BLE) had 3/5 strength with a proximal, symmetric pattern of weakness. Labs revealed creatinine of 1.7 mg/dl with unknown baseline, ESR of 65 mm, CRP of 2.1 mg/dL. Urine analysis showed myoglobinuria and CPK was 9000 mcg/L. COVID-19 PCR, age-adjusted D-dimer, mycoplasma, urinary legionella antigen and respiratory viral panel were unremarkable. Chest X-ray revealed bibasilar interstitial infiltrates. High Resolution CT scan of the chest showed symmetric peripheral extensive bilateral ground glass opacities more predominant at the bases. MRI of the BLE showed increased signal uptake in thigh musculature concerning for myositis. In addition to supportive care, the patient was started on prednisone at 60 mg daily. Muscle biopsy from right anterior thigh revealed lymphocyte, and macrophage invasion of the muscle fibers along with phagocytic changes. Autoimmune workup was significant for negative ANA, Anti-DsDNA, Anti-SSA and SSB, Anti-centromere, Anti-CCP, Rheumatoid factor, Anti Jo1 however had strongly positive Anti-PL7 antibody. The patient was diagnosed with Anti-PL7 positive ASyS as per the Connors et. al criteria. By day 10, the patient had significant improvement in weakness and was weaned down to 2 liters on nasal canula. Patient was eventually discharged with outpatient rheumatology, pulmonology follow up and age-appropriate cancer screening.

Discussion - Manifestations of ASyS range from myositis, interstitial lung disease (ILD), and non-erosive arthritis to less common features such as fever and several cutaneous manifestations. For diagnosis, Connors et. al proposed that patients must have the presence of a tRNA synthetase antibody plus one of the classical clinical features. ILD is the most common extramuscular manifestation. In 15-30% of ASyS patients, ILD can be the presenting disease manifestation. HRCT is critical in diagnosis and follow-up of ASyS; non-specific interstitial pneumonia (NSIP) or organizing pneumonia (OP) is the most common patterns in ASyS. Even among patients without ILD initially, 67% may later go on to develop ILD. Invasive testing such as bronchoscopy or surgical biopsy is typically not required to make the diagnosis ….

*Full abstract presented during the poster session

Interstitial lung disease presenting with non-specific serologic markers: suspected occult connective tissue disease

Yonatan Ghiwot, MD, Anneka Hutton, MD, Amira Ibrahim, MD

Introduction: Connective tissue diseases (CTD) have multiple clinical manifestation during the disease course. Interstitial lung disease (ILD) may be recognized at any point in the natural history of CTD. The diagnosis becomes extremely challenging when interstitial lung disease is the first manifestation of CTD without the presence of the more common phenotypical manifestations such as skin, muscle, or joint involvement.

Case presentation: A 76-year-old male with no past pulmonary or rheumatological disease initially presented with 3 weeks of dyspnea. Prior to his presentation, the patient was blowing leaves in North Carolina after which he developed a nonproductive cough and shortness of breath. The patient denied fever, expectoration, chest pain, dry mouth or dry eyes, weight loss or skin changes. He denied rashes, Raynaud's phenomenon, arthralgia, myalgias or weakness. He self-prescribed a five-day course of Cefadroxil and Prednisone with no improvement. The patient is a non-smoker, denied alcohol intake or illicit drug use. His only medications were Atorvastatin and Losartan. On presentation, he was saturating 93% on ambient air. Musculoskeletal, skin, and joint exam was benign. Normal saliva pool without ulcers. Lung exam revealed bilaterally diffuse fine crackles more pronounced on the right lung field. The initial concern was bacterial pneumonia. He was empirically started on antibiotics. His Infectious workup was unrevealing with mild elevation of ESR and CRP. Chest CT revealed ground glass opacities with peripherally predominant bilateral infiltrates with subpleural sparing. Antibiotics were stopped and the patient was empirically initiated on 60 mg prednisone daily for suspected interstitial lung disease. Further lab work revealed ANA 1:2560 (reference range: 1:40 to 1:60), positive PL-7, positive R052, anti-SSA and SSB. Further extensive serologic workup was unrevealing. He experienced symptomatic improvement on steroid therapy. Infiltrates improved slightly but did not completely normalize prompting thoracoscopic right lung wedge biopsy. Pathology specimens were consistent with organizing pneumonia. He was then started on Mycophenolate Mofetil and Rituximab while tapering prednisone dose. He had continued improvement of respiratory symptoms and frequent follow up with chest CT scans every 6 months showing improved infiltrates.

Ischemic stroke, pulmonary embolism and acute limb ischemia in a COVID-19 patient with a supratherapeutic INR

Prashank Neupane M.D., Arun Sunny M.D., Zed Seedat M.D., Christopher Jordan M.D.

Background: As understanding of the prevalence and pathomechanisms of COVID-19–associated coagulopathy (CAC) grows, it has become essential to highlight drastic and unique manifestations of this disease. We present an interesting case of a COVID-19 patient with ischemic stroke, simultaneous venous and arterial thrombosis, and a supratherapeutic INR.

Case Presentation: A 69-year-old-male with a history of atrial fibrillation on warfarin, hypertension, diabetes, heart failure with reduced ejection fraction, and recently diagnosed COVID-19 pneumonia presented with syncope, dyspnea, and altered mentation. Initial vitals were blood pressure of 157/124 mmHg, heart rate of 104 bpm, and oxygen saturation of 82% on room air. Laboratory evaluation revealed a WBC count of 18000/ cu mm, Hb 17.7 g/dL, Platelets 167 x 10^9/L, CRP 3.37 mg/dL, PT 128.6 seconds, INR 19.2, PTT 42.2 seconds, D-Dimer 13.45 mg/L, and Fibrinogen 5.02 g/L. Repeat COVID-19 nasopharyngeal PCR was positive. Chest radiograph evidenced diffuse bilateral alveolar and interstitial opacifications. Initial CT brain without contrast was unremarkable. The patient was treated with IV vitamin K for supratherapeutic INR. Later, CT pulmonary angiography evidenced a filling defect right lower lobe consistent with pulmonary embolism. Lower extremity arterial doppler ultrasound revealed occlusion beginning at the level of proximal superficial femoral artery, extending to the popliteal artery. After the discovery of multiple thrombotic sites, the patient was started on a continuous infusion of heparin. Seven hours after admission, the patient was noted to have slurred speech, right facial droop, and right upper extremity weakness. Repeat CT Head with contrast identified region of ischemia within the left parietal region corresponding to occlusion of distal left vertebral artery, as well as high grade stenosis at the basilar artery. CTA brain confirmed occluded distal left vertebral artery. Heparin infusion was continued. Repeat INR after 8 hours was 7.9. Repeat CT Head on hospital day 2 evidenced an evolving infarct throughout the left cerebrum, particularly in the middle cerebral artery distribution with associated areas of hemorrhage. Heparin infusion was held. Following extensive goals of care discussion with the patient's
family, patient was transitioned to hospice care.

Discussion: The international experience with the SARS-CoV2 virus has identified COVID-19–associated coagulopathy (CAC), a spectrum of disease ranging from minor laboratory derangement to catastrophic systemic thrombosis. The coexistence of supratherapeutic INR, pulmonary embolism, and large burden peripheral arterial and cerebrovascular thrombosis evidenced in our case represents another striking example on the spectrum of coagulopathy in COVID-19. A variety of suggested pathomechanisms including endotheliitis, hyperinflammation, and increased platelet aggregation have been proposed to explain the development of CAC….

*Full abstract presented during the poster session

A classic presentation of catamenial pneumothorax

Meagan Mayo, DO, Prashank Neupane, MD, Deborah Baum, MD

Introduction: Catamenial pneumothorax (CP) defines recurrent, spontaneous pneumothorax in association with the menstrual cycle. It is the most common presentation of thoracic endometriosis and usually occurs in the third to fourth decade of life. The overall prevalence of CP is only 2.8–5.6% in women suffering from spontaneous pneumothoraces, with 85-90% occurring on the right side. Erosion of the diaphragm by endometrial tissue is central to the pathogenesis of CP.

Case Presentation: A 51-year-old female, non-smoker with a past medical history of endometriosis presented with pleuritic chest pain and dyspnea. X-ray and CT chest revealed a 40-50% right pneumothorax with associated atelectasis. One month prior, she presented with similar symptoms and was diagnosed with a large right-side, spontaneous pneumothorax. At that time, she underwent chest tube placement with complete resolution. Of note, she was menstruating during both episodes. For her repeat presentation, she underwent video assisted thoracoscopic surgery for pleurodesis. She also had resection of a right middle lobe bleb, repair of fenestrations discovered in the tendinous portion of the diaphragm, and removal of brownish-black growths on the diaphragm and lung -- which were later identified as endometrial tissue via pathology.

Discussion: Although well described in the literature, the pathogenesis of catamenial pneumothorax remains somewhat evasive. One possibility involves retrograde expulsion of endometrial tissue during menstruation that travels, via peritoneal fluid flow, to the subdiaphragmatic area. This occurs preferentially on the right due to clockwise peritoneal circulation. Cyclic necrosis of diaphragmatic endometrial implants results in micro-perforations with endometrial tissue then entering the thoracic cavity. It has also been proposed that high levels of prostaglandin F2 during menstruation may cause the rupture of preformed subpleural blebs via bronchial and vascular constriction. Yet another theory involves the microembolization of endometrial tissue to the thorax via venous circulation. In reality, the formation of CP is likely multifactorial. This patient's presentation demonstrated classic diaphragmatic defects and endometrial implants within the thoracic cavity. Management of CP must be surgical and should involve pleurodesis, repair of diaphragmatic defects, removal of implanted endometrial tissue, and resection of any pulmonary blebs. GnRH agonists may be used short-term in pre-operative patients and post-operatively during maturation of the pleurodesis.

*Full abstract presented during the poster session

A rare case of unilateral pulmonary fibrosis after COVID-19 infection

Katherine Reano MD, Meagan Mayo DO

Introduction: COVID-19 pneumonia is known to cause a wide range of clinical symptoms. However, long term effects have yet to be well documented. Unilateral lung fibrosis is a rare clinical entity that has been poorly reported in relation to COVID-19.

Case description: A 64-year-old male with a history of hypertension, hepatocellular carcinoma (secondary to Hepatitis C) status-post liver transplant on tacrolimus, and recent COVID-19 infection presented with worsening shortness of breath. He had been discharged the day prior with 2L nasal cannula after completing remdesivir, tocilizumab, and a ten-day course of daily dexamethasone. Upon evaluation, he was saturating 87% on room air, requiring 15L ventimask. Chest x-ray showed predominantly left sided diffuse interstitial opacities. CT chest revealed extensive consolidations throughout the left lung, indicating possible post-COVID fibrotic changes. He was started on inhaled corticosteroids and broad-spectrum antibiotics to cover for any underlying hospital acquired pneumonia. The patient eventually was weaned off supplemental oxygen and was discharged to rehab with inhaled corticosteroids.

Discussion Progressive fibrotic bilateral pulmonary disease is a known long-term sequela of COVID-19, however unilateral disease has not been well documented in literature. Proposed mechanisms for unilateral involvement include proximal pulmonary artery occlusion, pulmonary vein thrombosis, single lung ventilation, and localized infection. This patient responded well to inhaled budesonide, however it is unknown whether antifibrotic drugs would be of use in this population. Further research and awareness would help in applying early medical treatment strategies among these patients with post-COVID fibrosis.

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Post COVID-19 Collinsella bacteremia - Not a coincidence

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Introduction: *Collinsella aerofaciens (C. aerofaciens)* is a known intestinal bacterium that is often isolated from human feces[1]. It is rare for this pathogen to be identified as a cause of bacteremia. Patients with cancer have an increased burden of colonies with recent data emerging on a correlation with COVID-19[2]. We present a unique case of a patient with metastatic stage IV lung cancer and a recent COVID-19 infection, who developed *Collinsella* sepsis leading to septic shock and ultimately her demise.

Case Presentation: A 72-year-old female with a recent history of a new lung mass presented to our hospital with acutely worsening dyspnea. She was hemodynamically unstable and required respiratory support. She required frequent thoracenteses for recurrent pleural effusions. Her dyspnea worsened despite multiple interventions. Pathological biopsies of the tumor revealed squamous cell carcinoma of lung. Her course was complicated by septic shock and multiorgan dysfunction leading to her ultimate demise. Post expiration, blood cultures drawn on the day of her presentation grew *Collinsella.*

Discussion: We postulate three pathological mechanisms for bacteremia in our patient. Bacterial translocation from the intestines, dysbiosis related to lung cancer, or a relation to COVID-19. *Collinsella* has been identified in stool samples of COVID-19 patients[3]. Our patient had a positive IgG antibody titer consistent with recent viral infection. Clinicians should be aware of the possibility of *Collinsella* bacteremia, that includes patients who have an increased abundance secondary to simultaneous diagnoses of COVID-19 and lung cancer. With increased awareness, a prompt diagnosis of *Collinsella* bacteremia will lead to better outcomes.

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Immune thrombocytopenia purpura post covid vaccination

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Introduction: It's been reported that vaccination against coronavirus called SARS-CoV-2 (COVID-19) could trigger auto-immunity through an aberrant immune response induced by molecular mimicry and bystander activation as a possible mechanism [1}.

Objective: Our case will discuss a case of 34 year old Hispanic male with life threatening Immune thrombocytopenia Purpura (ITP) following the administration of the Moderna Covid-19 vaccination.

Case summary: A 34-year-old male with hypertension, hyperlipidemia and diabetes presented to the hospital with a three day history of bleeding mouth sores with a non-itchy petechial rash that started one day after receiving the second dose of Moderna Vaccine. Patient has a known history of thrombocytopenia with a platelet count of 90x10^3/uL one month prior to admission after his first dose. On admission his vitals were unremarkable. His initial platelet count was significant for 1x10^3/uL. On repeat with EDTA, it was 3x10^3/uL. Physical examination revealed two bleeding ulcers in the buccal mucosa with a petechial rash seen on the mid back and dorsal aspect of both feet and knees (Images 1-3). Hematological evaluation revealed negative results for HIV, hepatitis and blood cultures however, revealed pertinent positives of antinuclear antibody, SS-A/Ro antibody and direct anti-platelet GP IIb/IIIa. Further blood studies did not reveal any hematolymphoid neoplasm, only megakaryocytic hyperplasia. Ultrasound of spleen displayed mild splenic enlargement of 17 cm. Patient was treated for ITP with IVIG (1 gm/kg daily X4) and prednisone (1 mg/kg) followed by a slow taper. After a week his platelets levels improved to above 285x10^3/uL. He was discharged home with hematology follow up.

Discussion:: ITP is a complex autoimmune disease characterized by T-cell mediated destruction of the platelets. It is considered as a diagnosis of exclusion. Peripheral blood smear is used to evaluate the absence of platelet clumping and morphology. Patients should be tested for HIV and Hepatitis C as thrombocytopenia is common in these conditions and treatment can improve thrombocytopenia [2]. There are multiple mechanisms proposed for the cause of thrombocytopenia in COVID-19 infections and vaccinations such as platelet-virus interactions, sepsis, consumptive coagulopathy, direct invasion of bone marrow cells and molecular mimicry [3-4]. Although these mechanisms provide physiologic sense the underlying pathogenesis remains obscure….

*Full abstract presented during the poster session

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Sphingobacterium Spiritivorum: The first reported case of pneumonia with bacteremia

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Introduction: Sphingobacterium spiritivorum is a gram-negative bacterium that is pervasive in the environment, but rarely causes clinical infection in humans. It has been described in eleven total documented cases, including endocarditis, endophthalmitis, bacteremia, and most commonly cellulitis. We describe the first reported case of S. spiritivorum pneumonia with consequent bacteremia.

Case Presentation: A 52-year-old female with a history of HIV, schizophrenia, and polysubstance abuse presented to the emergency department with altered mental status. She was febrile with leukocytosis and chest computed tomography (CT) demonstrated bilateral ground glass opacities with an unilateral consolidation. She was empirically started on vancomycin, ceftriaxone and azithromycin. Legionella antigen returned positive. Her respiratory status however worsened, necessitating the need for bi-level positive airway pressure. Due to clinical deterioration, antibiotics were escalated to levofloxacin and meropenem. Blood cultures grew Sphingobacterium spiritivorum, sensitive to the newly changed regimen. Pulmonary infiltrates on chest x-ray and leukocytosis worsened until day 6 of these antibiotics. After continued clinical improvement, she was discharged after her twelve day hospitalization.

Discussion: S. spiritivorum was first described in 1982 and first reported to cause infection in 2002. Despite its long established presence, there have been increasing reports of cases in the last 5 years. Given increasing incidence of community acquired infection by this pathogen, it should be considered in the differential for patients with systemic infection who do not respond to initial treatment, as seen in our patient. Varying resistance patterns across cases warrant increased awareness of this pathogen to tailor treatment to each case

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Reducing racial disparities in asthma care improves health equity in asthma outcomes

Kate Krueck MD, William Long MD, and Susan Mills RRT

Introduction: It is well recognized that racial inequities exist throughout healthcare, and pediatric asthma is no exception. African American children have higher rates of both asthma-related emergency department (ED) visits and hospitalizations than their Caucasian counterparts. To improve health equity for asthma outcomes, we aimed to identify those processes that contribute to the disparate outcomes and work to reduce these disparities.

Methods: Starting in 2016, we began a campaign to provide comprehensive asthma care universally to all our patients with asthma, utilizing tools to improve assessment and management of all asthma patients. Tools used included asthma control tests and fractional exhaled nitric oxide (FeNO) at preventive care visits, and targeted pulmonary function tests (PFTs) for higher risk patients. We compared the use of such tools to asthma- related ED visits and hospital admissions for both our full asthma population and separately by race to better understand the contributors to disparities in asthma outcomes in our primary care setting.

Results: When PFTs and FeNO were utilized more equitably among African American and Caucasian populations, racial disparities in asthma-related ED visits and hospitalizations decreased. The degree of racial disparity in all measures was maximal in 2016, prior to the implementation of universal asthma care, and showed sustained reductions through the spring of 2021.

Conclusions: The implementation of a universal and comprehensive approach to asthma management increases access to best practices in asthma care for racially diverse populations, which in turn improves health equity in pediatric asthma outcomes.

Funding: none

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Patient-reported improvements following omalizumab for nasal polyps during the POLYP 1 and 2 open-label extension

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Background: Recent studies report disparities between patients and physicians in severity and impact of chronic rhinosinusitis with nasal polyps (CRSwNP) symptoms. Omalizumab, an anti–immunoglobulin E (IgE) monoclonal antibody, has been shown to improve these symptoms (Gevaert P, et al. *J Allergy Clin Immunol*. 2020;146:595–605). Patient perspective is important when examining omalizumab benefit; we examined patient-reported outcomes (PROs) in patients with CRSwNP after omalizumab in the POLYP 1 and 2 open-label extension (OLE) study (NCT03478930).

Methods: Patients with CRSwNP in the placebo arm of the 24-week POLYP 1 and 2 studies who entered the OLE received open-label omalizumab 75–600 mg every 2 or 4 weeks from Week 24 (baseline) through Week 52 (treatment phase) with an off-treatment follow-up period through Week 76 (n=126) and were included in these prespecified exploratory analyses.
PROs included Patient Global Impression of Change (PGIC) in symptom severity from last visit (scale: very much better, much better, a little better, no change, a little worse, much worse, very much worse) at Weeks 36, 52, 64, and 76; and overall health in the previous month per Healthy Days Core Module (HDCM; scale: poor, fair, good, very good, excellent) at Weeks 24, 36, 52, 64, and 76. Results are summarized descriptively.

Results: 65% of patients reported improvement in PGIC from Weeks 24–52 (treatment phase), with 33.3% reporting symptoms as very much better/much better. 27.4% and 7.7% indicated no change or symptom worsening. After the follow-up phase, more patients reported no change (36.3%) vs worsening (33.6%) at Week 76.
HDCM showed that the proportion of patients who scored their previous month's overall health as good/very good/excellent improved from 48.8% at Week 24 to 65.8% at Week 52. At Week 76, after the follow-up period, more patients reported good/very good/excellent overall health in the previous month (55.8%) vs at baseline (Week 24), despite being off treatment.
Safety findings from the OLE have been previously presented (Gevaert P, et al. Presented virtually at the American College of Asthma, Allergy, and Immunology Annual Meeting; November 13–15, 2020) and were consistent with the parent studies.

Conclusions: Patients in the POLYP 1 and 2 OLE reported improved health following omalizumab. Improvements waned after treatment discontinuation, but remained improved vs pretreatment. These data show patient-centric benefits of omalizumab in treating CRSwNP.

Funding: Genentech/Novartis

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The impact of omalizumab therapy on sleep in patients with nasal polyps

Vijay Ramakrisnan, Cecile T.J. Holweg, Jinnie Ko, Kelly Montalto, Rebecca Saenz, Petter Olsson, Lauren Millette, Eli Meltzer

Rationale: Sleep disturbance drives patients to seek care for chronic rhinosinusitis with nasal polyps (CRSwNP), and prompts more aggressive management. We examined omalizumab's impact on sleep in patients with CRSwNP to understand the benefits beyond rhinological symptoms.

Methods: This prespecified exploratory analysis evaluated patient-reported sleep outcomes over the previous 4 weeks, including sleep disturbances, snoring, shortness of breath, sleep adequacy, somnolence, and sleep quantity, using the Medical Outcomes Study (MOS) Sleep Scale from Weeks 24–76 of the POLYP 1/2 open-label extension (OLE) (NCT03478930). Patients receiving placebo with intranasal corticosteroids during POLYP 1/2 switching to omalizumab at Week 24 (N=126) were included. Omalizumab discontinuation at Week 52 allowed for examination of response durability through Week 76.

Results: Mean [SD] points improvement from Weeks 24–52 were observed in sleep disturbance (–6.85 [18.55]), snoring (–5.69 [27.76]), and Sleep Problems Indexes I/II (–4.25 [15.07] and –5.29 [14.07], respectively) with the greatest improvements in shortness of breath (–7.07 [24.21] points). Effects waned upon therapy discontinuation (Week 52), but benefits over baseline at OLE remained at Week 76. Minimal to no improvements were observed in sleep adequacy, somnolence, and sleep quantity. These data support trends in observed improved sleep in the Sino-Nasal Outcome Test-22 (SNOT-22) sleep domain of omalizumab patients during POLYP 1/2. Safety data on POLYP 1/2 studies has been previously reported (Gevaert P, et al. *JACI*. 2020;146(3):595-605).

Conclusions: Overall sleep improvements observed during the POLYP 1/2 OLE suggest that omalizumab can provide value beyond rhinological symptoms in patients with CRSwNP.

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Real-world Effectiveness of benralizumab on asthma exacerbations: Results from the ZEPHYR 1 study

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Introduction: Although randomized clinical trials have demonstrated the impact of benralizumab on reducing asthma exacerbations, there are few studies describing the impact of benralizumab on asthma exacerbations in a real-world setting. This is one of the first studies to characterize US patients taking benralizumab in a real-world setting and to identify the impact on asthma exacerbations.

Methods: This retrospective cohort study utilized data from a large medical and pharmacy claims data source between November 2016 and November 2019. A pre-post design was implemented, in which the index date was the day after benralizumab initiation. Eligible patients initiating benralizumab were diagnosed with asthma, aged ≥12 years at index, biologic-naïve in the pre-index period, had 24 months of continuous insurance enrollment, and had ≥2 asthma exacerbations in the pre-index period. The primary cohort focused on patients with ≥2 records of benralizumab, and a secondary cohort examined persistent benralizumab users (≥6 records of benralizumab including the index record in the 12 months post-index). Asthma exacerbations in the 12-month periods pre- and post-index were analyzed and compared using generalized estimating equations.

Results: Among the 204 patients in the primary cohort with ≥2 records of benralizumab, the mean age at index was 45.3 years old, 68.6% were female, 45.1% had commercial medical insurance, and 40.7% had Medicaid. The most common pre-index comorbidities included allergic rhinitis (77.5%), mental disorders (49.5%), and hypertension (45.6%). Additionally, 33.8% of patients had chronic sinusitis, 30.9% of patients had chronic obstructive pulmonary disease, and 16.7% of patients had nasal polyps. Almost all patients used oral corticosteroids at some point during the pre-index period (99.0%), and the majority of patients had also used inhaled corticosteroids with long-acting beta-agonists (77.9%) and leukotriene modifiers (83.3%). The rate of asthma exacerbations decreased with statistical significance from 3.25 exacerbations per person-year in the pre-index period to 1.47 exacerbations per person-year in the post-index period, representing a 55% reduction ($p<0.001$). Furthermore, 41% of patients had no exacerbations in the post-index period. Greater exacerbation reductions were observed among persistent benralizumab users (n=103), with a statistically significant 62% reduction (3.23 asthma exacerbations per person-year pre-index to 1.23 asthma exacerbations per person-year post-index, $p<0.001$), and 43% of patients had no exacerbations in the post-index period.

Conclusion: Patients treated with benralizumab in this real-world analysis experienced a significant reduction in asthma exacerbations consistent with the reduction observed in the pivotal randomized clinical trials of benralizumab.

Funding: AstraZeneca

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Long-term exacerbation and mortality benefits of implementing closed triple therapy in the US COPD population

Gerard Criner, Fernando Martinez, Hitesh Gandhi, Norbert Feigler, Bruce Pyenson, Matthew Emery, Umang Gupta, Muthiah Vaduganathan

Introduction: The US has about 24 million COPD patients. Clinical trials have demonstrated the efficacy of closed triple therapy (CTT, combining a long-acting beta-agonist, a long-acting muscarinic antagonist, and an inhaled corticosteroid) in reducing COPD exacerbations, yet the long-term population implications of its implementation among eligible individuals with COPD is unknown. We projected 10-year clinical benefits of CTT if appropriately used among US patients with COPD meeting ETHOS (NCT02465567) eligibility criteria.

Methods: An agent-based model of the US COPD population was subject to 1,000 simulations of patient progression over 10 years. Agent characteristics were based on literature and claims analysis of the 2016-2018 Medicare 100% FFS and IBM-MarketScan databases. Agents moved annually including COPD incidence, changes in GOLD stage, COPD treatment, mortality, and exacerbations under status quo treatment patterns (baseline) and adoption of CTT (alternative).

Results: Applying ETHOS results to the US COPD population, we estimated 21% fewer exacerbations and 24% mortality improvement with CTT. We simulated approximately 250,000,000 life-years over 10 years with 8% meeting ETHOS eligibility. Under the alternative, the annual rate of exacerbation-induced hospitalizations dropped by 0.039 per patient on CTT, an improvement of 14.9% (5^{th}-95^{th} percentiles: 12.3%-17.7%). Higher CTT adoption is projected to extend survival by 953,000 life-years (5^{th}-95^{th} percentiles: 700,000-1,355,000), an increase of 0.4% (0.3%-0.5%) across the US COPD population and 4.6% (3.4%-6.6%) across patients on CTT.

Conclusions: Assuming exacerbation/mortality outcomes observed in ETHOS are translated in clinical practice, adoption of CTT over 10 years would substantially reduce exacerbation-induced hospitalizations and extend survival.

Funding: AstraZeneca

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Relationship of annual short-acting beta$_2$-agonist use and systemic corticosteroid exposure in children and adults with asthma in the United States

Njira Lugogo, Ileen Gilbert, Michael Pollack, Hitesh Gandhi, Joseph Tkacz, Miguel Lanz

Introduction: Cumulative systemic corticosteroid (SCS) exposures of ≥4 annual courses or 500-1000mg leads to acute and chronic illnesses. We analyzed relationships between short-acting beta$_2$-agonists (SABA) and SCS exposures.

Methods: IBM® MarketScan® research databases of 2010-2017 administrative claims were evaluated for patients ≥4 years receiving SABA for asthma. Patients were indexed on a random SABA claim, had 12-months' eligibility pre- and post-index, and ≥1 post-index SABA or maintenance claim. Patients with <32 days' maintenance were classified as SABA-only; post-index medication possession ratio (MPR) was determined on all other maintenance claims. Post-index SCS exposures were compared (unadjusted descriptive statistics, significance $p \leq 0.05$) by treatment group, MPR, and SABA fills (low: index only; medium: 2-3 fills; high: ≥4 fills).

Results: 1,085,698 patients were included (53.4% female; mean[SD] age 25.8[20.5]; 51.8% SABA-only, 48.2% SABA+Maintenance). Significant differences were observed between SABA-only and SABA+Maintenance: 49.5% vs 43.7% ≥1 SCS claim; 16.0% vs 20.0% ≥2; 1.9% vs 4.6% ≥4. A significantly greater proportion of SABA+Maintenance vs SABA-only had annual SCS exposures ≥500mg (21.1% vs 16.8%) or ≥1000mg (11.7% vs 7.9%). The proportion of patients with SCS ≥500 or ≥1000mg increased significantly with increasing SABA fills. 68.8% of SABA+Maintenance patients had an MPR <50% and 10.5% had ≥80%. Lower MPR (<50%) was associated with significantly higher SCS exposures of ≥500 (22.2% vs 15.4%) and ≥1000mg (12.5% vs 7.9%).

Conclusions: Many patients with asthma have high-risk SCS exposures. Treatment strategies of fast-acting bronchodilators with concomitant inhaled corticosteroids could mitigate SCS exposure and associated health risks.

Funding: AstraZeneca

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Decline in forced vital capacity (FVC) as a surrogate for mortality in patients with fibrosing interstitial lung diseases

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Introduction: Use of surrogate endpoints in clinical trials enables more efficient determination of meaningful treatment effects than applying the endpoint of ultimate interest. We used data from trials of nintedanib in patients with fibrosing ILDs to assess FVC decline as a surrogate for mortality.

Methods: Data from patients who received nintedanib or placebo in the placebo-controlled periods of trials in patients with IPF (TOMORROW, INPULSIS-1 and -2, a Phase IIIb trial with a placebo-controlled period ≤12 months [NCT01979952]), systemic sclerosis-associated ILD (SENSCIS) and progressive fibrosing ILDs other than IPF (INBUILD) were pooled. Associations between change in FVC % predicted and time to death over 52 weeks were assessed.

Results: The analysis included 2553 patients. Differences between nintedanib and placebo in absolute change in FVC % predicted and rate of change in FVC % predicted over 52 weeks were 2.87 (95% CI: 2.23–3.51; $p<0.0001$) and 2.84 (95% CI: 2.20–3.49; $p<0.0001$), respectively. Over 52 weeks, 63 patients (4.6%) in the nintedanib group and 65 (5.5%) in the placebo group died. Decreases in FVC % predicted and rate of decline in FVC % predicted were associated with an increased risk of death (HR 1.24 [95% CI, 1.17–1.32] per 5-unit decrease and 1.79 [1.57–2.03] per 5-unit decrease, respectively)(pooled dataset).

Conclusions: Data from clinical trials of nintedanib in patients with fibrosing ILDs demonstrate a strong association between decline in FVC % predicted and death over 52 weeks, supporting the use of FVC decline as a surrogate for mortality in clinical trials.

Funding: Boehringer Ingelheim

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A pooled analysis of mortality in patients with COPD receiving triple therapy versus dual bronchodilation

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Introduction: A possible mortality benefit of long-acting muscarinic antagonist (LAMA)/long-acting β2-agonist (LABA)/inhaled corticosteroid (ICS) versus LAMA+LABA combination treatment is reported in patients with highly symptomatic chronic obstructive pulmonary disease (COPD) with a history of exacerbations (≥1 moderate/severe exacerbation in previous year). We compared the time to all-cause mortality with LAMA+LABA+ICS versus LAMA+LABA in patients with moderate-to1severe COPD and predominantly lower exacerbation risk.

Methods: Patients who received either LAMA+LABA+ICS (n=11,891) or LAMA+LABA (n=3,156) were pooled from phase 3/4 randomized controlled trials (TONADO 1/2, DYNAGITO, WISDOM, UPLIFT and TIOSPIR). Analysis was on-treatment and censored at 52 weeks. Propensity score (PS)- matched cohorts (covariates: age, sex, geographical region, smoking status, postbronchodilator forced expiratory volume in 1 second (FEV1) percent predicted, exacerbation history, body mass index and time since diagnosis) were used to ensure well-balanced treatment groups. Time to all-cause mortality was assessed using Cox proportional-hazards regression models adjusted for covariates.

Results: Each PS-matched treatment group had 3,133 patients with well-balanced baseline characteristics and comorbidities (LAMA+LABA+ICS vs. LAMA+LABA: male: 72.0% vs. 71.7%; age, mean±SD: 65.5±8.7 vs. 65.5±8.8years; postbronchodilator FEV1% predicted, mean±SD: 48.4±13.3% vs. 48.6±13.2%; patients with ≥2 COPD exacerbations in prior year: 19.0% vs. 19.1%). No statistically significant difference in time to all-cause mortality was observed between treatment groups (hazard ratio[95% CI]: 1.06 [0.68–1.64]; P=0.806). There were 41 (1.3%) deaths in the LAMA+LABA+ICS group and 41 (1.3%) in the LAMA+LABA group.

Conclusions: This pooled analysis showed no differences in mortality between LAMA+LABA and LAMA+LABA+ICS in patients with moderate-to-severe COPD and predominantly lower exacerbation risk.

Funding: Boehringer Ingelheim

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Tiotropium/Olodaterol delivered via the Respimat improves lung function in COPD patients with optimal or suboptimal peak inspiratory flow

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Introduction: Tiotropium/olodaterol delivered via the Respimat® Soft Mist™ inhaler (SMI) is efficacious in a broad chronic obstructive pulmonary disease (COPD) population; however, data on lung function in individuals with varying inhalation effort are lacking. The TRONARTO study evaluated the efficacy of tiotropium/olodaterol Respimat® in patients with moderate-to-severe COPD stratified by peak inspiratory flow (PIF).

Methods: Patients with moderate-to-severe COPD were stratified according to PIF (optimal, ≥60L/min; suboptimal, <60L/min). Eligible patients were randomized to tiotropium/olodaterol fixed-dose combination (5µg/5µg) or placebo for 4 weeks. The primary endpoint was change from baseline in forced expiratory volume in 1 second (FEV1) area under the curve between 0–3 hours (AUC0–3h) at Week 4. A key secondary endpoint was change from baseline in trough FEV1.

Results: Overall, 213 patients were randomized (optimal PIF, n=103; suboptimal PIF, n=110). After 4 weeks, FEV1 AUC0–3h increased significantly in tiotropium/olodaterol-treated versus placebo in patients with optimal (0.333L [95% confidence interval (CI) 0.270, 0.396] versus 0.012L [95% CI -0.049, 0.073]; *P*<0.0001) and suboptimal PIF (0.250L [95% CI 0.185, 0.315] versus -0.086L [95% CI -0.148, -0.024]; *P*<0.0001). Trough FEV1 significantly increased with tiotropium/olodaterol versus placebo in patients with optimal (0.177L [95% CI 0.119, 0.236] versus -0.040L [95% CI -0.097, 0.017]; P<0.0001) and suboptimal PIF (0.095L [95% CI 0.035, 0.156] versus -0.106L [95% CI -0.165, -0.047]; P<0.0001).

Conclusions: In the TRONARTO study, treatment with tiotropium/olodaterol delivered via the Respimat® SMI improved lung function versus placebo, irrespective of PIF. The Respimat® device is suitable for COPD patients with optimal/suboptimal PIF.

Funding: Boehringer Ingelheim

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Dupilumab efficacy and safety in children with uncontrolled moderate-to-severe asthma: The phase 3 VOYAGE study

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Introduction: Type 2 inflammation underlies most pediatric asthma. Dupilumab, a fully human monoclonal antibody, blocks the shared receptor component for interleukin-4/interleukin-13, key and central drivers of type 2 inflammation in multiple diseases. Phase 3 VOYAGE (NCT02948959) evaluated dupilumab efficacy/safety in children 6–<12 years with uncontrolled, moderate-to-severe asthma.

Methods: Patients with asthma receiving high-dose inhaled corticosteroids (ICS) alone or medium-to-high–dose ICS with second controller were randomized 2:1 to dupilumab 100mg or 200mg q2w or matched placebo. Primary analysis populations were patients with type 2 inflammatory phenotype (baseline blood eosinophils≥150cells/µL or FeNO≥20parts per billion [ppb]) and with baseline blood eosinophils≥300cells/µL. Annualized rate of severe asthma exacerbations and change from baseline in pre-bronchodilator FEV1 percent predicted (FEV1pp), FeNO level, and 7-item Asthma Control Questionnaire–Interviewer Administered (ACQ-7-IA) scores were assessed.

Results: Of 408 patients randomized, 350 had type 2 inflammatory asthma phenotype; 259 had blood eosinophils≥300cells/µL at baseline. In patients with type 2 phenotype, dupilumab reduced exacerbation rate by 59.3% (P<0.0001); improved FEV1pp (least squares[LS] mean difference vs placebo 5.21%; P=0.0009); and reduced FeNO levels (LS mean difference vs placebo −17.84ppb; P<0.0001) at Wk12 vs placebo. At Wk24, dupilumab showed greater improvement in ACQ-7-IA scores from baseline vs placebo (LS mean difference vs placebo −0.33; P=0.0001). Similar findings were observed in patients with eosinophils≥300cells/µL. In the safety population, overall TEAE rates in dupilumab vs placebo groups were 83% vs 80%.

Conclusions: Dupilumab demonstrated efficacy and acceptable safety in patients 6–<12 years with uncontrolled, moderate-to-severe asthma and type 2 inflammatory phenotype.

Funding: Sanofi and Regeneron

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Assessment of long-term maintenance of OCS reduction and efficacy in the dupilumab LIBERTY ASTHMA TRAVERSE extension study

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Introduction: Many severe asthma patients require long-term systemic corticosteroid treatment. Dupilumab, a fully human monoclonal antibody, is approved in USA for treatment of moderate-to-severe and oral corticosteroid (OCS)–dependent asthma. This post hoc analysis assessed whether OCS dose reduction and dupilumab efficacy observed in 24-week VENTURE (NCT02528214) were maintained when patients continued dupilumab in TRAVERSE (NCT02134028).

Methods: VENTURE patients treated with dupilumab q2w or matched placebo enrolling in TRAVERSE received dupilumab 300mg q2w for up to 96 weeks. Endpoints assessed in dupilumab-dupilumab–treated and placebo-dupilumab–treated patients included change in OCS use from VENTURE baseline and percentage of patients completely discontinuing OCS during VENTURE and remained OCS-free during TRAVERSE. Treating physicians were not specifically instructed to reduce patient OCS dose. Efficacy endpoints were severe exacerbation rates and change in pre-bronchodilator FEV_1 from VENTURE baseline.

Results: Of 210 patients completing VENTURE, 187 enrolled in TRAVERSE. At TRAVERSE Wk48 and 96, sustained reductions (89% by Wk96) from VENTURE baseline in OCS were observed in dupilumab-dupilumab–treated patients; substantial improvements were achieved in placebo-dupilumab patients (74% reduction by Wk96). Among patients discontinuing OCS by VENTURE Wk24 (dupilumab-dupilumab: 53.3%, placebo-dupilumab: 29.9%), most remained OCS-free during TRAVERSE (dupilumab-dupilumab: 31/33 [93.3%] and 14/14 [100%], placebo-dupilumab: 21/21 [100%] and 9/9 [100%] at Wk48 and 96, respectively). Despite reductions in OCS requirement, exacerbation rates during TRAVERSE were low and FEV_1 change greatly improved.

Conclusions: Long-term dupilumab treatment of OCS-dependent asthma facilitated weaning OCS use, while concomitantly decreasing and maintaining low annualized rates of exacerbations and improving lung function.

Funding: Sanofi and Regeneron

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CAPTAIN: Effects of adding the long-acting muscarinic antagonist umeclidinium to inhaled corticosteroid/long-acting β_2-agonist therapy on symptoms in patients with inadequately controlled asthma

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Introduction: The Evaluating Respiratory Symptoms in Asthma (E-RS: Asthma) measure assesses respiratory symptoms in patients with moderate/severe asthma through three symptom domains: RS-Breathlessness, RS-Chest and RS-Cough and Sputum. This analysis evaluated effects of adding umeclidinium (UMEC) to fluticasone furoate/vilanterol (FF/VI) on symptom burden.

Methods: CAPTAIN: Phase IIIA, randomized, double-blind, 24–52-week, parallel-group study in adults with uncontrolled asthma. Treatment: once-daily FF/VI (100/25, 200/25mcg) or FF/UMEC/VI (100/31.25/25, 100/62.5/25, 200/31.25/25, 200/62.5/25mcg) (ELLIPTA inhaler). Outcomes: least squares (LS) mean change from baseline at Weeks 21–24 in E-RS: Asthma total and subscale scores for pooled FF/UMEC 62.5mcg/VI versus pooled FF/VI data; proportion achieving minimally important within-patient change for E-RS: Asthma total score.

Results: All treatment groups improved RS-Total score beyond the minimally important within-patient change (-2.0), with LS mean (95% confidence interval [CI]) improvements from baseline of -2.89 (-3.15, -2.64) and -2.47 (-2.73, -2.22) for FF/UMEC 62.5/VI (n=712) and FF/VI (n=703), respectively. There were more E-RS responders with FF/UMEC 62.5/VI versus FF/VI (45% vs 41%; odds ratio [95% CI]: 1.18 [0.96, 1.45]). RS-Breathlessness and RS-Chest Symptoms improved with FF/UMEC 62.5/VI versus FF/VI (-0.19 [95% CI -0.37, -0.01] and -0.16 [95% CI -0.27, -0.05], respectively), with no difference for RS-Cough and Sputum (-0.07; 95% CI -0.18, 0.05).

Conclusions: Addition of UMEC 62.5mcg to FF/VI improves E-RS: Asthma breathlessness and chest symptom domains, but not those related to cough and sputum. As one cough and two sputum items are included in this domain, it may be less responsive in asthma.

Funding: GSK

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A Comparison of clinic versus home spirometry in the CAPTAIN Study

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Introduction: Respiratory consultations are taking place virtually due to the SARS-CoV-2 pandemic, while lung function testing in clinic is difficult to perform. There is increasing interest in the use of home measurements of lung function, however the accuracy and reliability of home spirometry is not known. We evaluated the agreement between home and clinic measurements of trough FEV_1 (post hoc).

Methods: CAPTAIN: Phase IIIA, randomized, double-blind, 24–52-week, parallel-group study in adults with uncontrolled asthma. Treatment: once-daily FF/VI (100/25, 200/25mcg) or (FF/UMEC/VI 100/31.25/25, 100/62.5/25, 200/31.25/25, 200/62.5/25mcg) (ELLIPTA inhaler). Trough FEV_1 measurements were taken in clinic using a MasterScope device. Patients took measurements at home using a peak flow meter (AM3 device); three measurements were performed at each time point and the highest was recorded. Agreement between clinic trough FEV_1 and the average of home measurements (taken on the same day and 2 days prior to clinic measurement) were assessed at baseline and at Week 24, using the Bland-Altman method.

Results: Agreement between clinic and home trough FEV_1 measurements was poor. At baseline, lower and upper limits of agreement were -812 mL and 943 mL, respectively; at Week 24 these were -771 mL and 980 mL, respectively. In total, 6% of patients were outside the limits of agreement at baseline (n=151) and Week 24 (n=143).

Conclusions: Home spirometry performed with the AM3 device cannot be used as an alternative to clinic spirometry. The reason for the lack of agreement is not clear and further investigation is warranted.

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Categorization of asthma patients by Global Initiative for Asthma (GINA) 2018 Guidelines using a US administrative claims database

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Introduction: GINA steps are defined based on reliever and controller medications used to treat asthma. Administrative claims data offer a novel means to describe the distribution of asthma patients by GINA 2018 step based on their real-world use of asthma medications, and assess the use of newer asthma treatments such as biologics.

Methods: Retrospective analysis of IBM®Watson MarketScan® claims data from Jan 2015 to Dec 2018 was conducted. Patients were aged ≥12 years, had asthma diagnosis, short-acting beta-agonist prescription indexed from Jan 2016 to Dec 2017, and 1-year continuous insurance plan enrolment pre- and post-index date. Patients with comorbid respiratory conditions were excluded.

Results: Of 7,746,127 patients with available data, 579,955 were included in the analysis. Overall, 54.3% were classified as Step 1, 14.6% as Step 2, 10.2% as Step 3, 20.5% as Step 4 and 0.4% as Step 5. Average patient age was greater in the higher GINA steps. Across all GINA steps, 62–66% of patients were female.

Conclusions: These findings describe real-world medication use by GINA step among insured US asthma patients. Administrative claims data offer a novel means of assessing the practical adoption of treatment guidelines. These data provide framework for future research evaluating clinical and health resource outcomes by GINA step and evolving treatment strategies.

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Assessing real-world uncontrolled COPD therapy using a US Administrative claims database

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Introduction: Long-acting maintenance therapies are the mainstay of COPD treatment. Increased "rescue" short-acting bronchodilator (SABD) and/or systemic corticosteroid (SCS) use may reflect sub-optimal maintenance effectiveness and indicate "uncontrolled" disease or suboptimal therapy. We analyzed real-world data to explore COPD management across therapeutic domains.

Methods: IBM/Watson MarketScan® US administrative claims data (Jan 2017–Dec 2019) were retrospectively analyzed. Patients aged ≥35 years with COPD diagnosis, ≥1 SABD prescription within 12 months of diagnosis (index date), and 1-year continuous insurance plan enrolment pre- and post-index date. Patients with comorbid respiratory conditions were excluded. Patients were stratified by their highest maintenance therapy category in the 12-months post-index, and assessed by the number of SABD or SCS prescription fills post-index.

Results: Of 74,229 patients included in this analysis, 57.3% were female and 81.8% were aged ≥55 years. 38.4% of patients received only SABD at the index date, 44.2% received LABA/inhaled corticosteroids (ICS), 7.8% received long-acting muscarinic antagonists (LAMA), 6.3% received LABA/LAMA, 1.5% received LABA/LAMA/ICS and 1.5% received phosphodiesterase-4 inhibitors (PDE4). Mean (SD) SABD and SCS fills post-index date were 3.1 (3.5) and 1.6 (2.6), respectively. Annualized proportions of patients with ≥3 SABD fills or ≥2 SCS fills post-index were >40% for patients on combination therapies, and for those on monotherapies or no therapy.

Conclusions: Observed high SABD and/or SCS use may suggest not only uncontrolled disease but also poor disease severity recognition in US clinical practice. Improved recognition of high SABD and SCS use in COPD may offer earlier intervention opportunities.

Funding: TEVA

A digital inhaler uncovering patterns of SABA use in asthma and COPD

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Background: Patterns of SABA use may enhance clinical decision making. Integrated sensors in an electronic inhaler (ProAir Digihaler) record objective data on inhaler usage and, consequently, inhalation technique.

Aims: To identify real-life SABA use and technique by patients with asthma or COPD.

Methods: This post hoc analysis assessed data from two 12-week, open-label studies of adult patients with asthma (NCT02969408) or COPD (NCT03256695) who used ProAir Digihaler (salbutamol 90 µg) as needed. On each use, Digihaler recorded time and inhalation variables: peak inspiratory flow (PIF), time to PIF, inhalation volume and duration. Temporal plots of inhalation variables were analysed in search of usage patterns.

Results: Data from 696 patients with valid Digihaler inhalations were used and individual clinical patterns were identified, including: exacerbations, possible unrecognised exacerbations, users with technique deterioration (gradual decrease in PIF and volume), infrequent users (not used each day), stable users (~2 doses/day), frequent or very frequent users with no specific pattern, and users with consistent trends.

Conclusions: Visual displays of inhaler use data may help identify clinically meaningful information early and facilitate physician-patient interventions and conversations. Additional research is needed to assist clinical decisions and identify more complex data patterns to further interpretation.

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