



Investigating the patient with pulmonary oedema

Each month we present authoritative advice on the investigation of a common clinical problem, specially written for family doctors by the Board of Continuing Medical Education of the Royal Australasian College of Physicians.



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Radiologically confirmed pulmonary oedema implies that the patient has left heart failure until proved otherwise. With an ageing population, heart failure is becoming the most common reason for admission to hospital. Patients who develop pulmonary oedema slowly may not require hospitalisation, thus GPs should be confident about managing these patients.

Aetiology: clues from the initial presentation

Typically the patient with left heart failure presents with increasing shortness of breath on exertion. As the condition deteriorates, orthopnoea, paroxysmal nocturnal dyspnoea and symptoms of right heart failure (peripheral oedema, hepatic congestion) become evident. Attention should be paid to all steps of the clinical evaluation to detect vital clues to the underlying cause and exacerbating factors in Table 1. It is important to elicit physical signs of left heart failure, e.g. a third heart sound, and/or bilateral basal crepitations, as treatment can be initiated before investigations have been performed.

The time course of evolution of symptoms varies according to the underlying aetiology. Rapid onset of symptoms (less than a week) is usually due to one of the following:

- a tachyarrhythmia (atrial flutter or atrial fibrillation with a rapid ventricular response)
- acute ischaemia
- silent myocardial infarction
- rarely, acute valve failure from endocarditis or rupture of the chordae tendineae of the mitral valve.

More gradual onset may be due to any cardiovascular disease. Ischaemic heart disease, hypertension, valvular heart disease or cardiomyopathy (idiopathic or secondary to excessive alcohol use or diabetes) are the most common causes.

In patients with pre-existing cardiovascular disease, pulmonary oedema may occur when demand on the heart is increased by anaemia, thyrotoxicosis or an infection. Fluid retention caused by the recent introduction of NSAIDs or COX-2 specific inhibitor therapy should also be considered. Thus, exacerbating factors need to be excluded in all cases.

Initial investigations

The presence of pulmonary oedema should be confirmed by chest x-ray. Clues to the underlying cardiovascular cause can be identified in most cases by an ECG and an echocardiogram. To identify potential exacerbating factors, a full

IN SUMMARY

- **Pulmonary oedema should be confirmed by chest x-ray.**
- **A detailed history, physical examination and basic laboratory tests are essential to identify exacerbating factors.**
- **Patients with rapid onset of symptoms should be hospitalised.**
- **Loop diuretic and ACE inhibitor therapy should be started while awaiting the results of initial investigations.**
- **Echocardiography and specialist referral of selected patients are essential for definitive management.**

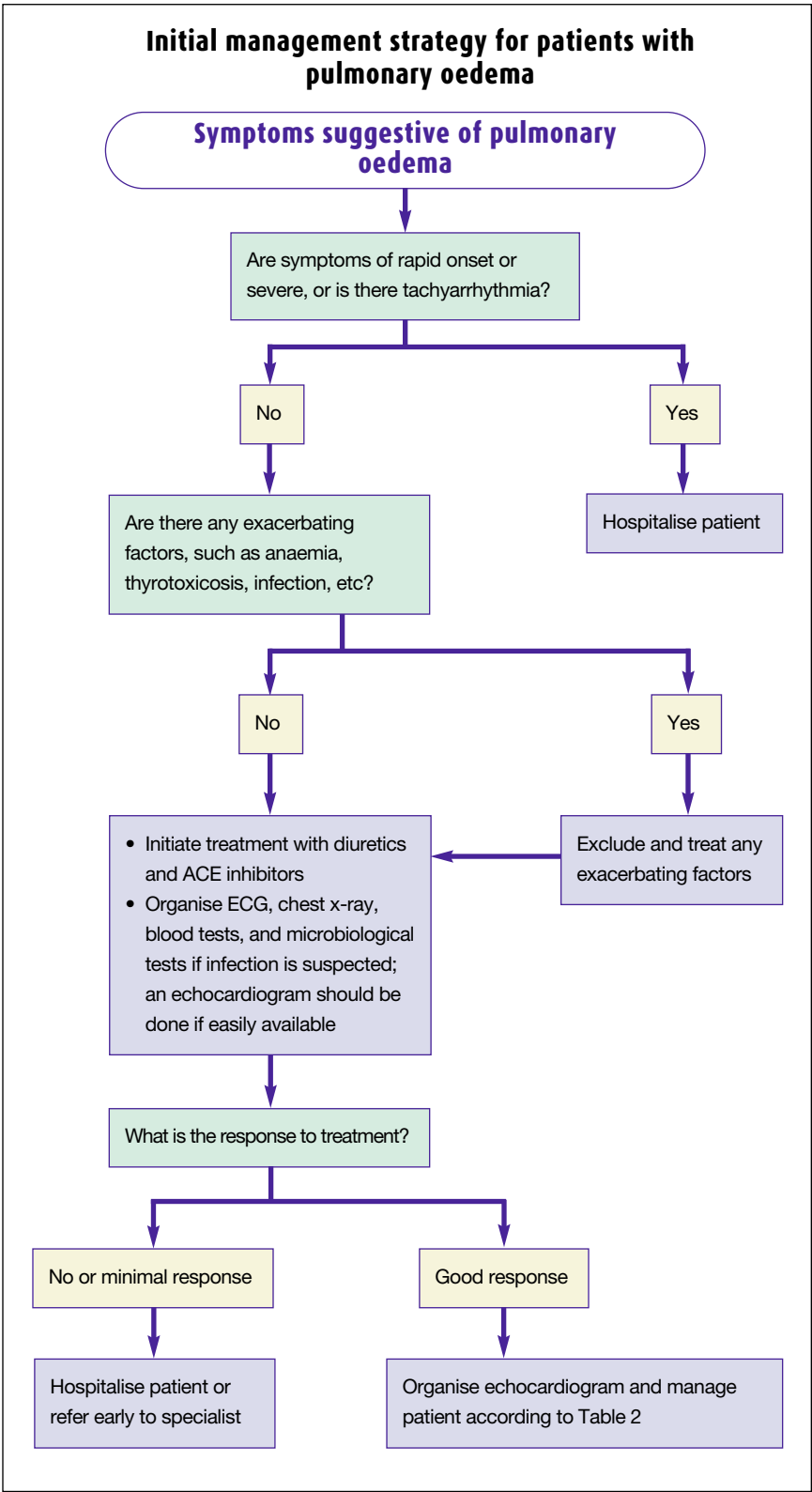


Table 1. Clinical evaluation: identifying likely aetiology

History
Prior cardiovascular disease
Hypertension
NSAID or COX-2 specific inhibitor use
Infection
Excessive alcohol intake
Examination
Hypertension
Valvular heart disease
Arrhythmia
Infection
Anaemia
Thyrotoxicosis
Laboratory tests
Anaemia
Thyrotoxicosis
Infection
Renal failure
Cardiac investigations
Ischaemic heart disease
Valvular heart disease
Cardiomyopathy
Arrhythmia

blood count should be done to detect anaemia and thyroid function tests to detect thyrotoxicosis. A white cell count and appropriate microbiological studies should be performed when infection is suspected by clinical findings. Urea, electrolyte and creatinine measurements are mandatory as the presence of renal failure or electrolyte disturbances complicates management.

Management while awaiting results

The initial management strategy for patients with pulmonary oedema is summarised in the flowchart on this page. Hospitalisation is recommended for all patients who have rapid onset of symptoms or who fail to respond to initial treatment over 24 to 48 hours. While awaiting ambulance transfer for acute pulmonary oedema, severe symptoms

should be ameliorated by oxygen therapy and intravenous administration of frusemide and morphine.

Patients with pulmonary oedema of any duration with a tachyarrhythmia should be admitted to hospital because urgent cardioversion is often the best management strategy. Admission should be strongly considered also for those patients who have recent or frequent paroxysmal nocturnal dyspnoea.

All other patients can be managed as outpatients while awaiting the results of investigations and response to initial treatment. As discussed previously, treatment with loop diuretics (e.g. frusemide) and ACE inhibitors can be safely initiated before laboratory test results are available. Potassium supplementation is not generally required at the initiation of treatment as ACE inhibitors inhibit potassium excretion. NSAIDs and COX-2 specific inhibitors should be withdrawn. Any obvious infection should be treated after appropriate microbiological investigations have been instigated.

GP and specialist participation in care

GPs may wish to involve cardiologists in the care of the patient before or after the results of initial investigations are

available. Before the results of initial investigations are known, telephone consultation can be useful when there is doubt about a patient's need for hospitalisation. It is also useful if there is doubt about additional treatment in patients with known cardiovascular disease already maintained on diuretics and ACE inhibitors. After initial investigations, involvement of cardiologists will be determined by the patient's prior cardiovascular history, the test results and the response to initial treatment.

Referral and the definitive management of new patients should be based primarily on the echocardiographic findings as summarised in Table 2. Patients who respond to treatment and have left ventricular (LV) diastolic dysfunction or a normal echocardiogram do not need specialist referral; diuretic therapy is usually sufficient to control symptoms with good long term prognosis.

While rare, lymphangitis carcinomatosa should be considered in patients who do not respond to treatment and have no cardiomegaly and a normal echocardiogram.

The presence of a regional wall motion abnormality suggests ischaemic heart disease. The occurrence of pulmonary oedema in such patients strongly suggests

Table 2. Definitive management based on echocardiographic findings

Inadequate images

Specialist referral

Alternative imaging procedures depending on clinical scenario, e.g. transoesophageal echocardiography, gated heart pool scan, myocardial perfusion studies

Normal findings or left ventricular (LV) dysfunction

Continue diuretic treatment

Refer if symptoms worsen or there is no response to treatment

Significant valve dysfunction

Specialist referral

Valve surgery or valvuloplasty may be indicated

Isolated regional wall motion abnormality (with or without old myocardial infarction on ECG)

Exercise stress test

Consider specialist referral

Generalised hypokinesia with LV systolic dysfunction

Specialist referral

?Diabetes

?Haemochromatosis

Tips in counselling patients not requiring hospitalisation

At initial assessment

- Inform patients of the need for a chest x-ray to confirm the suspected diagnosis of pulmonary oedema.
- Explain that laboratory tests, an ECG and an echocardiogram are needed to identify exacerbating factors and the underlying cardiac cause.
- Explain that treatment with diuretics and ACE inhibitors usually provides rapid relief of symptoms while awaiting test results. If relief is not obtained, however, hospitalisation may be required.
- Inform patients that test results will help determine the prognosis, the need for further investigations and the need for specialist referral.
- Emphasise the need to avoid exacerbating factors (excessive alcohol, NSAIDs, excess salt intake).
- Ensure patients have an emergency plan should they experience acute severe dyspnoea.

At follow up

- Ensure vaccinations for influenza and pneumococcal disease are current.
- Consider an increase in diuretic dosage and early review if patients' symptoms increase or they gain weight.
- Discuss the likely cause and need for specialist referral based on the results of echocardiography.

the presence of prognostically significant coronary artery disease. A specialist referral should be considered, therefore, for those patients who fail to respond to initial treatment or those who would be prepared to undergo coronary bypass surgery should they have severe coronary disease at angiography.

Patients who have significant valve dysfunction often need valve surgery or balloon valvuloplasty. Consequently,

these patients should always be referred for specialist evaluation.

Patients with severe LV systolic dysfunction (ejection fraction less than 35%) with regional wall motion abnormalities or generalised hypokinesis have a poor prognosis. Prognosis can be improved significantly by the addition of a beta blocker (carvedilol [Dilatrend]) and spironolactone (Aldactone, Spiractin). As problems often occur during the initiation of therapy with these drugs, specialist involvement is strongly advised.

Once the patient has been stabilised, ongoing supervision is important. Tips for patient counselling are listed in the box on this page. NSAIDs and COX-2 specific inhibitors should be avoided if possible, and vaccination for influenza and pneumococcal disease maintained. Patients need to know that symptoms may fluctuate. They should receive advice on daily weighing to guide variation of diuretic dosage. They should also have an emergency plan in the event that pulmonary oedema recurs.

Management in rural practice

In the rural setting, rapid onset of pulmonary oedema should still be managed in hospital whenever possible. GPs working in rural practice should have a predetermined retrieval service and referral hospital. It is appropriate to discuss initial investigation and management with the specialists providing these services. Patients should undergo all the investigations outlined above; however, the timing of these investigations will clearly be determined by their availability, the severity of symptoms and response to initial treatment. An ECG, chest x-ray and laboratory tests should be available in most centres. Thus, the only investigation not immediately available will be the echocardiogram.

Echocardiography can be deferred safely while the initial response to treatment is assessed. If symptoms persist or they deteriorate, early referral should be

considered. If the patient responds well to initial treatment, referral can be deferred to a more convenient time.

As specialist referral is often required, this should be co-ordinated with the appointment for the echocardiogram. Rural GPs should attempt to predict the need for other investigations such as stress testing to exclude ischaemic heart disease or other imaging modalities. The latter are often required when poor images are obtained with transthoracic echocardiography, particularly in obese or emphysematous patients. Prior liaison with the referral specialist can optimise the scheduling of these procedures.

Conclusion

With the ageing population, the incidence of heart failure and pulmonary oedema will continue to increase. GPs have a pivotal role in the initial assessment and ongoing management of these patients. To reduce the burden on hospitals, GPs need to focus on early detection, rapid initial investigation and management followed by appropriate specialist referral as outlined in this brief review. **MT**