ILD is a progressive disease with a **poor prognosis**[1]*

When patients with ILD develop **PH**, it greatly **accelerates their decline**[2,3]

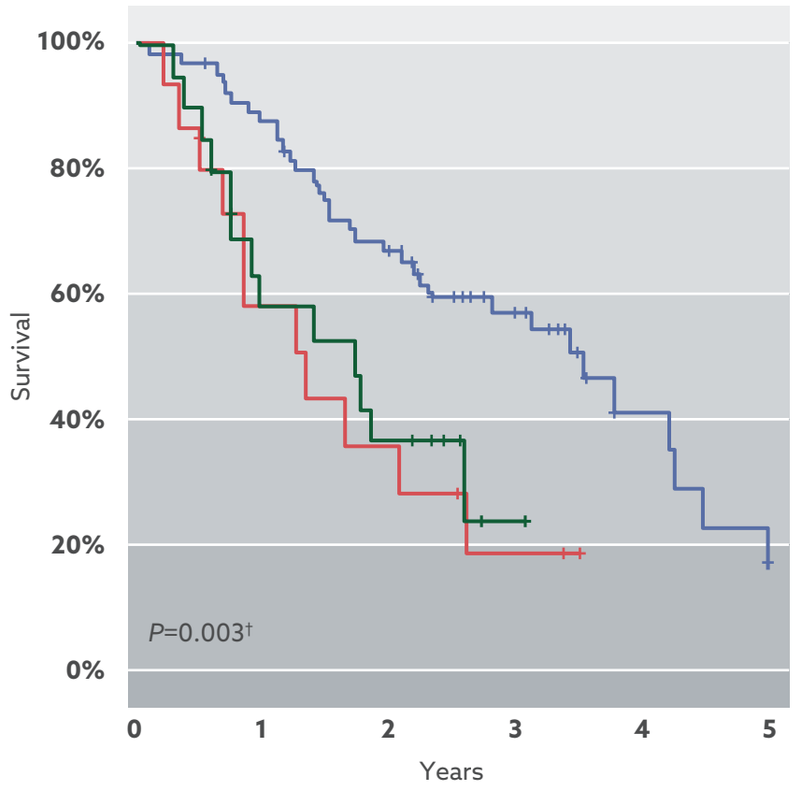
*For patients with IPF not receiving antifibrotic therapy, median post-diagnosis survival is 3 to 4 years.[1]

ILD=interstitial lung disease; IPF=idiopathic pulmonary fibrosis; PH=pulmonary hypertension.

References: 1. Kolb M, Vašáková M. The natural history of progressive fibrosing interstitial lung diseases. *Respir Res*. 2019;20:57. **2.** King CS, Shlobin OA. The trouble with group 3 pulmonary hypertension in interstitial lung disease: dilemmas in diagnosis and the conundrum of treatment. *Chest*. 2020;158(4):1651-1664. **3.** Kimura M, et al. Pulmonary hypertension as a prognostic indicator at the initial evaluation in idiopathic pulmonary fibrosis. *Respiration*. 2013;85(6):456-463.

Even in **early-stage IPF**, any indication of PH markedly impacts prognosis[1,2]

PH significantly decreased median survival for early-stage IPF patients by **about half**[1]



Retrospective, single-center study (N=101). Similar results were reported in a second independent study.[1*]

- **Early-stage IPF only = mPAP ≤20 mm Hg** (n=66)
- **Early-stage IPF+PH = mPAP 21-25 mm Hg** (n=20)
- **Early-stage IPF+PH = mPAP >25 mm Hg** (n=15)

Patients with early-stage IPF + PH had a mean FVC of 68% and were not receiving supplemental oxygen.[1]

Be vigilant about checking for PH at diagnosis of ILD.

*Patients with left heart failure (PAWP >15 mm Hg) or who were receiving supplemental oxygen were excluded. Similar survival results were reported by Yagi M et al in *Respirology* 2017.[1,2]

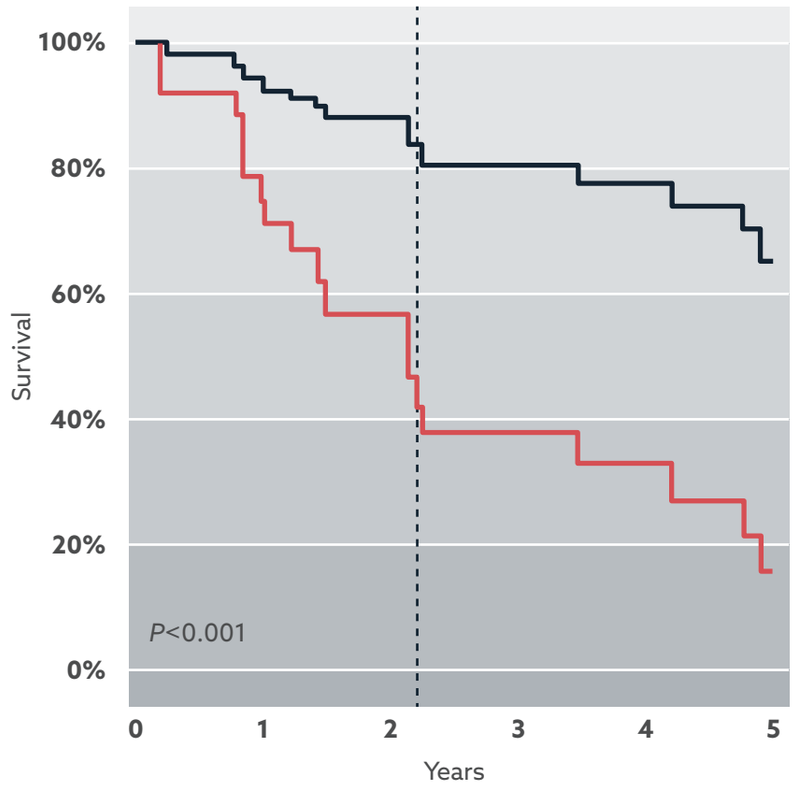
†*P* value pertains to the 5-year survival of mPAP 21-25 mm Hg and mPAP >25 mm Hg groups vs the mPAP ≤20 mm Hg group.[1]

FVC=forced vital capacity; mPAP=mean pulmonary arterial pressure; PAWP=pulmonary arterial wedge pressure.

References: 1. Kimura M, et al. *Respiration*. 2013;85(6):456-463. **2.** Yagi M, et al. CT-determined pulmonary artery to aorta ratio as a predictor of elevated pulmonary artery pressure and survival in idiopathic pulmonary fibrosis. *Respirology*. 2017;22(7):1393-1399.

For patients with advanced IPF, PH remains a **key driver of worsening outcomes**[1]

PH reduced survival in patients with advanced IPF **by half** after 2 years[1]*



Based on a study of 79 patients with advanced IPF who were referred for lung transplant evaluation and underwent RHC.[1]

Late-stage IPF: mPAP 19.1 mm Hg (n=54)

Late-stage IPF + PH: mPAP 29.5 mm Hg (n=25)

PH was defined as mPAP >25 mm Hg.[1]

The prognosis for other types of ILD (eg, CTD and CPFE) is similarly affected by PH.[2,3]

Whether early- or late-stage IPF—once PH develops, it drives worsening outcomes.[1,4,5]

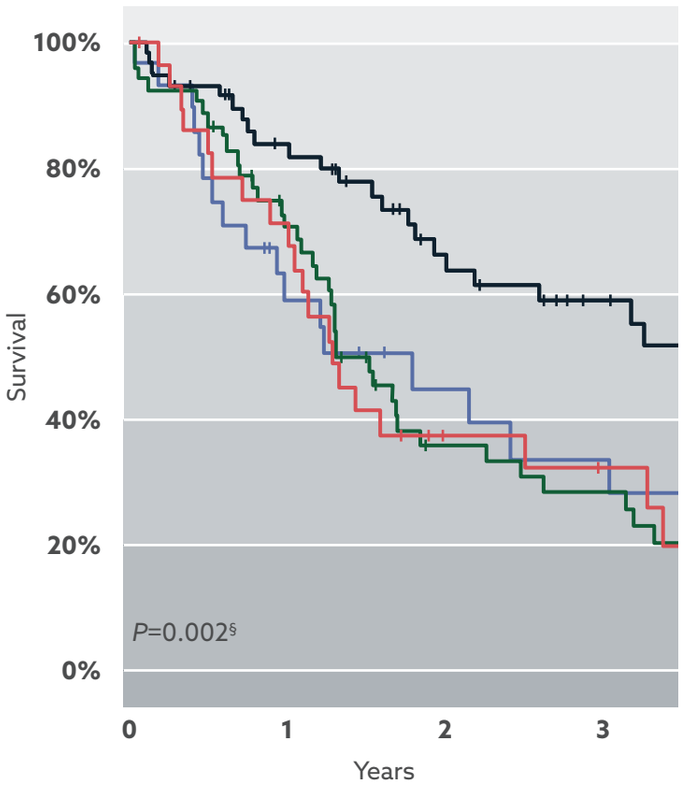
*Figure legend indicates average mPAP values for both subgroups.[1]

CPFE=combined pulmonary fibrosis and emphysema; CTD=connective tissue disease; RHC=right heart catheterization.

References: 1. Lettieri CJ, et al. Prevalence and outcomes of pulmonary arterial hypertension in advanced idiopathic pulmonary fibrosis. *Chest*. 2006;129(3):746-752. **2.** Cottin V, et al. Pulmonary hypertension in patients with combined pulmonary fibrosis and emphysema syndrome. *Eur Respir J*. 2010;35(1):105-111. **3.** Oliveira RP, et al. Connective tissue disease-associated interstitial lung disease. *Pulmonology*. 2022;28(2):113-118. **4.** King CS, et al. *Chest*. 2020;158(4):1651-1664. **5.** Kimura M, et al. *Respiration*. 2013;85(6):456-463.

Regardless of hemodynamic severity, PH significantly impacts prognosis[1*]

Survival in ILD stratified by hemodynamic subgroups[1†‡]



Retrospective data from patients with ILD (N=170) who were evaluated and underwent RHC at 12 expert PH centers, most of which were participating in the Spanish Registry of Pulmonary Hypertension in Respiratory Disease (REHAR).[1*]

- **ILD only**
- **ILD + Severe PH**
- **ILD + Mild-Moderate PH**
- **ILD + Borderline PH**

In a separate analysis, there was no difference in the risk of death for patients with a PVR >5 WU compared to those with a PVR ≤5 WU.[1]

Any PH—no matter how mild or severe—significantly worsens your patient's prognosis.[1,2]

*Patients with CPFE, left heart disease, or who had undergone lung transplant were excluded. ILD diagnoses (N=170): 74% IPF, 15% nonspecific interstitial pneumonia, 8% hypersensitivity pneumonitis, and 3% other.[1]

†Patients were divided into 4 hemodynamic subgroups based on the 2018 WSPH definitions for Group 3 PH, with patients falling within the then newly lowered mPAP threshold range (21-24 mm Hg) separated into their own subgroup: ILD only (No PH), mPAP <21 mm Hg or mPAP 21-24 mm Hg and PVR <3 WU; Borderline PH, mPAP 21-24 mm Hg and PVR ≥3 WU; Mild-Moderate PH, mPAP 25-35 mm Hg and CI ≥2.0 L/min/m^2; and Severe PH, mPAP ≥35 mm Hg or mPAP ≥25 mm Hg and CI <2.0 L/min/m^2.[1]

‡Median values at baseline: ILD Only = mPAP 19 mm Hg; PVR 1.8 WU (n=59); ILD + Severe PH = mPAP 41 mm Hg; PVR 7.7 WU (n=30); ILD + Mild-Moderate PH = mPAP 29 mm Hg; PVR 4.7 WU (n=52); ILD + Borderline PH = mPAP 23 mm Hg; PVR 3.5 WU (n=29).[1]

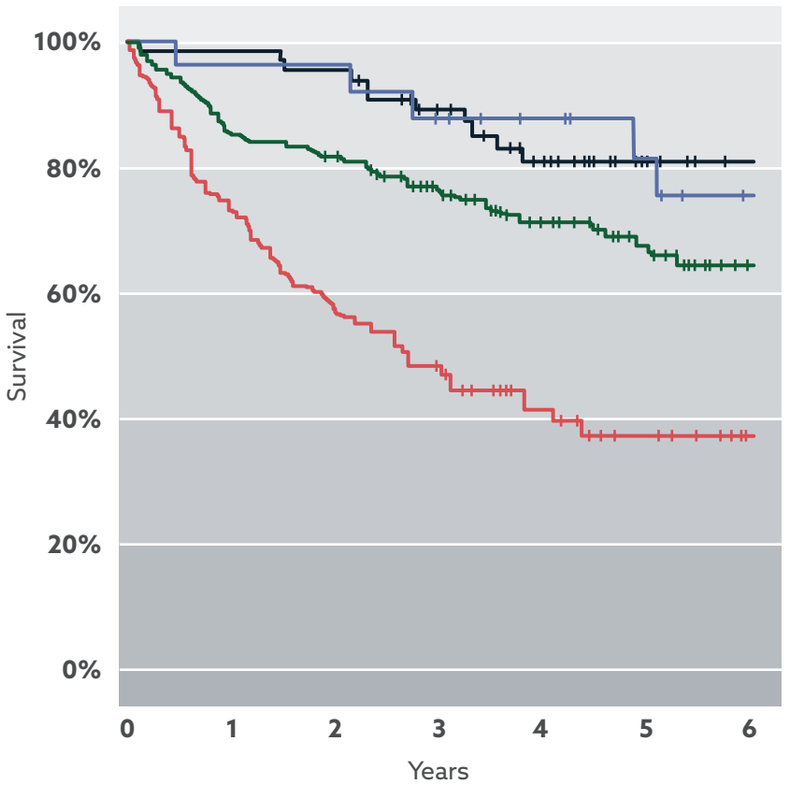
§The *P* value pertains to comparing survival in any PH group vs the No PH group at 3 years.[1]

CI=cardiac index; PVR=pulmonary vascular resistance; WSPH=World Symposium on Pulmonary Hypertension; WU=Wood units.

References: 1. Piccari L, et al; REHAR Registry Investigators. The effect of borderline pulmonary hypertension on survival in chronic lung disease. *Respiration*. 2022;101(8):717-727. **2.** Humbert M, et al; ESC/ERS Scientific Document Group. 2022 ESC/ERS Guidelines for the diagnosis and treatment of pulmonary hypertension. *Eur Heart J*. 2022;43(38):3618-3731.

Patients in Group 3 with PH-ILD have a markedly sharper decline in prognosis[1,2]

Survival in different PH groups[1*]



Retrospective data from an expert PH center (N=363). Group 2 was excluded.[1†]

Group 4 (n=65)
Group 5 (n=25)
Group 1 (n=164)
Group 3 (n=109)

Patients with PH-ILD have a worse prognosis than those with PAH (Group 1).[1]

Early detection of PH in patients in Group 3 is critical.[1,2]

*WHO categorization of PH: Group 1 – Pulmonary Arterial Hypertension (PAH); Group 2 – PH Due to Left Heart Disease; **Group 3 – PH Due to Lung Diseases and/or Hypoxia**; Group 4 – PH Due to Pulmonary Artery Obstructions; Group 5 – PH With Unclear and/or Multifactorial Mechanisms.[3]
†Similar results were reported from the Giessen Pulmonary Hypertension Registry (N=2067).[2]

PH-ILD=pulmonary hypertension associated with interstitial lung disease; WHO=World Health Organization.

References: 1. Chebib N, et al. Pulmonary hypertension in chronic lung diseases: comparison to other pulmonary hypertension groups. *Pulm Circ*. 2018;8(2):1-10. **2.** Gall H, et al. The Giessen Pulmonary Hypertension Registry: survival in pulmonary hypertension subgroups. *J Heart Lung Transplant*. 2017;36(9):957-967. **3.** Simonneau G, et al. Haemodynamic definitions and updated clinical classification of pulmonary hypertension. *Eur Respir J*. 2019;53(1):1801913.

PH may be present at any stage of ILD, **even at diagnosis**[1-3]

Up to 15% of patients with early-stage IPF have confirmed PH.[1-3]

As ILD advances, **PH frequency rises**.[1]

- In patients with advanced and end-stage IPF, PH prevalence can rise **beyond 50%**.[1*]

- **Up to 86% of patients with IPF may develop PH by the time of lung transplant.[4]**

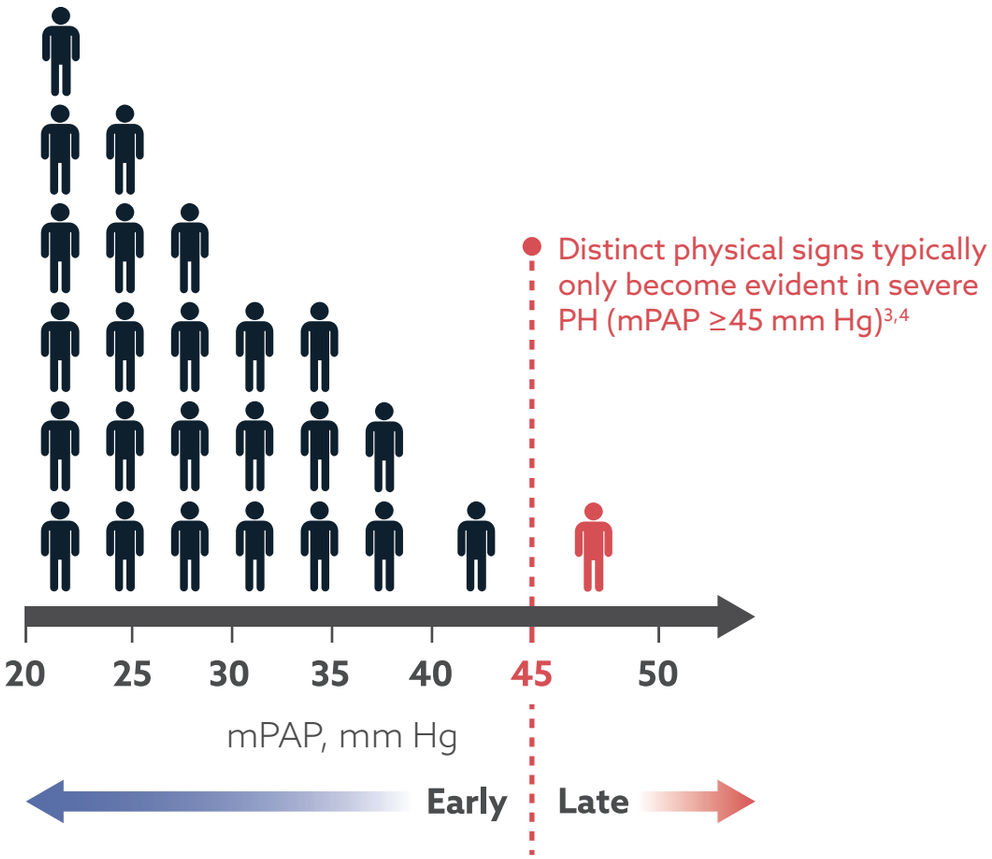
Check for PH at diagnosis of ILD and during routine follow-ups.[2,5]

*In IPF, the extent of restriction does not correlate with mPAP.[6]

References: 1. King CS, et al. *Chest*. 2020;158(4):1651-1664. **2.** Kimura M, et al. *Respiration*. 2013;85(6):456-463. **3.** Raghu G, et al. Pulmonary hypertension in idiopathic pulmonary fibrosis with mild-to-moderate restriction. *Eur Respir J*. 2015;46(5):1370-1377. **4.** Nathan SD, et al. Serial development of pulmonary hypertension in patients with idiopathic pulmonary fibrosis. *Respiration*. 2008;76(3):288-294. **5.** Yagi M, et al. *Respirology*. 2017;22(7):1393-1399. **6.** Nathan SD, et al. Pulmonary hypertension and pulmonary function testing in idiopathic pulmonary fibrosis. *Chest*. 2007;131(3):657-663.

Waiting for distinct signs of PH **misses the majority of patients** with PH-ILD[1-4]

Relative distribution of elevated mPAP values in patients with IPF[5-10]*



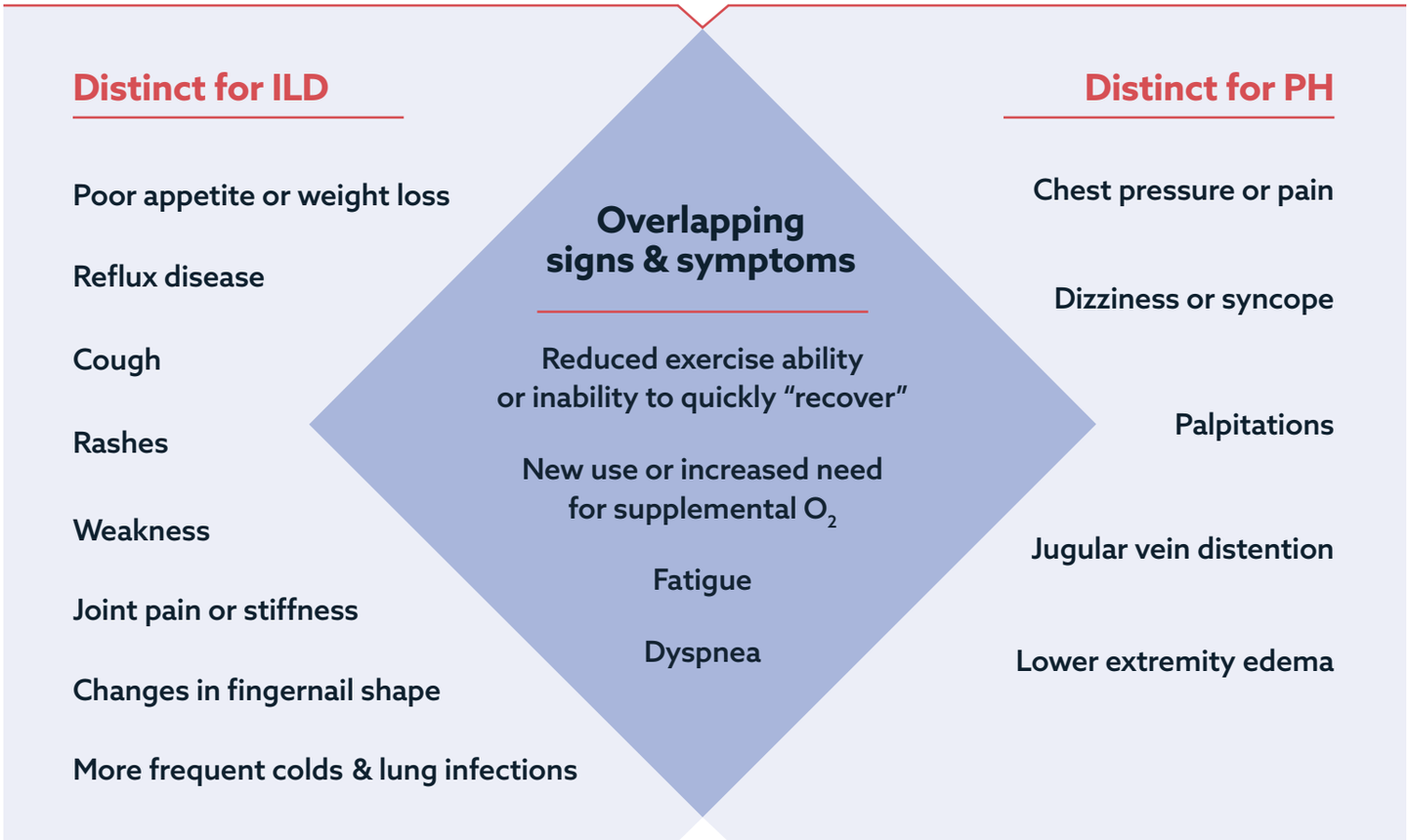
Do not wait. More distinct signs of PH indicate advanced disease.[1,2,4,5,11]

*Composite graphical representation of the mPAP distribution observed across multiple studies in patients with IPF.

References: 1. King CS, et al. *Chest*. 2020;158(4):1651-1664. **2.** Humbert M, et al; ESC/ERS Scientific Document Group. *Eur Heart J*. 2022;43(38):3618-3731. **3.** Nikkho SM, et al. Clinical significance of pulmonary hypertension in interstitial lung disease: a consensus statement from the Pulmonary Vascular Research Institute's innovative drug development initiative—Group 3 pulmonary hypertension. *Pulm Circ*. 2022;12(3):e12127. **4.** Braganza M, et al. A prospective evaluation of the diagnostic accuracy of the physical examination for pulmonary hypertension. *Chest*. 2019;155(5):982-990. **5.** Lettieri CJ, et al. *Chest*. 2006;129(3):746-752. **6.** Yagi M, et al. *Respirology*. 2017;22(7):1393-1399. **7.** Kimura M, et al. *Respiration*. 2013;85(6):456-463. **8.** Raghu G, et al. *Eur Respir J*. 2015;46(5):1370-1377. **9.** Furukawa T, et al. A scoring system to predict the elevation of mean pulmonary arterial pressure in idiopathic pulmonary fibrosis. *Eur Respir J*. 2018;51(1):1701311. **10.** Shorr AF, et al. Pulmonary hypertension in patients with pulmonary fibrosis awaiting lung transplant. *Eur Respir J*. 2007;30(4):715-721. **11.** Rahaghi FF, et al. Screening strategies for pulmonary hypertension in patients with interstitial lung disease: a multidisciplinary Delphi study. *Chest*. 2022;162(1):145-155.

Are your patients' ILD symptoms getting worse, **or is it PH**?[1-4]

Overlapping symptoms can make PH hard to detect[1-9]



Ask your patients about new or worsening symptoms. They may indicate PH.[1-4]

References: 1. King CS, et al. *Chest*. 2020;158(4):1651-1664. **2.** Humbert M, et al; ESC/ERS Scientific Document Group. *Eur Heart J*. 2022;43(38):3618-3731. **3.** Nikkho SM, et al. *Pulm Circ*. 2022;12(3):e12127. **4.** Braganza M, et al. *Chest*. 2019;155(5):982-990. **5.** van Manen MJG, et al. Clubbing in patients with fibrotic interstitial lung diseases. *Respir Med*. 2017;132:226-231. **6.** Shen Q, et al. Pain is a common problem in patients with ILD. *Respir Res*. 2020;21(1):297. **7.** Carvajalino S, et al. Symptom prevalence of patients with fibrotic interstitial lung disease: a systematic literature review. *BMC Pulm Med*. 2018;18(1):78. **8.** Margaritopoulos GA, et al. Comorbidities in interstitial lung diseases. *Eur Respir Rev*. 2017;26(143):160027. **9.** Kalchiem-Dekel O, et al. Interstitial lung disease and pulmonary fibrosis: a practical approach for general medicine physicians with focus on the medical history. *J Clin Med*. 2018;7(12):476.

ILD symptoms can **mask PH**[1-3]

PH is often not diagnosed until **significant right heart dysfunction** has developed[1-3]

Early PH symptoms overlap with symptoms of ILD progression[1-3]:

- **Increased shortness of breath**
- **Fatigue**
- **Reduced ability to be active**

Later, more distinct PH signs indicate significant right heart dysfunction[3,4]:

- **Jugular vein distention**

- **Peripheral edema**

To catch PH early, talk to your patients about any changes they experience.[1,5]

Ask patients:

- What has changed since your last appointment?
- Are you able to walk as far as you used to without resting?
- What does a typical day look like for you? How is your routine different since our last appointment?
- Are you not doing some things you used to?
  - For example:
    - Do you walk your dog? How far are you able to walk together? Has that become a more difficult activity?
    - Can you walk to a store from the parking lot? Or do you need to be dropped off at the front?

Discuss changes your patients might see that could reveal PH earlier.[1,5]

References: 1. King CS, et al. *Chest*. 2020;158(4):1651-1664. **2.** Humbert M, et al; ESC/ERS Scientific Document Group. *Eur Heart J*. 2022;43(38):3618-3731. **3.** Nikkho SM, et al. *Pulm Circ*. 2022;12(3):e12127. **4.** Braganza M, et al. *Chest*. 2019;155(5):982-990. **5.** Rahaghi FF, et al. *Chest*. 2022;162(1):145-155.

You can uncover helpful clues in **routine ILD tests**[1]

Routine ILD Tests	PH Watchouts
PFTs (D_{LCO})*	▶ Low D_{LCO} (<40% predicted)[2-5] ▶ Disproportionate decline in D_{LCO} vs FVC[1,2†]
Exercise capacity	▶ Poor results during exercise testing[1-3,6,7‡] – Marked or worsening desaturation or dyspnea – Severely reduced or worsened distance, particularly with stable PFTs – Impaired heart rate recovery
Oxygen needs	▶ Any need for supplemental oxygen[1]
BNP and NT-proBNP	▶ Elevated or increasing levels of BNP or NT-proBNP[8-10] – Levels correlate to the severity of cardiac stress[11] – Levels increase **before** symptoms of severe PH and heart failure (eg, peripheral edema, weight gain) are present[11]

Take a closer look at routine ILD test results to detect PH earlier.[1,3]

*Declining FVC and D_{LCO} are both measures of ILD disease progression and severity. In ILD, the decline in D_{LCO} is thought to be due to alveolar destruction and thickening/compression of pulmonary capillaries. PH can cause damage to the microvasculature, resulting in an additional decline in D_{LCO} that does not always correlate with FVC impairment.[1-3,12-15]

†CPFE is commonly associated with the combination of preserved lung volumes and extremely low D_{LCO} and also carries a high risk for PH. Additionally, an FVC/D_{LCO} ratio >1.6 has been used to screen for PH in patients with scleroderma.[3,16]

‡Based on studies using the 6MWT.[1-3]

6MWT=6-minute walk test; BNP=B-type natriuretic peptide; D_{LCO}=diffusing capacity of the lung for carbon monoxide; NT-proBNP=N-terminal pro–B-type natriuretic peptide; PFT=pulmonary function test.

References: 1. Rahaghi FF, et al. *Chest*. 2022;162(1):145-155. **2.** Nathan SD, et al. Pulmonary hypertension in chronic lung disease and hypoxia. *Eur Respir J*. 2019;53(1):1801914. **3.** King CS, et al. *Chest*. 2020;158(4):1651-1664. **4.** Alhamad EH, et al. Predictors of mortality in patients with interstitial lung disease-associated pulmonary hypertension. *J Clin Med*. 2020;9(12):3828. **5.** Rose L, et al. Survival in pulmonary hypertension due to chronic lung disease: influence of low diffusion capacity of the lungs for carbon monoxide. *J Heart Lung Transplant*. 2019;38(2):145-155. **6.** Rosenkranz S, et al. Systemic consequences of pulmonary hypertension and right-sided heart failure. *Circulation*. 2020;141(8):678-693. **7.** Swigris JJ, et al. Heart rate recovery after six-minute walk test predicts pulmonary hypertension in patients with idiopathic pulmonary fibrosis. *Respirology*. 2011;16(3):439-445. **8.** Leuchte HH, et al. Brain natriuretic peptide is a prognostic parameter in chronic lung disease. *Am J Respir Crit Care Med*. 2006;173(7):744-750. **9.** Song JW, et al. Echocardiography and brain natriuretic peptide as prognostic indicators in idiopathic pulmonary fibrosis. *Respir Med*. 2009;103(2):180-186. **10.** Andersen CU, et al. Diagnostic and prognostic role of biomarkers for pulmonary hypertension in interstitial lung disease. *Respir Med*. 2012;106(12):1749-1755. **11.** Mueller C, et al. Heart Failure Association of the European Society of Cardiology practical guidance on the use of natriuretic peptide concentrations. *Eur J Heart Fail*. 2019;21(6):715-731. **12.** Wijsenbeek M, Cottin V. Spectrum of fibrotic lung diseases. *N Engl J Med*. 2020;383(10):958-968. **13.** Hughes JM, Pride NB. Examination of the carbon monoxide diffusing capacity (DL(CO)) in relation to its KCO and VA components. *Am J Respir Crit Care Med*. 2012;186(2):132-139. **14.** Waxman AB, et al. Recent advances in the management of pulmonary hypertension with interstitial lung disease. *Eur Respir Rev*. 2022;31(165):210220. **15.** Nathan SD, et al. *Chest*. 2007;131(3):657-663. **16.** Hinchcliff M, et al; PHAROS Investigators. Pulmonary Hypertension Assessment and Recognition of Outcomes in Scleroderma (PHAROS): baseline characteristics and description of study population. *J Rheumatol*. 2011;38(10):2172-2179.

Changes in ILD test results could signal PH[1]

Look at the results with an eye for PH[1]

When your patient with ILD is getting worse, don't assume it's due to ILD—it may be PH.[2]

ASK YOURSELF:

- Why do they need supplemental oxygen now?[1]
- Why is there a need to increase their supplemental oxygen?[1]
- Do they have other signs of PH, like D_{LCO}<40%?[2-5]
- Can you confirm your ILD patient doesn't have PH?
- Could elevated or increased BNP or NT-proBNP levels be a sign of PH?[6-8]
- Might poor results during exercise testing be due to PH?[1-3,9,10]

Perform routine ILD tests with a PH lens.[1]

References: 1. Rahaghi FF, et al. *Chest*. 2022;162(1):145-155. **2.** King CS, et al. *Chest*. 2020;158(4):1651-1664. **3.** Nathan SD, et al. *Eur Respir J*. 2019;53(1):1801914. **4.** Alhamad EH, et al. *J Clin Med*. 2020;9(12):3828. **5.** Rose L, et al. *J Heart Lung Transplant*. 2019;38(2):145-155. **6.** Leuchte HH, et al. *Am J Respir Crit Care Med*. 2006;173(7):744-750. **7.** Song JW, et al. *Respir Med*. 2009;103(2):180-186. **8.** Andersen CU, et al. *Respir Med*. 2012;106(12):1749-1755. **9.** Rosenkranz S, et al. *Circulation*. 2020;141(8):678-693. **10.** Swigris JJ, et al. *Respirology*. 2011;16(3):439-445.

In a cohort of patients with ILD clinically suspected of having PH-ILD* (N=265)

40% of patients with an echo showing a low likelihood of PH were confirmed to have PH-ILD by RHC[1*†]

Echo probability of PH[1†]	Patients, n[1]	Patients with PH, n (%) *(confirmed by RHC)*[1]
Low	43	**17** (40%)
Intermediate	60	**42** (70%)
High	162	**135** (83%)

"Low probability" of PH was defined as TRV ≤2.8 m/s or unmeasurable, with no other echo signs of PH.[1]

Echo is not sensitive enough to rule out PH-ILD.[1-3]

*Clinical suspicion was determined following integrated review of all relevant information (ie, physical exam, echo, PFTs, and other tests where available) by an expert PH physician.[1]

†**Probability was determined based on modified 2015 ESC/ERS screening recommendations** (ie, using peak TRV thresholds plus the presence of RV dilatation and/or dysfunction).

PH was defined as mPAP ≥25 mm Hg. Of the 194 patients with confirmed PH, 140 (72%) had precapillary PH (PCWP ≤15 mm Hg). For the 17 patients misclassified as having a "low probability" of PH, mean mPAP was 35 mm Hg, mean PCWP was 11.4 mm Hg, and mean PVR was 4.9 WU.[1]

ERS=European Respiratory Society; ESC=European Society of Cardiology; PCWP=pulmonary capillary wedge pressure; RV=right ventricular/right ventricle; TRV=tricuspid regurgitation velocity.

References: 1. Keir GJ, et al. Pulmonary hypertension in interstitial lung disease: limitations of echocardiography compared to cardiac catheterization. *Respirology*. 2018;23(7):687-694. **2.** Humbert M, et al; ESC/ERS Scientific Document Group. *Eur Heart J*. 2022;43(38):3618-3731. **3.** Fisher MR, et al. Accuracy of Doppler echocardiography in the hemodynamic assessment of pulmonary hypertension. *Am J Respir Crit Care Med*. 2009;179(7):615-621.

Why does echo have **limitations for identifying PH early?**

Echo findings do not reliably detect early-stage PH[1-3]

- Signs of RV dysfunction appear in later-stage PH
- Some echo findings that are suggestive of PH require expert echo assessment and may not be routinely evaluated

RVSP estimates of mPAP derived from echo are frequently inaccurate or not reported[1,2,4-6]

In fact, in about 50% of patients with ILD, TR jet velocity (used to calculate RVSP) may:

- Frequently over- or underestimate RVSP, causing echo estimates to differ from RHC values by >10 mm Hg*
- Be difficult to visualize, preventing RVSP from being calculated or reported

Do not rely on echo alone to detect PH.[4,6,7]

RHC

*Echo-estimated systolic PAP vs RHC-measured systolic PAP.[2,6]

PAP=pulmonary arterial pressure; RVSP=right ventricular systolic pressure; TR=tricuspid regurgitation.

References: 1. Ruffenach G, et al. Pulmonary hypertension secondary to pulmonary fibrosis: clinical data, histopathology and molecular insights. *Respir Res*. 2020;21(1):303. **2.** Nathan SD, et al. Right ventricular systolic pressure by echocardiography as a predictor of pulmonary hypertension in idiopathic pulmonary fibrosis. *Respir Med*. 2008;102(9):1305-1310. **3.** Vaidya A, et al. Virtual echocardiography screening tool to differentiate hemodynamic profiles in pulmonary hypertension. *Pulm Circ*. 2020;10(3):2045894020950225. **4.** Humbert M, et al; ESC/ERS Scientific Document Group. *Eur Heart J*. 2022;43(38):3618-3731. **5.** King CS, et al. *Chest*. 2020;158(4):1651-1664. **6.** Fisher MR, et al. *Am J Respir Crit Care Med*. 2009;179(7):615-621. **7.** Keir GJ, et al. *Respirology*. 2018;23(7):687-694.

If either routine ILD tests or echo indicate PH, **confirm with RHC**[1]*

		Echocardiographic Probability of PH[1]		
		High	Intermediate	Low
Clinical Suspicion of PH From Symptoms and Routine ILD Tests	High	RHC	RHC	Consider RHC
	Low	RHC	Consider RHC	No RHC

Even if echo results don't suggest PH, RHC should be considered.[1]

- **The hemodynamic definition of precapillary PH has changed over time, with 2022 ESC/ERS Guidelines recommending lower values for mPAP (>20 mm Hg) and PVR (>2 WU)[2-4]†**

When clinical findings make you suspect PH, even if there is no evidence from echo results, RHC may be needed.[1]

*United Therapeutics does not provide medical advice.
†PAWP ≤15 mm Hg is the criteria for PH in recent ESC/ERS Guidelines.[2]

References: 1. Rahaghi FF, et al. *Chest*. 2022;162(1):145-155. **2.** Humbert M, et al; ESC/ERS Scientific Document Group. *Eur Heart J*. 2022;43(38):3618-3731. **3.** Galiè N, et al; ESC Scientific Document Group. 2015 ESC/ERS Guidelines for the diagnosis and treatment of pulmonary hypertension: the Joint Task Force for the Diagnosis and Treatment of Pulmonary Hypertension of the European Society of Cardiology (ESC) and the European Respiratory Society (ERS). *Eur Heart J*. 2016;37(1):67-119. **4.** Simonneau G, et al. *Eur Respir J*. 2019;53(1):1801913.

RHC is a **routine** procedure[1,2]

Transplant candidates are required to undergo RHC[1,3]

There are few contraindications for RHC[4]*

Low prevalence of serious AEs/complications (1.1%)[5]

It can be used to diagnose several other conditions[4]†

RHC is the gold standard that gives you clear answers on PH.[1,2,4,5]

*Absolute contraindications for RHC include right-sided endocarditis, tumor, or thrombus; relative contraindications include severe coagulopathy or bleeding diathesis.[4]
†In patients with dyspnea, RHC can also be used to diagnose or exclude constrictive pericardial disease, restrictive cardiomyopathy, and heart failure with preserved ejection fraction.[4]

AE=adverse event.

References: 1. Nathan SD, et al. *Eur Respir J*. 2019;53(1):1801914. **2.** Humbert M, et al; ESC/ERS Scientific Document Group. *Eur Heart J*. 2022;43(38):3618-3731. **3.** King CS, et al. *Chest*. 2020;158(4):1651-1664. **4.** Chokkalingam Mani B, Chaudhari SS. Right heart cardiac catheterization. *StatPearls* [Internet]. Accessed April 17, 2024. https://www.ncbi.nlm.nih.gov/books/NBK557404/. **5.** Rosenkranz S, Preston IR. Right heart catheterisation: best practice and pitfalls in pulmonary hypertension. *Eur Respir Rev*. 2015;24(138):642-652.

Symptoms and test results are **part of the PH puzzle**[1-5]

Together, they help determine the likelihood of PH[1-5]

Discuss new and worsening symptoms with your patients

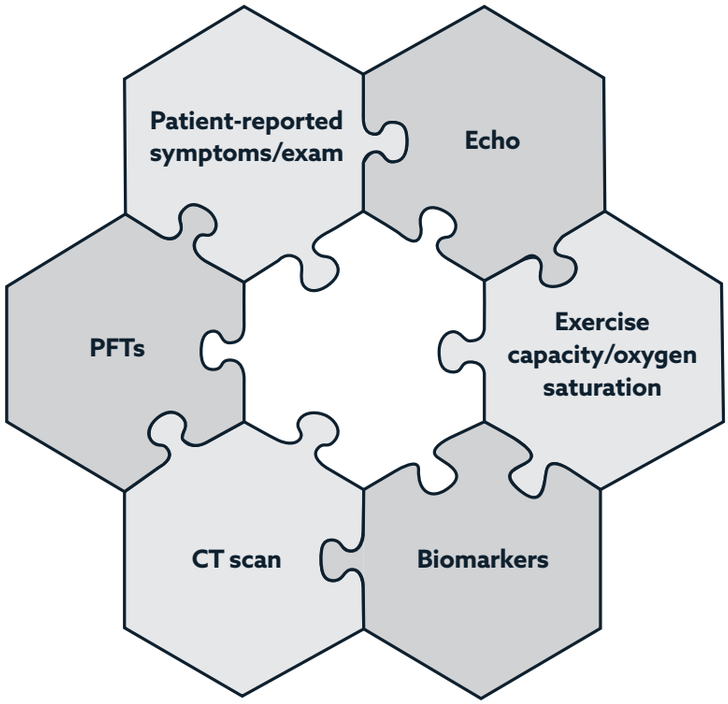
- PH and ILD symptoms can overlap[1-4]
- More distinct signs of PH only appear when it has advanced[3,4]

Consider other ILD test results along with echo to determine if RHC is needed[5]

- **40% of patients with ILD** whose echo results showed a low chance of PH, were later confirmed to have PH-ILD by RHC[6*†]

Use routine ILD tests to check for PH

- Tests you're already performing could reveal early PH[1,5]



Order RHC if there is any suspicion of PH.[5‡]

*Clinical suspicion was determined following integrated review of all relevant information (ie, physical exam, echo, PFTs, and other tests where available) by an expert PH physician.[6]
†**Probability was determined based on modified 2015 ESC/ERS screening recommendations** (ie, using peak TRV thresholds plus the presence of RV dilatation and/or dysfunction). **PH was defined as mPAP ≥25 mm Hg.** Of the 194 patients with confirmed PH, 140 (72%) had precapillary PH (PCWP ≤15 mm Hg). For the 17 patients misclassified as having a "low probability" of PH, mean mPAP was 35 mm Hg, mean PCWP was 11.4 mm Hg, and mean PVR was 4.9 WU.[6]
‡United Therapeutics does not provide medical advice.

References: 1. King CS, et al. *Chest*. 2020;158(4):1651-1664. **2.** Humbert M, et al; ESC/ERS Scientific Document Group. *Eur Heart J*. 2022;43(38):3618-3731. **3.** Nikkho SM, et al. *Pulm Circ*. 2022;12(3):e12127. **4.** Braganza M, et al. *Chest*. 2019;155(5):982-990. **5.** Rahaghi FF, et al. *Chest*. 2022;162(1):145-155. **6.** Keir GJ, et al. *Respirology*. 2018;23(7):687-694.

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