Supplementary Figure 1: Needs assessment questionnaire for pulmonary fellows

1. Does the Pulmonary & Critical Care Fellowship Program (and its dedicated didactics) adequately prepare you to provide excellent outpatient pulmonary care?
    a. Yes
    b. No

2. Do you think additional directed learning on outpatient pulmonary topics would be helpful?
    a. Yes
    b. No

3. If yes, which topics would you be interested in learning more during your first and second year of fellowship? Please select at most 3 topics.

Asthma Mimics	Tobacco Cessation
Diagnosis and Management of IPF	Chronic Cough Management
Neuromuscular Disease Management	Referral for Lung Transplant
Initial Evaluation of ILD	Pulmonary Nodules Management
Palliative Care in COPD	Preoperative Pulmonary Assessment
Asthma Step-Up Management	COPD Step-Up Management
HIV-Associated Pulmonary Disease	Recurrent Pulmonary Effusion
VTE Management	Pulmonary Hypertension

4. Are there any topics not mentioned that you feel would be beneficial to add to the curriculum?

Supplementary Interview Template: ILD – the diagnostic process

Introduction

One of the most challenging aspects of Pulmonary medicine is the patient with newly discovered but otherwise undiagnosed interstitial lung disease. So diverse and varying are the causes, disease patterns, and radiographic findings that landing on a singular diagnosis is almost always a monumental task. For some, even within Pulmonology, this process is too harrowing to invest in, and oftentimes institutions will designate one or two ILD 'experts' in order to help suss out accurate diagnoses and treatment courses for this challenging constellation of diseases. While we get frequent and effective teaching on the most common types of ILD, the process of making the diagnosis can be somewhat of a mystery. Our focus on today's episode will thus be to help develop a guide to getting these patients closer and closer to their true diagnosis.

To discuss this, we have a local expert, Dr. ***. Briefly Dr. *** obtained her medical degree at ***. They then did their residency and pulmonary fellowship training here at ***. Now, Dr. *** works as an assistant professor at ***, serves as ***, manages their own ILD clinic, runs our weekly multidisciplinary ILD conferences, and overall serves as our go-to consultant inside and out of the pulmonary division.

Hello Dr. ***

*Expert: Say hello and anything you wish to say initially (thanks for having me, this is a great topic because ***, the field of ILD is continuing to develop and is a great place for new research in *** because ***, etc…). On the scale of 1-2 sentences.*

Thank you for taking the time to educate us a little more on ILD and the process of making specific diagnoses within this massive, overarching umbrella of diseases. For the purposes of this session, we won't spend any significant amount of time discussion pathophysiology or findings of any one specific ILD, but as mentioned before, rather what steps can be made to hone in on the diagnosis. For anyone listening who is interested in a review of the features and management of specific ILDS, including imaging findings, antifibrotics, and things like IPF vs chronic HP or the like, please refer to our collection of references on Canvas attached to today's episode.

Questions:

1. First, a semi-personal question, but how does one get into ILD and become an institutional leader in it? How do you get the know-how?

2. Is there any way you break up ILD in your head to help you better compartmentalize things? Like how is done with Small Cell vs Non-Small Cell lung cancer?

3. When a patient has imaging findings that are concerning for an interstitial lung disease, what is your initial approach to determining what's going on?

    a. Do you have screening questionnaires or other tools?

    b. What does the initial bloodwork workup look like?

    c. What other tests are you sending right off the bat, and why?

4. Assuming that you still don't have a great answer after this workup, and your patient is stable without significant symptoms, what are your next steps?

    a. How often are you obtaining PFTs and CT chests?

5. Okay same question now, but in the patient with significant dyspnea, or with more rapid changes to their imaging findings?

6. If you are still stuck without an answer, you've sent all these labtests, have your restrictive PFTs, imaging is worsening but you're no closer… well then what do you do?

7. What is your threshold for an empiric trial of steroids? And how do you approach this? (dose/duration)? How do you monitor for a response—Subjective or Objective? If based on PFTs, then what would be considered "steroid responsive"?

    a. Comment on PJP ppx

    b. Why don't we just empirically treat everyone with steroids if some might improve? Are there any ILD processes where initiation of steroids would be a detriment? Why?

8. What is the role of multidisciplinary ILD conference, and who is there?

9. When do you start thinking about lung biopsy?

    a. How do you counsel patients on this?

    b. What types of biopsy or tools are you expecting your proceduralist to use?

    c. Do you go straight for CT surgery referral or start with IP or IR? Why?

10. Does pathology always clinch the diagnosis? And if not, how often does it help?

11. What is your approach if biopsy results are unhelpful in identifying a diagnosis? Are there other ways to determine the etiology? Or do you send them to another proceduralist for another go at it?

12. Are there any other steps after biopsy, or that we missed out?

13. Any final thoughts for our listeners?

Conclusion:
Okay to attempt to summarize some of Dr. ***'s process. The undiagnosed ILD patient is a often a difficult challenge. While some can be categorized radiographically (such as definite UIP lending to IPF), or identified more simply from clear rheumatologic symptoms, or specific medication usage, many times there won't be a clear answer. Having a regimented approach to the workup of these patients can be helpful in narrowing down which of the many disease processes they truly have underlying their ILD.

Dr. *** has taken us through her process. Which briefly is:

1. X
2. Y
3. Z

If you're still diagnosis-less, then lung biopsy is a next step. This can be done with interventional pulmonology, IR, or cardiothoracic surgery depending on the resources and culture of your institution. Oftentimes this will clinch the final answer, but sometimes the diagnosis will continue to elude you. In those cases, consider ***

And that's it! I want to thank again our expert Dr. *** for their time and wisdom. Don't hesitate to review this episode of our OPC (outpatient pulmonary curriculum) and feel free to send any further questions to us at *** (which we can then consolidate so Dr. ***'s inbox doesn't get flooded). And with that, we'll close. Thanks and goodnight!

Supplementary Figure 2: Pre-course questionnaire

1. Do you listen to podcasts?
    a. Yes
    b. No

2. If you listen to podcasts, do you listen to any medical podcasts?
    a. Yes
    b. No
    c. N/A

3. How comfortable do you feel managing each of the following:

	Extremely uncomfortable	Somewhat uncomfortable	Neutral	Somewhat comfortable	Extremely comfortable
Management of IPF including anti-fibrotics	○	○	○	○	○
Evaluation of chronic cough	○	○	○	○	○
Evaluation of pulmonary complications of neuromuscular disease	○	○	○	○	○
Evaluation of ILD	○	○	○	○	○
Management of severe asthma including biologics	○	○	○	○	○
Evaluation of wheezing including diagnosis of inducible laryngeal obstruction	○	○	○	○	○
Management of severe COPD	○	○	○	○	○
Assessment of risk of complications after lung resection	○	○	○	○	○

4. A 67-year-old male with PMH CAD, HTN, HLD, and BPH was referred to Pulmonary Clinic for management of his ILD. His HRCT shows reticulation and traction bronchiectasis in a basal and subpleural distribution. You recommend initiation of nintendanib. What is the potential benefit of this medication, based on prior studies?
    a. Improvement in St. George's Respiratory Questionnaire
    b. Improvement in six-minute walk test
    c. Improvement in all-cause mortality
    d. Reduction in rate of FVC decline

5. A 77-year-old male with PMH HLD, GERD, and history of CVA was referred to Pulmonary Clinic for management of his IPF. You are planning to initiate treatment with an anti-fibrotic. Which of the following is TRUE regarding side effects of these medical therapies?
    a. Pirfenidone can be associated with skin rash and photosensitivity
    b. Pirfenidone should be avoided or used with extreme caution in patients with recent active coronary artery disease
    c. Nintedanib-associated diarrhea is a black box warning and should result in immediate discontinuation of this medication

6. A 82-year-old male with PMH IPF was transferred to Pulmonary Clinic after a recent diagnosis of IPF. You are planning to initiate treatment with pirfenidone. Which of the following laboratory studies should you monitor?
    a. Creatinine
    b. LFTs
    c. CBC

7. A 42-year-old female with PMH obesity was referred to Pulmonary Clinic for evaluation of a chronic cough. She reports that her cough has been persistent for the past 3 months. She reports throat clearing and sensation of a lump in her throat. She is not on any medications. She denies a history of tobacco use. CXR was unremarkable. What is TRUE regarding this diagnosis?
    a. Patients often present with dyspepsia or heartburn
    b. Laryngoscopy can be beneficial for diagnosis and show subglottic/vocal fold/laryngeal edema, erythema, granulation, and thick endolaryngeal mucus
    c. Studies show that this disease is quite responsive to PPI

8. A 35-year-old female with PMH hypothyroidism has been followed by Pulmonary for evaluation and management of a chronic cough. She has trialed multiple therapies including a variety of inhalers for possible cough-variant asthma and non-asthmatic eosinophilic bronchitis (NAEB), nasal steroids and anti-histamine for upper airway cough syndrome (UACS), and PPI for GERD without improvement. She has had a thorough negative work-up including CT chest, 24-hour esophageal pH monitoring, laryngoscopy and bronchoscopy with consultations by GI and ENT. She was referred for multimodality speech therapy. Which of the following is NOT an accepted medical treatment for this diagnosis, in combination with this speech therapy?
    a. Amitriptyline
    b. Gabapentin
    c. Quetiapine

9. A 28-year-old male with PMH Duchenne Muscular Dystrophy has been followed by Pulmonary. He is currently able to cough, but he has had multiple recent pneumonias requiring hospitalization. At what peak cough flow (PCF), should you be concerned about ineffective cough clearance?
    a. Below 400 L/min
    b. Below 360 L/min
    c. Below 270 L/min

10. A 57-year-old male patient with PMH ALS has been followed by Pulmonary. Recently, he has noticed that his symptoms are slightly worse while supine than sitting. Which of the following criteria can be used to predict the need for non-invasive ventilation?
    a. Reduced FVC <50% predicted
    b. Reduced peak cough flow <160 L/min
    c. Positive sniff test

11. A 62-year-old male patient with PMH ALS has been followed by Pulmonary. Family notes that his major complaint is sialorrhea. What therapies canNOT be used to manage this complication?
    a. Glycopyrrolate
    b. Corticosteroid injections into salivary gland
    c. Radiation of salivary gland

12. A 65-year-old female with PMH HTN, HLD has been followed by Pulmonary for ILD. She has no clear systemic symptoms to suggest underlying CTD. Her medication list does not show any known offending medications. Her HRCT showed centrilobular ground-glass opacities, reticulation in the upper lung fields with mosaic attenuation. Bronchoscopy with BAL (+)22% lymphocytes. Upon reflection, she notes that her symptoms began when she took on more farm-related responsibilities including cleaning up hay. Since your discussion with her, she avoids all offending antigens. Given her persistent symptoms, you suggested a trial of oral glucocorticoids. How do you counsel your patient about your trial of prednisone?
    a. Glucocorticoids can lead to improved sense of well-being, causing patients to be less stringent about measures to limit antigen exposure
    b. PCP prophylaxis is recommended for patients receiving a glucocorticoid dose equivalent to >15 mg of prednisone daily for one month or longer
    c. Trimethoprim-sulfamethoxazole and aerosolized pentamidine are of equal efficacy, but the former is typically recommended due to ease of administration

13. A 69-year-old female has been followed by Pulmonary for ILD. Her HRCT showed diffuse ground glass opacities in the lower lung fields. While she had multiple positive antibodies, her symptoms did not result in a unifying rheumatologic diagnosis. Given her PFT and radiologic progression, she was trialed on systemic glucocorticoids with subjective and objective improvement. You are planning to initiate a second immunosuppressive agent such as mycophenolate. Which of the following laboratory studies do you NOT need to obtain prior to its administration?
    a. Calcium
    b. Hepatitis B and C serologies
    c. Latent TB screen with IGRA

14. A 33 year-old female with PMH migraines was referred to Pulmonary Clinic for management of her asthma. She reports asthma symptoms 3-4 days a week. She reports nighttime awakenings. She has had four exacerbations in the last year. Her medications include fluticasone 550 mcg - salmeterol 50 mcg twice daily, tiotropium 18 mg daily, montelukast daily, albuterol as needed (uses daily). Her adherence and inhaler technique are appropriate. Given her symptoms, you are considering escalating her current inhaler regimen. She does not have peripheral eosinophilia, elevated IgE or allergen-specific IgE. Which of the following would be the most appropriate next step in management for her asthma?
    a. Omalizumab
    b. Benralizumab
    c. Tesalizumab

15. A 24-year-old female with PMH chronic rhinosinusitis and urticaria was referred to Pulmonary Clinic for management of severe, persistent asthma. During your initial evaluation, you note that she may have multiple indications for a biologic agent. Please match the additional comorbidities with the biologic agents.
    a. Chronic rhinosinusitis with nasal polyposis
    b. Chronic spontaneous urticaria
    c. Eosinophilic esophagitis
    d. Eosinophilic granulomatosis with polyangiitis
    e. Omalizumab
    f. Mepolizumab
    g. Dupilumab

16. A 46-year-old male with PMH asthma has been followed by Pulmonary for management of his asthma. His symptoms remain poorly-controlled with symptoms throughout the day and almost nightly despite high dose fluticasone-salmeterol and montelukast. He has been on some level of prednisone for the past three months. Therefore, you are considering the addition of a biologic agent. Which of the following statements is TRUE regarding biologic agents?
    a. Benralizumab can be associated with hypereosinophilia after its administration
    b. Omalizumab, Mepolizumab and Reslizumab are all weight-based medications
    c. Dupilumab can be associated with conjunctivitis
    d. Tezepelumab is administered via intravenous route and thus, can be used in those who have anaphylaxis to other biologics attributed to the subcutaneous preparation

17. A 22-year-old male was referred to Pulmonary Clinic for evaluation of dyspnea and wheeze. His PCP had initially diagnosed him with possible asthma. His PFTs are still pending. He had trialed a variety of inhalers and prednisone without symptomatic improvement. During your initial evaluation, you note some atypical aspects of his history. Please match the additional HPI information with the possible alternative diagnosis
    a. Childhood history of recurrent infections with purulent productive cough
    b. Continuous dyspnea, hoarseness, and history of intubation
    c. Episode of inspiratory stridor localized to neck, especially after perfume exposure
    d. Inducible laryngeal obstruction
    e. Bronchiectasis
    f. Vocal cord paralysis

18. A 38-year-old female was referred to Pulmonary Clinic for evaluation of dyspnea and wheeze. She reports throat tightness and noisy breathing that occurs during maximal exercise. She denies a history of tobacco use. Her work-up included a normal CXR and negative bronchoprovocation study. Which of the following is a characteristic finding of this disorder?
    a. Laryngoscopy with partial adduction of the vocal cords with an opening at the posterior aspect of the cords
    b. Laryngoscopy with abduction of the vocal cords during mid-inspiration
    c. PFTs with flattened expiratory limb of the flow-volume loop

19. A 65-year-old man with PMH COPD Gold Stage E has been followed by Pulmonary. He can only ambulate 1 block before becoming dyspneic. He has had 3 exacerbations in the past year despite single-inhaler triple therapy. You are considering either the addition of azithromycin or roflumilast. How do you counsel your patient about the medication?
    a. Both azithromycin and roflumilast are associated with hearing loss
    b. Azithromycin is associated with AV block
    c. Roflumilast has been associated with increased neuropsychiatric effects including insomnia, anxiety, depression and rare suicidal ideation

20. A 71-year-old female with PMH COPD has been followed by Pulmonary. Her symptoms remain poorly-controlled with several COPD exacerbations in the past year. Her PFTs show obstruction with FEV1 19% and DLCO 24% predicted and significant air trapping with RV 230%. Her CT scan shows homogeneous emphysema but target RUL with no collateral ventilation. Her medications include fluticasone-salmeterol at maximum dosage twice a day, tiotropium daily and PRN albuterol. She has already completed pulmonary rehabilitation. Is she a candidate for bronchoscopic lung volume reduction surgery (BLVRS) or lung volume reduction surgery (LVRS)?
    a. She is a candidate for both BLVRS and LVRS
    b. She is a candidate for BLVRS but not LVRS
    c. She is not a candidate for either BLVRS or LVRS

21. A 66-year-old female with PMH COPD has been followed by Pulmonary. Her symptoms remain poorly-controlled despite maximal therapy. Her PFTs show obstruction with FEV1 35% and DLCO 58% predicted. Her CT scan shows upper-lobe heterogeneous emphysema. She has low exercise capacity. She is interested in proceeding with LVRS. How do you counsel your patient about the expected outcomes in this particular patient population?
    a. Decrease in St. George's Respiratory Questionnaire score at 24 months
    b. Improvement in FEV1 and TLC
    c. Reduction in total mortality

22. A 48-year-old female with PMH T2DM, HTN, asthma, and OSA on CPAP, was referred to Pulmonary Clinic for pulmonary resection of Stage I lung cancer. Which of the following PFT markers are evaluated to assess for post-operative pulmonary complications? Multiple answer choices possible.
    a. FEV1
    b. FVC
    c. TLC
    d. DLCO

23. A 62-year-old male with PMH COPD and recently-diagnosed lung adenocarcinoma was referred to Pulmonary Clinic for pre-operative risk assessment. His most recent CT chest shows 2 cm pulmonary nodule in RUL without lymph node involvement on his bronchoscopy with EBUS. His most PFTs show FEV1 65% (1.8 L) predicted and DLCO 62% predicted. He is being considered for possible RUL lobectomy. Which of the following is true regarding this patient's candidacy for surgical resection?
    a. If the patient climbed 26 meters on stair climb test, he is considered low risk and should tolerate resection
    b. If the patient ambulated 200 meters on shuttle walk test (SWT), he is considered low risk and should tolerate resection
    c. VO2 max <30 mL/kg/min is associated with a high risk of morbidity and mortality

Supplementary Figure 3: Post-course questionnaire

1. What is your preferred style of learning?
    a. Textbooks
    b. Lectures
    c. Podcasts
    d. Others

2. Were these podcasts helpful for your pulmonary education overall?
    a. Yes
    b. No

3. What was your major obstacle in listening to these podcasts?

4. Do you have any feedback on the podcasts?

5. How comfortable do you feel managing each of the following:

	Extremely uncomfortable	Somewhat uncomfortable	Neutral	Somewhat comfortable	Extremely comfortable
Management of IPF including anti-fibrotics	○	○	○	○	○
Evaluation of chronic cough	○	○	○	○	○
Evaluation of pulmonary complications of neuromuscular disease	○	○	○	○	○
Evaluation of ILD	○	○	○	○	○
Management of severe asthma including biologics	○	○	○	○	○
Evaluation of wheezing including diagnosis of inducible laryngeal obstruction	○	○	○	○	○
Management of severe COPD	○	○	○	○	○
Assessment of risk of complications after lung resection	○	○	○	○	○

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24. A 48-year-old female with PMH T2DM, HTN, asthma, and OSA on CPAP, was referred to Pulmonary Clinic for pulmonary resection of Stage I lung cancer. Which of the following PFT markers are evaluated to assess for post-operative pulmonary complications? Multiple answer choices possible.
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25. A 62-year-old male with PMH COPD and recently-diagnosed lung adenocarcinoma was referred to Pulmonary Clinic for pre-operative risk assessment. His most recent CT chest shows 2 cm pulmonary nodule in RUL without lymph node involvement on his bronchoscopy with EBUS. His most PFTs show FEV1 65% (1.8 L) predicted and DLCO 62% predicted. He is being considered for possible RUL lobectomy. Which of the following is true regarding this patient's candidacy for surgical resection?
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    b. If the patient ambulated 200 meters on shuttle walk test (SWT), he is considered low risk and should tolerate resection
    c. VO2 max <30 mL/kg/min is associated with a high risk of morbidity and mortality