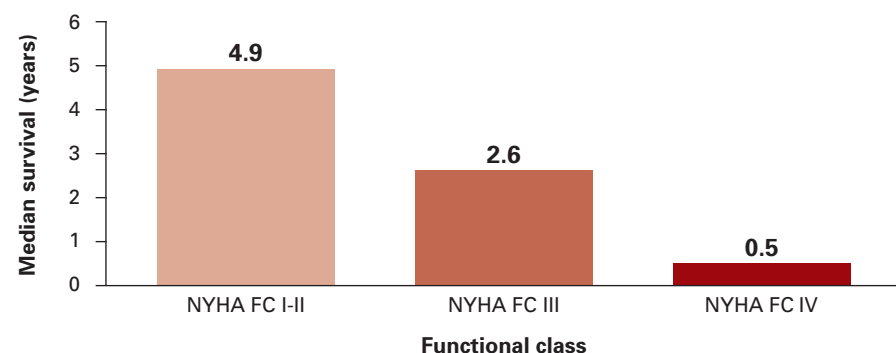


PROGNOSIS OF UNTREATED PAH IS POOR, EVEN FOR MILDLY SYMPTOMATIC PATIENTS⁷

Median survival (years) in IPAH patients by functional class⁷



In Australia the average delay to diagnosis from first point of medical contact is 3 years. This involves 5 GP visits and a further 3 specialist visits ahead of confirmatory right-heart catheterisation and definitive diagnosis.³

During this delay to diagnosis, most patients in the Australian context deteriorated from WHO functional class II to WHO functional class III – corresponding to a worsened prognosis.⁶

PAH MAY BE ASSOCIATED WITH OTHER CONDITIONS⁸:

- Connective tissue disease e.g. Scleroderma
- Congenital heart disease
- Portal hypertension
- HIV
- Drug and toxin exposure

References: 1. Rubin LJ *et al.* *N Eng J Med* 1997;336:111-17. 2. Strange G *et al.* *Pulmonary Circulation* 2013;3:1:89-94. 3. Humbert M, *et al.* *Eur Respir Rev* 2012;21(126):306-12. 4. Medicare Australia: Primary pulmonary and pulmonary arterial hypertension: November 2014: <http://www.medicareaustralia.gov.au/provider/pbs/drugs2/hypertension.jsp>. 5. Galie N *et al.* *Eur Respir Rev* 2009;34:1219-1263. 6. Hoeper MM *et al.* *J Am Coll Cardiol* 2013 Dec 24;62(25 Suppl):D42-50. 7. D'Alonzo GE *et al.* *Ann Intern Med.* 1991;115:343-349. 8. Simonneau G *et al.* *J Am Coll Card.* 2013;62:D34-41.

PULMONARY HYPERTENSION CLINICS

Pulmonary Arterial Hypertension (PAH) is a life-limiting condition where progressive changes in the pulmonary vascular pathology lead to right heart failure and death.¹

Diagnosis of PAH is often delayed or missed in the early stages of disease due to the non-specific nature of common symptoms.²

Early diagnosis of PAH is vital, with intervention at this point likely to delay disease progression and improve patient outcomes.³

PAH clinics aim to reduce this delay to diagnosis and to provide specialist care tailored to patient needs. Due to the complexity of the diagnosis and management of PAH, prescription of PAH specific therapies has been restricted to clinicians affiliated with Medicare approved designated PAH centres.⁴

To support early and appropriate diagnosis, referring physicians suspecting the presence of PAH have the option to screen and/or conduct preliminary tests (as outlined in Figure 1). To further support early diagnosis, referral of suspected PAH patients to the PAH multidisciplinary clinic is encouraged even before diagnosis is confirmed.

Designated PAH centres in Queensland

Cairns Base Hospital The Esplanade CAIRNS QLD 4870	Dr Stephen Vincent Dr James Brown Dr Graham Simpson	Chest Clinic Tel (07) 4226 6240 Fax (07) 4226 6241
Gold Coast University Hospital Pulmonary Hypertension Clinic 1 Hospital Boulevard SOUTHPORT QLD 4215	Dr Siva Sivakumaran	Tel (07) 5687 0000 Nurse 0405 121 862
Mater Hospital 21-37 Fulham Road PIMLICO QLD 4810	Dr John Binder	Tel (07) 4728 6122
The Prince Charles Hospital Pulmonary Hypertension Clinic Rode Road CHERMSIDE QLD 4032	Dr John Feenstra Dr Michael Trotter	Switch (07) 3139 4000 Nurse (07) 3139 5363
Princess Alexandra Hospital Pulmonary Hypertension Clinic 199 Ipswich Road WOOLLOONGABBA QLD 4102	Dr Greg Keir Dr Claire Ellender Dr Sudhir Wahi	Switch (07) 3176 2111 Nurse (07) 3176 2466
Queensland Paediatric Cardiac Service Pulmonary Hypertension Clinic Lady Cilento Children's Hospital 501 Stanley Street SOUTH BRISBANE QLD 4101	Dr Scott Fox	Tel (07) 3068 2790 Fax (07) 3068 2779
Royal Brisbane and Women's Hospital Pulmonary Hypertension Clinic Butterfield Street HERSTON QLD 4006	Dr Chris Zappala	Nurse (07) 3646 3330 Fax (07) 3646 5651
Wesley Hospital 451 Coronation Drive AUCHENFLOWER QLD 4066	Dr John Feenstra Dr Chris Zappala	Tel (07) 3876 9033 Tel (07) 3371 0500

Patient referrals must name specific doctor at relevant hospital.

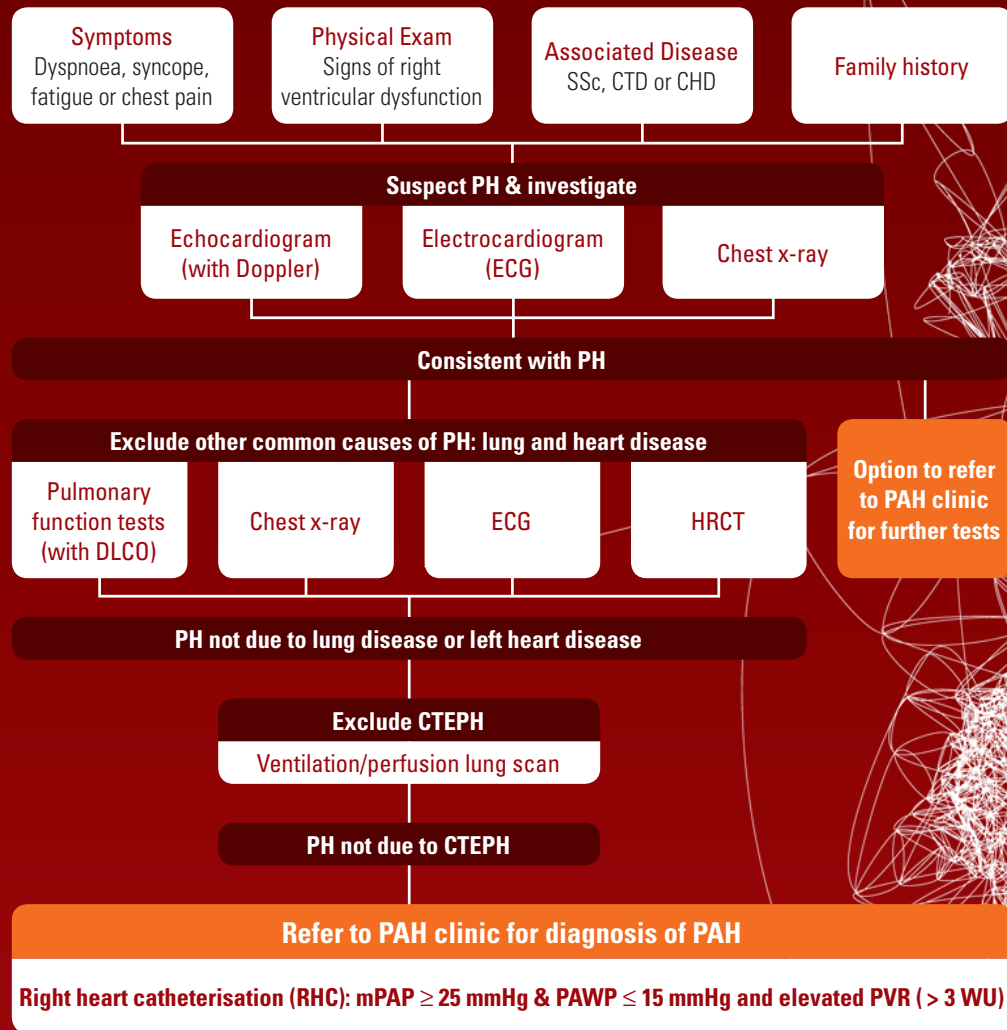
DIAGNOSIS OF PAH^{5,6}

PAH should be considered in all patients presenting with otherwise unexplained dyspnoea, syncope and/or signs of right ventricular dysfunction.⁶

Annual echocardiography screening for PAH is recommended in patients with the scleroderma spectrum of diseases.⁶ Screening of other patients at elevated risk of developing PAH (e.g. family history of PAH, repaired and unrepaired congenital heart disease and connective tissue disease) may assist in the early identification of PAH before pathophysiological changes have significantly progressed.^{5,6}

If clinical suspicion of PAH is confirmed with initial tests, the next step is to exclude other common causes of PH. This requires a comprehensive workup that may be performed in a PAH clinic. A right heart catheter (RHC) performed at a PAH clinic is mandatory to establish the diagnosis of PAH.⁶

FIGURE 1: WHEN TO CONSIDER REFERRING A PATIENT WITH SUSPECTED PAH TO A PAH CLINIC^{5,6}



DIAGNOSTIC TESTS FOR PAH^{5,6}

Initial Assessments	
Symptoms	<ul style="list-style-type: none"> PH/PAH should be suspected in patients with otherwise unexplained dyspnoea on exertion, as well as syncope, fatigue, chest pain or abdominal distension.
Physical Exam	<ul style="list-style-type: none"> Left parasternal lift, accentuated pulmonary component of second heart sound, pansystolic murmur of tricuspid regurgitation, diastolic murmur of pulmonary insufficiency, and a RV third heart sound. Jugular vein distension, hepatomegaly, ascites, cool extremities, cyanosis, and peripheral oedema characterise more advanced disease.
Associated Disease as a Potential Cause of PH	<ul style="list-style-type: none"> Telangiectasia, digital ulceration, nail fold capillary abnormalities, and sclerodactyly are seen in the scleroderma spectrum of diseases (systemic sclerosis, mixed connective tissue disease, or other CTDs). Inspiratory crackles may indicate interstitial lung disease. Spider naevi, testicular atrophy, and palmar erythema may indicate liver disease. Digital clubbing in "IPAH" may warrant an alternative diagnosis such as CHD or PVOD.
Family History	<ul style="list-style-type: none"> Investigate family history of PH/PAH or disease associated with PAH, such as scleroderma or congenital heart defects.
Suspicion of PH	
Electrocardiogram	<ul style="list-style-type: none"> Suggestive or supportive evidence demonstrating RV hypertrophy and strain, right axis deviation, and right atrial dilatation. Absence of these findings does not exclude PH nor does it exclude severe haemodynamic abnormalities due to insufficient sensitivity (55%) and specificity (70%).
Echocardiography	<ul style="list-style-type: none"> Tricuspid regurgitation velocity >2.8m/s, with PA systolic pressure 37-50mmHg with/without additional echo variables is suggestive of PH. Likelihood of PH increases as these variables increase. Right heart dilatation and right ventricular hypertrophy. Estimated PAP and RAP. Interventricular septum flat or concave to RV. Helpful in detecting cause of PH. Two-dimensional, Doppler and contrast examinations can be used to identify CHD. WHO Group 2 left heart disease should be suspected in presence of dilated left atrium, atrial fibrillation, increased left filling pressures, characteristic changes to mitral valve tissue and LV hypertrophy.
Chest X-ray	<ul style="list-style-type: none"> In 90% of patients with IPAH the chest radiograph is abnormal at time of diagnosis. Prominent pulmonary arteries contrasting with loss of peripheral blood vessels. Right atrial and right ventricular enlargement/hypertrophy. Enlarged or thickened pulmonary veins may indicate left heart disease.
Exclusion of Other Causes	
Pulmonary Function Tests	<ul style="list-style-type: none"> Normal spirometry and lung volumes (or mild restriction) with reduced DLCO (40-80% predicted) is indicative of PAH. Decreased lung volume together with a decrease in DLCO may indicate ILD. CT scans can be used to assess severity of emphysema or interstitial lung disease. COPD as a cause of hypoxic PH diagnosed on evidence of irreversible airflow obstruction together with increased residual volumes and reduced DLCO or increased CO2 tension. <p>If not already completed, ECG, chest x-ray, transthoracic echocardiogram, and high resolution CT (HRCT) of the chest can be requested to identify, or exclude the presence of Group 2 – left heart disease, or Group 3 – lung diseases.</p>
Further Imaging	<ul style="list-style-type: none"> Abdominal ultrasound: used to detect portal hypertension. Cardiac MRI: to assess RV/LV size and function and to detect CHD. Ventilation/perfusion lung scan: used to detect Group 4 – CTEPH patients. Higher sensitivity than CT scans. Unmatched perfusion defects may also be seen in PVOD.
Confirmation of PAH	
Right Heart Catheterisation	<ul style="list-style-type: none"> RHC in patients with PH can be technically demanding, and can be associated with some serious, sometimes fatal complications, therefore assessments should be carried out in expert centres. Key haemodynamic measures indicative of PAH are: mPAP ≥25mmHg and PAWP ≤15mmHg. Measurements of RAP, RVP, CO and mixed-venous oxygen saturation should also be collected.

For further information refer to the ESC/ERS Guidelines for the diagnosis and treatment of pulmonary hypertension: Gaile N *et al. Eur Respir J* 2009;34: 1219-63.